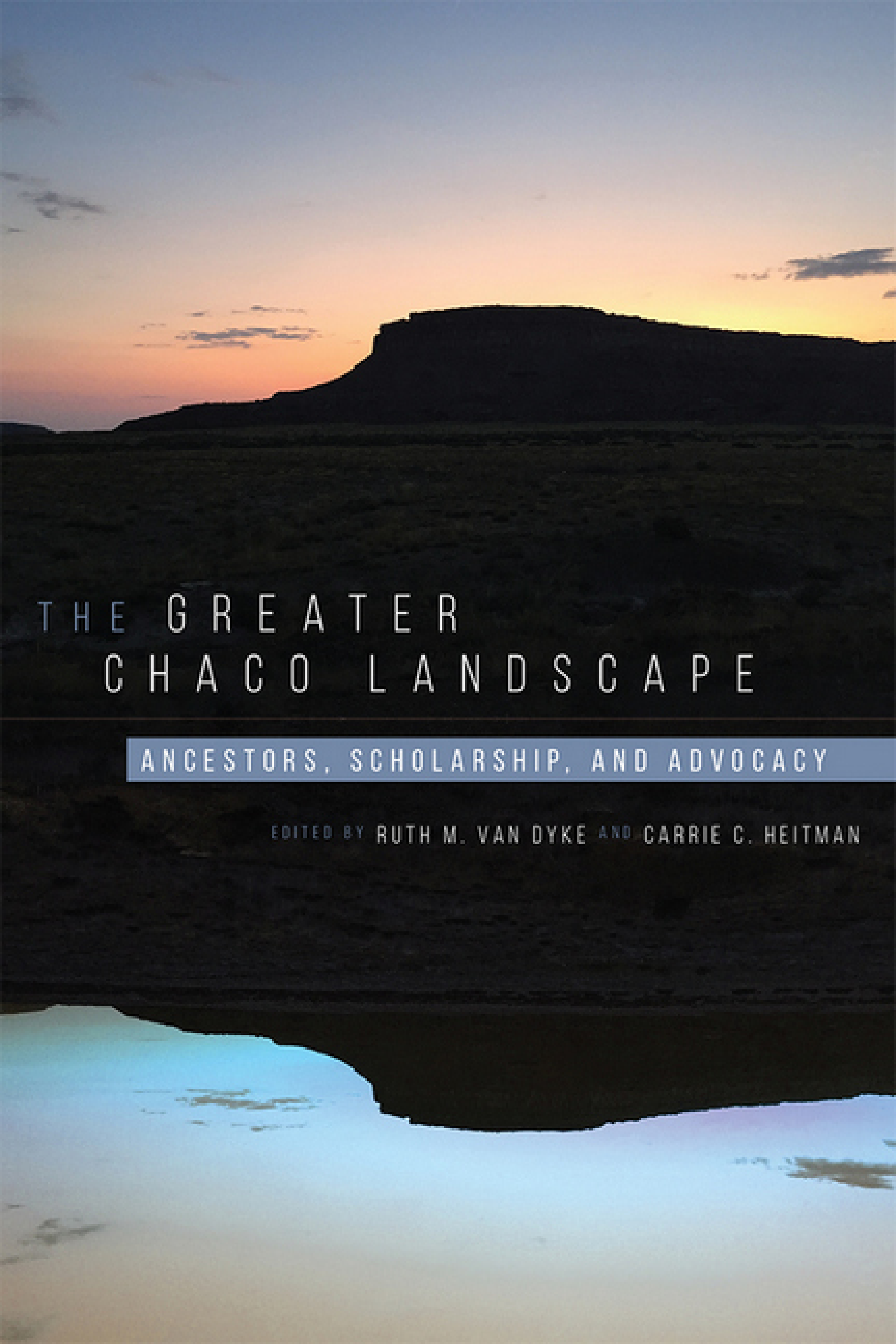


THE GREATER CHACO LANDSCAPE

ANCESTORS, SCHOLARSHIP, AND ADVOCACY

EDITED BY RUTH M. VAN DYKE AND CARRIE C. HEITMAN

THE GREATER CHACO LANDSCAPE

THE GREATER CHACO LANDSCAPE

ANCESTORS, SCHOLARSHIP, AND ADVOCACY

EDITED BY
RUTH M. VAN DYKE AND CARRIE C. HEITMAN

UNIVERSITY PRESS OF COLORADO
Louisville

Published by University Press of Colorado
245 Century Circle, Suite 202
Louisville, Colorado 80027

The University Press of Colorado is a proud member of
the Association of University Presses.

The University Press of Colorado is a cooperative publishing enterprise supported, in part, by Adams State University, Colorado State University, Fort Lewis College, Metropolitan State University of Denver, Regis University, University of Colorado, University of Northern Colorado, University of Wyoming, Utah State University, and Western Colorado University.

∞ This paper meets the requirements of the ANSI/NISO Z39.48–1992 (Permanence of Paper).

ISBN: 978-1-64642-169-5 (paperback)
ISBN: 978-1-64642-170-1 (ebook)
https://doi.org/10.5876/9781646421701

Library of Congress Cataloging-in-Publication Data

Names: Van Dyke, Ruth M., editor. | Heitman, Carrie C., editor.
Title: The greater Chaco landscape : ancestors, scholarship, and advocacy / edited by Ruth M. Van Dyke and Carrie C. Heitman.
Description: Louisville : University Press of Colorado, [2021] | Includes bibliographical references and index.
Identifiers: LCCN 2020051758 (print) | LCCN 2020051759 (ebook) | ISBN 9781646421695 (paperback) | ISBN 9781646421701 (ebook) `
Subjects: LCSH: Chaco architecture—New Mexico—Chaco Canyon. | Chaco culture—New Mexico—Chaco Canyon. | Pueblo Indians—Dwellings—New Mexico—Chaco Canyon. | Landscapes—New Mexico—Chaco Canyon. | Mineral industries—New Mexico—Chaco Canyon. | Chaco Canyon (N.M.)—Antiquities.
Classification: LCC E99.C37 G74 2021 (print) | LCC E99.C37 (ebook) | DDC 978.9/01—dc23
LC record available at https://lccn.loc.gov/2020051758
LC ebook record available at https://lccn.loc.gov/2020051759

Funded by the Department of the Interior, National Park Service, Intermountain Region. CESU Master Agreement P14AC00979, to Project Number: UCOB-109, granted by Chaco Culture National Historical Park, New Mexico, to the University of Colorado, Boulder, Colorado.

Digital material available at http://read.upcolorado.com/projects/the-greater-chaco-landscape/resources and http://read.upcolorado.com/projects/the-greater-chaco-landscape.

Cover art created by Daniel Pratt, based on a photo of 29SJ 1088 by Ruth M. Van Dyke.

For R. Gwinn Vivian

in gratitude for his scholarship, friendship,
and love of the Chaco landscape

Contents

Figures, Videos, and Tables

FIGURES

VIDEOS

TABLES

THE GREATER CHACO LANDSCAPE

I

Introduction and History

1

The Greater Chaco Landscape Volume

Ruth M. Van Dyke and
Carrie C. Heitman

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 14, 2017.

https://doi.org/10.5876/ 9781646421701.c001.v000

Every year, over 40,000 people make a bone-jarring drive up one of two remote, wash-boarded roads in one of the least densely populated counties in New Mexico to visit Chaco Culture National Historical Park. Inside Chaco Canyon, the multistoried sandstone walls of great houses such as Pueblo Bonito and Chetro Ketl stand against golden sedimentary cliffs, as they have for over a thousand years. Casual hikers, inspired artists, dedicated researchers, and Indigenous descendants find meaning and inspiration in these ancient buildings and this extraordinary place.

At the heart of Chaco Canyon lie a dozen great houses—monumental buildings staged within a terrain formalized by staircases, roads, mounds, ramps, and other features. The great houses coexist with several hundred domestic pueblos or "small sites," mostly scattered down the south side of the canyon. On a sunny autumn day in 2014, we perched on a rock along the Pueblo Alto Trail and looked out over the San Juan Basin. It seemed that we were in the tactile presence of time itself. The air was silent, except for a slight breeze in the saltbush, the soft skitter of a nearby lizard, and the deep bass thrumming of . . . energy extraction.

Of course, Chaco was not silent during its ancient heyday between AD 850 and 1150. A thousand years

DOI: 10.5876/9781646421701.c001

ago, the canyon soundscape would have been alive with conversations, barking dogs, laughter, songs, and conch shell trumpets. But the thrumming of oil and gas wells across the greater Chaco landscape today is a symptom of a deep contemporary disregard for our planet's past as well as its future. Oil, gas, and coal mining are not recent developments, nor are they likely to disappear soon. Our society needs energy, and as the owners of SUVs and pickups, we are no exceptions. But if our government continues to foreground mineral extraction at the expense of every other concern, we may ultimately find that there is no society left to energize, no planet left to power.

The authors participating in this volume are united by two primary concerns. The first of these is the real and imminent threat to the greater Chaco landscape from energy extraction. The second is our shared interest in anthropological questions that can only be asked, and answered, at the level of landscape. These two issues have been entwined since the mid-1970s as agencies, scholars, Tribes, and industry have attempted to address potential conflicts between energy development and Chacoan archaeology across the San Juan Basin. In chapter 2 of this volume, Steve Lekson offers a personal and historical tour of archaeological investigations into outliers and the greater Chaco landscape from the 1970s onward, and he explains the inception and development of our particular project.

Chaco has never been confined to Chaco Canyon. When Chaco Canyon was named a National Monument on March 11, 1907, the new park included the "outlier" units of Pueblo Pintado, Kin Bineola, and Kin Ya'a. Today, scholars recognize that Chaco-era great houses and associated communities are found from southeast Utah to west-central New Mexico over an area encompassing 60,000 sq. mi., about the size of the state of Alabama (figure 1.1). We can sort this vast area into three parts: central or "downtown Chaco"; an "inner circle" up to 150 km from downtown Chaco (the distance within which a bulk goods economy could theoretically operate, and roughly congruent with the San Juan Basin); and an "outer periphery" or limit at about 250 km (the outermost great house sites). The 200+ outliers found across this area express architectural and artefactual congruences with the canyon canon, but they likely represent diverse relationships with Chaco Canyon and with one another. Some outliers were clearly Chacoan colonies, while others seem to be local developments whose inhabitants emulated Chaco. Some were contemporaneous with the earliest developments at Chaco in the AD 800s, while many others were founded during apparent expansionist waves in the mid-1000s and 1100s. Outlier inhabitants may have traveled to Chaco Canyon, participated in canyon events, contributed resources and labor, and considered

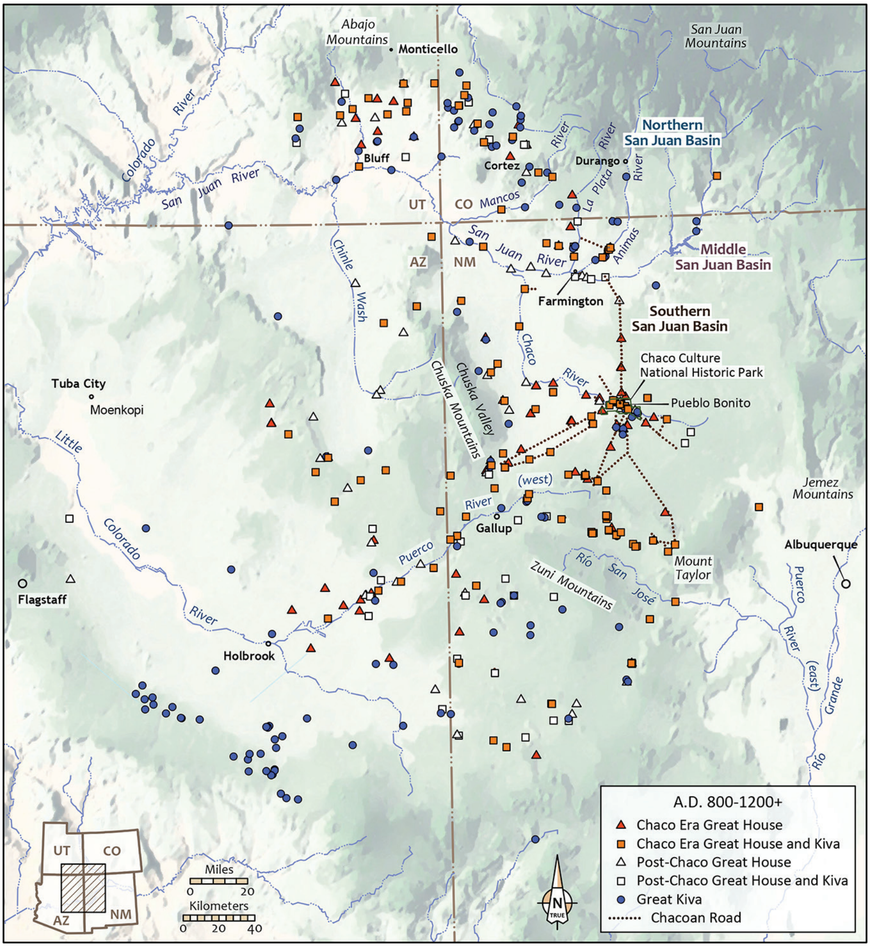


Figure 1.1. *Map of the greater Chacoan landscape. Based on database described in Heitman and Field (this volume).*

themselves to be Chacoans, or they may have known of the canyon only as a distant, storied neighbor. Archaeologists have developed a range of models to explain the geographically expansive appearance of Chacoan architecture across this arid, agriculturally marginal landscape. Regardless of a researcher's theoretical preferences or methodological proclivities, there is no denying that we must understand the relationships between Chaco Canyon and outlying great house communities (outliers) if we are to understand this complex chapter of human history.

In the 1970s, archaeologists began to realize the regional scale of the Chaco Phenomenon at the same time that energy developers began to express interest in the San Juan Basin. One of the first comprehensive outlier surveys (Marshall et al. 1979) was sponsored by the Public Service Company of New Mexico, in cooperation with the New Mexico Historic Preservation Division, with the explicit goal of identifying outliers for future management of energy development. On December 19, 1980, congressional legislation created Chaco Culture National Historical Park to include "thirty-three outlying sites . . . hereby designated 'Chaco Culture Archaeological Protection Sites'" administered under a Joint Management Plan (JMP) by federal and state agencies and the Navajo Nation. On December 8, 1987, when Chaco was inscribed in UNESCO's World Heritage List, the listing acknowledged Chaco's geographic scale by including nine Protection Sites: Aztec Ruins, Kin Bineola, Kin Ya'a, Pueblo Pintado, Casamero, Kin Nizhoni, Pierre's, Twin Angels, and Halfway House (the latter three related to the ancient "North Road," see Friedman et al. and Reed in this volume). Both the JMP and the World Heritage listing explicitly noted the potential for future conflicts between energy development and site protection.

Chaco was never a single locality, nor was it merely a series of discrete localities or elements. Management decisions that reduce this landscape to dots on a map threaten to destroy the most compelling, least-understood, and perhaps most significant aspect of the Chaco phenomenon. Given the significant growth of knowledge about the Chaco world since the 1970s, the increased sophistication in both archaeology and historic preservation regarding landscapes, and the renewed interest in energy development in the Chaco region, a new management philosophy seems warranted. In 2014, former National Park Service (NPS) archaeologist Tom Lincoln charged us, as academics and Chaco scholars, to help provide the management agencies with tools to better address the situation. As Steve Lekson details toward the end of chapter 2, he invited the two of us to collaborate on a series of meetings with Tribal members, researchers, consulting archaeologists, and land managers. One of the outcomes of these meetings was a "white paper" on the Chaco landscape that detailed the history, archaeological materials, anthropological questions, and management issues involved (appendix A). The paper was meant as a comprehensive tool that could be used for management purposes. Another outcome is this volume, which emerged from a seminar held at Crow Canyon Archaeological Center in August 2017 (figure 1.2).

Our seminar was at first facetiously and later seriously entitled "Chaco Landscapes: What We Know and What We Don't." We brought together people who are actively engaged with various dimensions of the Chaco

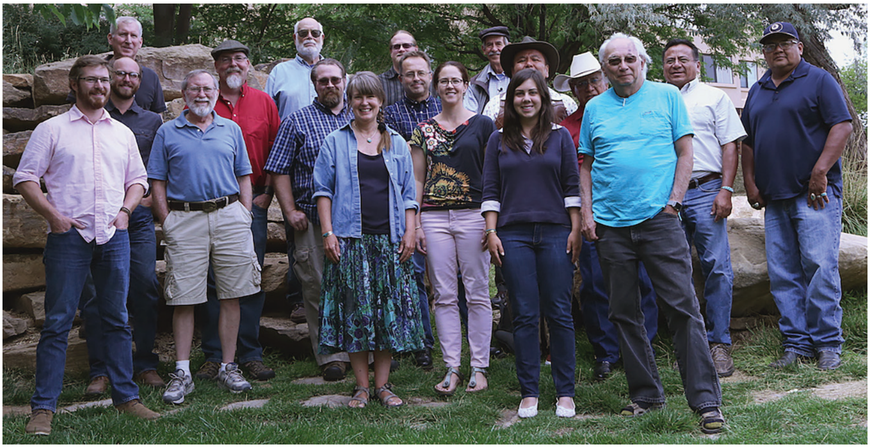


Figure 1.2. *Group photo from the Chaco Landscapes: What We Know and What We Don't conference, which took place at Crow Canyon Archaeological Center, Cortez, Colorado, on August 4–6, 2017.* From left to right*: Tim De Smet, Kellam Throgmorton, Steve Lekson, Roger Moore, Paul Reed, G. B. Cornucopia, Geoff Haymes, Ruth Van Dyke, Aron Adams, Julian Thomas, Carrie Heitman, Tom Windes, Katilyn Davis, Will Tsosie, Ernest Vallo, Philip Tuwaletstiwa, Richard Begay, and Robert Begay. Photo by Davd Valentine.*

landscape, studying issues that range from agricultural productivity and roads to rock art and soundscapes. Our group included Native scholars who are, after all, the primary stakeholders in this struggle.

As you browse this volume, whether online or in print, you will notice that all the chapters are accompanied by video segments, and, indeed, six of the chapters exist *only* as video segments. We decided to develop an online and a video component to the project for three reasons. First, we hope that online and video formats allow us to reach a larger audience. Second, the online dimension allows us to incorporate a wide range of colorful and moving images that can better convey our arguments and our data. For some authors, video and images are better than text for evoking sensory aspects of their discussions. Third and most important, several of the people in our seminar—particularly but not exclusively our Native participants—felt that an oral presentation would be the most appropriate way to express their ideas, and video was an excellent way to capture this. So, we filmed all the presenters during their talks in the Crow Canyon seminar room, and videographer Larry Ruiz wove them together with the presenters' PowerPoints to make an oral version of each paper. You can watch these presentations as part of this volume (http://read.upcolorado.com/projects/the-greater-chaco-landscape/resources).[1] But when Will Tsosie pointed out the inherent difficulties for an Indigenous person to talk about the Chaco landscape while sitting indoors in a seminar room, we decided to expand the video dimension of our project to Chaco Canyon. As a result, the video chapters from the Diné (chapters 7 and 8), from Acoma elder Ernie Vallo (chapter 7), from Hopi cultural experts (chapter 9), and from A:shiwi (Zuni) cultural experts (chapter 10) consist of segments shot in Chaco Canyon during October 2017 and August 2019.

During the August 2017 seminar, our group spent two days together contemplating some of the big questions raised by the study of the greater Chacoan landscape: What do we mean by "Chaco?" What do we mean by "landscape?" Should changes in methods, theory, and scholarly understanding lead to changes in laws and land management practices?

What do we mean by Chaco? As we described above, Chaco is clearly bigger than Chaco Culture National Historical Park. All models for sociopolitical organization at Chaco require engagement with communities beyond the park boundaries. If "Chaco" is defined by the maximum spread of great houses or great-house-like architecture, then, as Lekson argues (chapter 2 in this volume), the Chacoan world is vast and threatens to engulf most of the non-Hohokam Southwest, at least between AD 1100 and AD 1300. It is interesting from a scholarly perspective to contemplate how Chaco's influence may have spread, but this maximal area is simply too large for land managers in northwest New Mexico to treat as a single entity. But would a 10 mi. buffer zone around CCNHP with an energy leasing moratorium (Reed, chapter 16 in this volume) protect enough? The Chaco Culture Heritage Area Protection Act (H.R. 2181)—legislation proposed in 2018 by New Mexico Representative Lujan, passed by the US House of Representatives in October 2019 and currently under consideration in the Senate Committee on Energy and Natural Resources—proposes such a buffer. This legislation would be a good start, but it would still leave out much of what is important, including roads that stretch far beyond such a boundary (Friedman et al., chapter 13 in this volume; Heitman and Field, chapter 14 in this volume; Tuwaletstiwa and Marshall, chapter 4 in this volume).

When we think about how far "Chaco" extended in space, we also must think about time. Chaco was not a monolithic entity that simply existed in the same form for three centuries—there was a gathering and an unraveling (Van Dyke 2019). Models for Chacoan origins ask us to think about the northern San Juan (e.g., Wilshusen and Van Dyke 2006) as well as the southern Cibola region (Mills et al. 2018). To understand how Chaco Canyon became so influential, we need to look at early AD ninth- and tenth-century communities that extend across the San Juan Basin. Windes and Van West (chapter 3 in this volume) examine a series of early great houses outside of Chaco Canyon and discuss their likely bearing on the rise of power within the canyon.

What do archaeologists today mean by landscape? How has this changed since cultural resource management laws were written in the 1960s? How do archaeological concepts of landscape articulate with Indigenous views of landscape? For many archaeologists, "landscape" means "settlement pattern," and landscape studies involve examining climate, resources, and subsistence practices. We do not neglect this well-studied dimension here. Chacoans were farmers, and Windes and Van West (chapter 3 in this volume) give us a look into what we know about Chacoan farming practices.

But landscape connotes more than a place to farm, hunt, and gather. Following the lead of British researchers, the study of "landscape" has evolved in archaeology to include spatial symbolism, meanings, and sensory engagements (e.g., Ashmore and Knapp 1999; Bradley 2000). Particularly in the Southwest, landscape studies go hand in hand with understanding Indigenous worldviews and perceptions (Anschuetz et al. 2001; Basso 1996; Fowles 2010). The archaeological study of sensory and meaningful landscapes is much less developed than the study of subsistence practices and resource use. At the same time, since the 1980s archaeologists have made tremendous use of spatial technologies and data management programs. Drones, Light Detection and Ranging (LiDAR), Geographic Information Systems (GIS) and related advances have transformed our ability to explore, analyze, and store information about the spatial world. Chaco scholars are only beginning to explore what we can do with these new theoretical approaches coupled with new technologies. Many of the chapters in our volume involve one or more of these newer theoretical and methodological directions.

Chacoan archaeology includes sites and features that are difficult to categorize, let alone date, record, manage, and understand. Roads are perhaps the most emblematic of these. Cleared linear alignments radiate to the north and south from Chaco Canyon, extending for tens of kilometers. Shorter segments enter and leave great houses, or seem to float in the interstices between outlier communities. Philip Tuwaletstiwa and Mike Marshall have spent years in the field tracing a set of roads leading west from Chaco toward the Chuska Mountains—they share with us the results of these ongoing efforts (Tuwaletstiwa and Marshall, chapter 4 in this volume). Chacoan roads can be difficult to see under the best circumstances; as energy extraction infrastructure expands, road segments may well represent the most fragile part of the Chacoan record. Rich Friedman, Anna Sofaer, and Rob Weiner (chapter 13 this volume) lead efforts to use LiDAR and other forms of aerial imagery to study Chaco's roads and alignments. Carrie Heitman and Sean Field (chapter 14 in this volume) use geospatial data and aerial imagery to study changes to roads over time.

Rock art is another poorly understood landscape-level dataset. In the past professional archaeologists have frequently ignored or downplayed the importance of rock art (but see Hays-Gilpin 2004); thankfully, this is changing (e.g., Crown et al. 2016; Schaafsma 2018). Jane Kolber, Donna Yoder, and Kelley Hays-Gilpin are working on a book that will share the results of many decades of work in Chaco Canyon. Here, Dennis Gilpin (chapter 5 in this volume) has assembled an overview of what we know about rock art beyond Chaco Canyon.

Roads may have been one set of filaments connecting the ancient Chacoan social and political world; lines-of-sight may have been another. Shrines, crescents, herraduras, stone circles, cairns, and related features have all figured into various researchers' investigations into networks of intervisibility (see, e.g., Hayes and Windes 1975; Kincaid 1983; Marshall and Sofaer 1988; Van Dyke et al. 2016; Windes 1978). For decades researchers have bestowed a wide range of labels on enigmatic rock features as they have attempted to sort out their various possible functions. More recently, Native voices have made it clear that it is not appropriate for archaeologists to study or disturb religious shrines in active use. In chapter 6 of this volume, Van Dyke attempts to disentangle this situation and chart a path forward that respects Indigenous concerns. She introduces the term enigmatic rock feature (ERF) as an umbrella concept to ameliorate past difficulties caused by conflating form with function. She also argues strongly that collaboration with Indigenous colleagues is the only way to ensure respectful treatment of ancient and ongoing landscape features.

We recognize that the Native peoples of the Colorado Plateau should be the most important voices in any discussion about the greater Chaco landscape. Here, we can only offer a beginning to these conversations. As described above, these contributions are in the form of video segments. In chapters 7 and 8, Ernie Vallo, from the Pueblo of Acoma, and Will Tsosie (Diné) speak to us from Chaco Canyon, describing their relationships to this place and to the ancient Chacoans. Tsosie converses with Eurick Yazzie and Tristan Joe, two students from Navajo Preparatory School in Shiprock, and their teacher, Ms. Denise Yazzie. In chapter 9 Terrance Outah, Georgiana Pongyesva, and Ronald Wadsworth from the Hopi Tribe share with us some of their traditional knowledge about Chaco and concerns for the future. In chapter 10 Octavius Seowtewa, Curtis Quam, and Presley Haskie from the Zuni

Cultural Resource Advisory Team speak to us about the A:Shiwi (Zuni) relationship with the Chacoan landscape. All of these Indigenous cultural experts describe in moving terms the importance of the greater Chacoan landscape for their people and their emphatic concerns for its protection from the ravages of energy development. In the coming years we plan to record additional conversations with members of the many other Tribes who have connections with Chaco and, if possible, add these conversations to the corpus of online materials associated with this book. Along similar lines, in the time since our seminar in August 2017, Archaeology Southwest has initiated efforts toward a large-scale study of Indigenous relationships with greater Chaco. Various Pueblo groups have also combined their efforts to create the Chaco Heritage Tribal Association.

For Indigenous peoples the landscape is inseparable from the stories and meanings conveyed by oral tradition and human experience. Somewhat similarly, but from an academic perspective, Van Dyke seeks to understand the sensory experiences of ancient Chacoans. In chapter 11 of this volume, Van Dyke and colleagues Tim De Smet and Kyle Bocinsky harness phenomenology to spatial modeling as they explore viewscapes and soundscapes within the Chaco outlier communities of Pierre's and Bis sa'ani. It seems to have been important for Chacoans to look and listen across large distances. Lines-of-sight and prominent peaks link both outlier communities to Chaco Canyon. A simulated conch shell trumpet blast from the top of a great house conforms neatly to Pierre's and Bis sa'ani settlement distribution maps, suggesting that Chacoan community boundaries may have been defined by sound. G. B. Cornucopia continues our exploration into the Chacoan sensorium. G. B. is a longtime Chaco interpretive park ranger with a passionate interest in the movements of the sun, moon, and stars at Chaco. He has a great gift for communicating his knowledge to the public; in the chapter 12 video, he shares with us his understanding of Chaco's night skies and the threats to Chaco's International Dark Sky desgination.

Should changes in methods, theory, and scholarly understanding lead to changes in laws and land management practices? GIS and remote-sensing technologies have given us the ability to examine and manage data over large areas of the earth's surface, yet cultural preservation laws remain focused on drawing tight boundaries around discrete points. Archaeologists' and land managers' most frequently invoked tool is Section 106 of the National Historic Preservation Act (NHPA). Most of the features and elements described in this volume would be considered "significant" cultural "resources" under Section 106 Criterion D, but the law does not ensure their preservation—only the "mitigation" of adverse effects. Furthermore, this "dots on a map" approach to management has given us today's Pierre's community. Here, although the placement of twelve drill rigs has not violated the National Historic Preservation Act, the rigs are well within view and earshot of any visitor to Pierre's, and service roads crisscross the Chacoan Great North Road (chapter 11, this volume).

It may be time for archaeologists to rethink how to best deploy our existing laws (and perhaps, someday, formulate new ones) that will do a better job of protecting *landscapes* in addition to discrete sites. Over a century ago, Richard Wetherill allegedly used timbers from Pueblo Bonito as firewood—dendrochronology had not yet been invented. In 1966, legislators gave us NHPA—LiDAR, GIS, phenomenology, and serious consideration of Indigenous perspectives had not yet become standard to archaeological practice. In the 1960s archaeologists used the scientific parlance of *resources* to convince legislators that the past was something worth protecting. But today we can see that landscapes, sites, and features are not simply *resources*—they are meaningful places. Julian Thomas (chapter 15 in this volume) describes how British archaeological preservation laws have changed and evolved over the past centuries, in tandem with changing archaeological and public needs and perspectives. Paul Reed (chapter 16 in this volume) lays out the legal and administrative challenges that face all of us today. Finally, in chapter 17, retired NPS archaeologist and administrator Tom Lincoln, who gave us the original mandate and the funding for this project, gets in the last word, reminding us all how and why the greater Chaco landscape matters.

One approach utilizing existing laws would be to advocate for consideration of the greater Chaco landscape under the National Environmental Policy Act (NEPA). NEPA states that environmental assessments must consider the "cumulative effects" of developments. Certainly the piecemeal leasing and drilling of tens of thousands of small patches of earth across the San Juan Basin is having a "cumulative effect" on Chacoan archaeology. For the past five years, we have advocated for the Bureau of Land Management to develop a landscape-level management plan for the San Juan Basin. These efforts thus far have been in vain. It seems most likely that the roads, soundscapes, viewscapes, night skies, rock art, and enigmatic features of the greater Chaco landscape will fall before the bulldozer's blade in our nation's blind drive for more corporate energy profits. The special fabric of the greater Chaco landscape—the sense of place, the stillness, the feeling of wonder—is being irretrievably destroyed, and with it will go our ability to unravel this complex chapter of human history.

ACKNOWLEDGMENTS

This volume exists due to the long-term vision of Tom Lincoln, who provided us with the instigation, the inspiration, and the funding to carry this project to fruition. Steve Lekson carried the ball for most of the way before choosing to pass it to us in the end zone. We appreciate the opportunities and the support they provided for us, and we hope they are pleased with the result. We thank the additional participants in the 2017 meeting who shared their perspectives and insights with us: Aron Adams, Victoria Barr, Richard Begay, Robert Begay, Amy Cole, Dabney Ford, Geoff Haymes, Roger Moore, Michael Quintano-West, Sharon Pinto, and Kellam Throgmorton. We appreciate the skillful cinematography contributed by Larry Ruiz, Davd Valentine, and Cloudy Ridge Productions. We also thank Kaitlyn Davis for her organizational support during the 2017 meeting and Crow Canyon Archaeological Center for agreeing to let us hold the conference on their campus. Darrin Pratt and his staff at the University Press of Colorado worked tirelessly to create this hybrid volume, helping us to imagine new ways to present scholarly material. Dan Leja was a terrific editorial assistant. We also want to thank the many Chacoan colleagues whom we could not include in this particular project but whose scholarship and knowledge are indispensable to our shared long-term goals of understanding Chaco.

NOTES

1. Please note that the video conference presentations from 2017 provided online are earlier working drafts of the final written products (2019/2020) included in this volume.

REFERENCES CITED

Anschuetz, Kurt F., Richard I. Wilshusen, and Cherie L. Scheick. 2001. "An Archaeology of Landscapes: Perspectives and Directions." *Journal of Archaeological Research* 9(2):157–211.

Ashmore, Wendy, and A. Bernard Knapp, eds. 1999. *Archaeologies of Landscape*. Blackwell Publishers, Oxford and Malden, MA.

Basso, Keith H. 1996. *Wisdom Sits in Places: Landscape and Language among the Western Apache*. University of New Mexico Press, Albuquerque.

Bradley, Richard. 2000. *An Archaeology of Natural Places*. Routledge, London.

Crown, Patricia, Keriann Marden, and Hannah V. Mattson. 2016. "Foot Notes: The Social Implications of Polydactyly and Foot-related Imagery at Pueblo Bonito, Chaco Canyon." *American Antiquity* 81(3):426–448.

Fowles, Severin. 2010. "The Southwest School of Landscape Archaeology." *Annual Review of Anthropology* 39:453–468.
Hayes, Alden C., and Thomas C. Windes. 1975. "An Anasazi Shrine in Chaco Canyon." In *Papers in Honor of Florence Hawley Ellis*, edited by T. R. Frisbie, 143–156. Papers of the Archaeological Society of New Mexico No. 2. Archaeological Society of New Mexico, Santa Fe, NM.
Hays-Gilpin, Kelley. 2004. *Ambiguous Images: Gender and Rock Art*. Gender and archaeology series. AltaMira Press, Walnut Creek, CA.
Kincaid, Chris, ed. 1983. *Chaco Roads Project, Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin*. Bureau of Land Management, Albuquerque.
Marshall, Michael P., and Anna Sofaer. 1988. "Solstice Project Investigations in the Chaco District 1984 and 1985: The Technical Report." Manuscript on file, Laboratory of Anthropology, Santa Fe, NM.
Marshall, Michael P., John R. Stein, Richard W. Loose, and J. E. Novotny. 1979. *Anasazi Communities of the San Juan Basin*. Public Service Company of New Mexico, Albuquerque.
Mills, Barbara J., Matthew A. Peeples, Leslie D. Aragon, Benjamin A. Bellorado, Jeffery J. Clark, Evan Giomi, and Thomas C. Windes. 2018. "Evaluating Chacoan Migration Scenarios Using Dynamic Social Network Analysis." *Antiquity* 92(364):922–939.
Schaafsma, Polly. 2018. "Chaco Rock Art Matters." *Journal of the Southwest* 60(1):42–#73.
Van Dyke, Ruth M. 2019. "Chaco Gathers: Experience and Assemblage in the Ancient Southwest." In *New Materialisms, Ancient Urbanisms*, edited by Susan M. Alt and Timothy R. Pauketat, 40–64. Routledge, New York.
Van Dyke, Ruth M., R. Kyle Bocinsky, Thomas C. Windes, and Tucker J. Robinson. 2016. "Great Houses, Shrines, and High Places: A GIS Viewshed Analysis of the Chacoan World." *American Antiquity* 81(2):205–230.
Wilshusen, Richard H., and Ruth M. Van Dyke. 2006. Chaco's Beginnings. In *The Archaeology of Chaco Canyon: An Eleventh-Century Pueblo Regional Center*, edited by Stephen H. Lekson, 211–259. School of American Research Press, Santa Fe, NM.
Windes, Thomas C. 1978. *Stone Circles of Chaco Canyon, Northwestern New Mexico*. Reports of the Chaco Center 5. USDI National Park Service, Albuquerque.

2

Chaco Landscapes

A Personal Account

Stephen H. Lekson

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 14, 2017.

https://doi.org/10.5876/9781646421701.c002.v000

I've roamed over Chacoan landscapes for forty years and I still haven't figured 'em out. The chapters in this volume go a long way toward that goal, with current and cutting-edge research. They point toward the future. My chapter looks to the past, a personal prehistory of Chacoan landscape studies. I mix useful (I hope) history with mythical (I fear) personal recollections. First-person accounts, eyewitness evidence: peace officers and trial lawyers will tell you that's shaky stuff.

LANDSCAPES, CITYSCAPES: CHACO CANYON

When Lt. James H. Simpson rode through Chaco Canyon in 1849, he asked Native and Mexican guides for the name of each ruin; they provided names, in a variety of languages: Navajo, Pueblo, Spanish. Thus each ruin was marked as a separately named entity: Pueblo Bonito (which meant Pretty Town) was terminologically distinct from near-neighbor Chetro Ketl (which meant who-knows-what). And so has archaeology taken them: each a "site," separate and entire.

The early history of archaeology in the canyon reflects that thinking, and also the outsized personalities of the early heroic archaeologists: Neil Judd and Edgar Hewett. Both were alpha males; they did not care

DOI: 10.5876/9781646421701.c002

for each other and could not share the canyon. Hewett, of Santa Fe, wanted Chaco Canyon for the penurious Museum of New Mexico; Judd, however, had established a robust research program for the (then) prosperous National Geographic Society at Pueblo Bonito, Pueblo del Arroyo, Shabik'eschee, and several other sites. When Hewett finally got to dig his site, Chetro Ketl, his writings had little to say about Pueblo Bonito (save that it was smaller than Chetro Ketl). When Judd finally got to write up Pueblo Bonito (decades later), his writings had little to say about Chetro Ketl. And so on and so on, as the philosopher says.

These divisions were not (only) the result of egos; both Judd and Hewett genuinely considered their sites as distinct and separate villages—albeit surprisingly close neighbors. Proximity was not unprecedented: for example, First Mesa at Hopi consists of three contiguous villages, and only a local can tell where Hano ends and Sitsmovi starts. That situation at Hopi (and several other Pueblos) represented a defense against Conquistadors and unsettled times, now become habit and habitus. Prior to any colonial need for joining forces (i.e., in Pueblo III and Pueblo IV), large Pueblo villages were more often spaced at appropriate distance; or, in halcyon times (Pueblo II), broken into their constituent single-family homes, scattered like Kansas farmsteads across a peaceful landscape.

A half-dozen major "towns" and scores of smaller "villages"—in the terms of those times—jammed together in the unlikely setting of Chaco Canyon gives one pause. One who paused, productively, was Gordon Vivian. Gordon Vivian was a student of Edgar Hewett's and the first NPS archaeologist at Chaco. He knew the canyon well and was impressed both by the density and variety of its many sites. Vivian and his colleague Tom Mathews (1965), along with dendrochronologist Bryant Bannister (1964), achieved the first real synthesis of Chaco Canyon prehistory; and it was . . . complicated.

Vivian defined three contemporary phases, all sharing the canyon: the Bonito and McElmo phases (two kinds of Great Houses, previously glossed as "towns") and the lowly Hosta Butte phase (small sites, previously glossed as "villages"). These three, Vivian insisted, represented three different ethnicities sharing Chacoan space (expanding on Clyde Kluckhohn's [1939] earlier interpretation). Again, there were Pueblo precedents: to return to First Mesa at Hopi, of the three coterminous villages, two are Hopi but one is a Tewa transplant, an in-migration. How Chaco's complex situation arose, Vivian did not say; but in a too-often-overlooked comment on "cultural values" he predicted where Chaco was headed: not to the ethnographically documented Pueblos.

> The developments in the Chaco [Canyon] in the 11th and the early part of the 12th century were not in the direct line of the Northern Pueblo continuum as it was exposed at the beginning of the historic period. The continuation of the directions taken by the Chaco group would have carried it even farther out of the stream of development that culminated in the Rio Grande [Pueblos] . . . The distinctive traits that we have so often emphasized . . . all imply a growing measure of specialization, social control, and interpueblo control. The elaboration of these institutions of ever-increasing control, specialization, and centralized authority was simply not compatible with the "slant" or "form" that directed the destiny of the Desert Culture–Basketmaker–Rio Grande [Pueblo] continuum . . . In this light then, the highest developments in the Chaco [Canyon] were cultural experiments or deviations that failed as they strayed from the main course of Northern Pueblo history. (Vivian and Mathews 1965:115)

A man ahead of his times, and a passage I never tire of quoting because no one else will. Now we need it more than ever (Lekson 2018 contra Ware 2014).

Vivian had rightly recognized (some of) the different kinds of buildings in Chaco Canyon and had offered an explanation congruent with the University of New Mexico's party line (see Vivian 1989). More than that, Vivian recognized that the various building types at Chaco were elements of a larger social and architectural entity he called "the Contemporaneous Community," which he estimated at about 4,400 persons (Vivian and Mathews 1965:108). This was a new way of looking at Chaco: not as a valley with a scattering of independent farming villages but as a large ensemble. The beginnings of a canyon-scale landscape approach. . . .

There things stood for a decade: the town-village terms continued in the work of Gordon's son Gwinn Vivian (e.g., 1970) who further developed the multiethnic model, but resolutely as "an egalitarian enterprise" (Vivian 1989, 1990). The early 1970s, however, saw the rise of putative "managerial elites" elsewhere in the ancient Southwest, and those short-lived enthusiasms spilled over into Chaco: Paul Grebinger (1973) proposed that the two kinds of buildings (towns and villages) housed two different kinds of peoples: an elite class (my word, not his) in the Great House towns and nonelites in the smaller villages. Here again, the canyon was not simply congeries of farming settlements, but an integrated whole. Notions of elites and so forth frothed about for another decade or two (e.g., Schelberg 1984; Sebastian 1992) before disappearing beneath the awful weight of ritual and Pueblo ethnology (Lekson 2018), but that argument is not central to our theme, which is the recognition of the *canyon as a whole* as a land- or cityscape, rather than a random collection of sites.

Not random at all! The next insight came from an unlikely source, a chapter in a stridently scientific New Archaeology collection of papers: "Paleopsychology Today: Ideational Systems and Human Adaptations in Prehistory" by John M. Fritz (1978). Fritz, unfashionably for those times, favored the epiphenomenal fluff of ideology over good solid scientific adaptation. His case study was Chaco Canyon, which he proposed was laid out symmetrically around an ideological north-south axis running from Pueblo Alto on the north rim of the canyon to Tsin Kletsin on the south. This indeed was a new way of looking at Chaco, verging on fringe: ley lines and all that. Fritz was a decade ahead of Maya cosmogram cities (e.g., Ashmore 1991). And he was talking about Chaco, for heaven's sake: Pueblo farming villages, not temples or palaces in a grand Mayan city.

Yet there was something undeniably attractive about Fritz's reading of Chaco's landscape, edging toward cityscape. It made sense. (And it has been greatly developed by Lekson 1999b and Van Dyke 2007.) I regret to say I did not cite Fritz in *Great Pueblo Architecture*, but I surely built on Gordon Vivian's and John Fritz's insight that Chaco Canyon was an entity, not a collection of sites (Lekson 1984a:272).

I added a few new wrinkles: modest monumentality (borrowing David Wilcox's words); regional centrality; and—most important—a class-stratified society, marked by Great Houses and small houses: "Stratification in housing presumably reflected social distinctions in the population"—cautious and careful, but there it was: class-stratified society (Lekson 1984a: 271). I did not yet dare utter the word "city," but urbanism hovered overhead. In a shorter, more daring (i.e., less heavily censored) version: "It would not be unreasonable to see this complexity, when coupled with Chaco's regional centrality and relatively high population density, as nearly urban. By the middle 1100s, Chaco was much closer to being a city than simply a canyon full of independent agricultural towns and villages" (Lekson 1984b:71). Thereafter, I escaped Downtown Chaco, its cares and its woes, for a decade or so. But when I was sucked back into Chaco's black hole (e.g., Lekson et al. 2006:101–116), I called a spade a spade, and a city a city: Chaco Canyon was not a landscape; Chaco Canyon was a cityscape.

Through the 1990s the central canyon became the focus of the formidable archaeological talents of Messrs. John Stein, Richard Friedman, Taft Blackhorse, and Richard Loose (2007), who saw monuments where others saw mere mounds. Ringing in the new millennium, fresh theoretical insights were brought to Chaco by Ruth Van Dyke (2007), whose *Chaco Experience* presented a phenomenological analysis of Chaco.

REGION: OUTLIERS

The existence of Chaco-outside-Chaco was recognized in the early twentieth century at sites such as Lowry Ruin (190 km from Pueblo Bonito); Chimney Rock (140 km from Pueblo Bonito); Village of the Great Kivas (120 km from Pueblo Bonito); and Aztec Ruins (85 km from Pueblo Bonito). By the third quarter of the century, Chaco-outside-Chaco faded from general interest, but not from the specific enthusiasm of archaeologists such as Gwinn Vivian.

I got my start in Chacoan archaeology at Salmon Ruins (Reed 2006; 70 km from Pueblo Bonito), where Cynthia Irwin-Williams had been lured away from hunter-gatherers to tackle a major Chaco Great House in a field project that ran from 1970 to 1978. Cynthia's project was a lively endeavor. I joined up in 1974 and survived until 1976, when—a husk of my former self, liver shot to Hell (but I never inhaled!)—I moved on to the sober, sedate NPS Chaco Center.

Salmon Ruins was a major Great House, as big as the major Chaco Canyon sites but surprisingly unknown to science. Were there more of those Big Boys out there, waiting to be discovered? (No, as it turns out, but we'll get back to that.) At the Chaco Center, as soon as it was decently possible (spring 1976, as I recall), I approached the director Jim Judge with a proposal to go find more Chaco sites. He informed me that only a week before, Bob Powers had made the very same suggestion. That was propitious: I thought we would find more Salmon Ruins, but Bob was a student of Gwinn Vivian and he knew that our targets would be smaller, more modest: Chimney Rocks and Lowrys. So Bob, William Gillespie, and I mounted a short survey (a month or so) in fall 1976, to document fully three such "outliers" (Bis sa'ani, Peach Springs, and Pierre's); to briefly visit more; and to document as many candidates as the literature revealed (Powers et al. 1983). The timing, again, was propitious: on the heels of the NPS survey, another survey of "Anasazi Communities of the San Juan Basin" was under way (1977–1979), led by Michael Marshall and John Stein. That survey was the brainchild of Richard Loose, then an archaeologist for the Public Service Company of New Mexico (PNM). The company thought it might burn coal from deposits in the San Juan Basin, and Loose persuaded PNM and the Historic Preservation Bureau in Santa Fe to jointly sponsor a proactive survey of the major sites in the coal area and beyond (Marshall, Stein, Loose and Novotny 1979). There was considerable and convivial interaction between the two surveys, and we visited the PNM crew at several of their sites and vice versa. Michael Marshall went on to work with the Solstice Project (among many other ventures). John Stein, too, continued to collect "outliers" and Great Houses (e.g., Fowler and Stein 1992), as did others (Altschul 1978; LeBlanc 1989; Wilcox 1999; chapters in Doyel 1992, Kantner and Mahoney 2000, Kantner 2003; Peeples et al. 2016; Heitman et al. 2016).

I've contributed (a bit) to the "outlier" files in this brave new millennium, but I'd like to revisit the thrilling days of yesteryear and the initial challenges of convincing archaeologists that "outliers" were (1) real and (2) in their backyards. The initial (1977–1979) "outlier hunts" were focused on the San Juan Basin of northwestern New Mexico, but soon spread into Colorado, Utah, and Arizona, and south in New Mexico well beyond the San Juan Basin, to (at least) the Mogollon Highlands—an area to which I will briefly return.

There was pushback, as they say. Much of that resistance was simply turf: Chaco in the 1970s and 1980s was in the news, and archaeologists outside the media circus (and outside northwest New Mexico) wanted none of it. A University of Colorado crew at the huge Mesa Verde site of Yellow Jacket produced a bumper sticker saying "Chaco is a Dairy Queen Outlier." David Breternitz, also of the University of Colorado, stood in front of Far View House and declared that he knew of no Chaco "outliers" on Mesa Verde. (There's a sizable Great House at Yellow Jacket, and Far View IS a Great House.) The Colorado reactions were typical of the times: no Chaco at Mesa Verde, no Chaco in Utah, no Chaco in Arizona. Indignant locals demanded data: what were the criteria, what were lists of traits, what gave Chaco the right to intrude on their space? In their backyards? This was difficult, because we "outlier" hunters had more or less abandoned lists of criteria. Outlier Great Houses were, as John Stein said, an "a-ha" experience: if you found yourself climbing up (and up, and up) a Pueblo II ruin, that was a pretty good clue. "Outliers" stick up. I eventually codified this as "big bump surrounded by small bumps" (Lekson 1991)—not my most precise work, I admit. Once verticality had been established, more often than not most of the desired criteria appeared: wide walls, big rooms, multiple stories, elevated "kivas," Great Kivas, road segments, earthworks, and so forth. It was a real struggle to get local archaeologists to think globally or even beyond their green valleys. More than once I was tempted to organize a tour, throwing the harshest critics into (not under) a bus and visiting "outlier" Great Houses from Bluff, Utah, to Grants, New Mexico, and from Polaca Wash, Arizona, to Guadalupe, New Mexico. Let them see for themselves; let them "a-ha."

In the end, objections fell before the weight of data: more and more so-called outliers piled up, and more and more people recognized that their little fiefdom was part of a larger world. Outliers were real and really were in (almost) everyone's backyards. Not in the Rio Grande, nor west past Hopi.

And not in the far south. There was not a lot of work going on in west-central New Mexico at that time, so no one could object to outliers around Quemado and Magdalena. And there were very convincing outliers near those peculiar towns, with all the necessary attributes. And further south? That's Mimbres country, and Mimbres archaeologists are famously anti-Anasazi. Which is a shame, because out on the edges, like Mimbres, Chaco archaeology could perhaps address one of its recurrent problems: export versus emulation.

At one point, near century's end, there was much discussion of export versus emulation of "outlier" Great Houses. Export = came from Chaco; emulation = copied from Chaco. I was never enthusiastic about this question; it seemed like a last refuge of the NIMBY, as if "emulating" a Chacoan Great House somehow made matters more comfortably local. But how would we tell a Great House built by local labor with local materials at the hand-waving direction of someone from Chaco? And there were indications that form mattered more than fabric, even in Chaco Canyon. The range of wall types found in Pueblo Bonito was nearly as great, or broad, or varied as the range of wall types seen in "outliers." In my mind none of that mattered much: either way—export or emulation—the area in question had come into Chaco's sphere. But for many people, export versus emulation was an issue. I suggested ways of thinking about the problem that turned the question on its head, or rather inside-out. For a particular "outlier" Great House, the identification had already been made that the darn thing was, in one way or another, Chacoan. Fussing about it would quickly degenerate into an empty game of I-am or I-am-not-convinced. Why not jump way outside Chaco's region, and work back in until we hit things not identified as outliers but that indeed went bump in the night (as it were): big bumps that might perhaps . . . and so forth?

Looking in from the north, through Fremont, for example: many of the big Fremont communities along the west slopes of the Wasatch Range had conspicuously big bumps among a cluster of smaller bumps (Lekson 2013). They were built of adobe, but when you started looking at them: wider walls, bigger rooms, more stuff, and so on. Now *those* Fremont big bumps might be a good place to start thinking about emulations! So too looking in from the south, through Mimbres: big bumps (with wide walls, big rooms, more stuff, "roads," etc.) among the small bumps of Mimbres sites on the Upper Gila (and maybe even on the mighty Mimbres itself) might represent some sort of local version of Great House (Lekson 1999b). The pundits laughed: I have a photo, somewhere, of a gang of Mimbres archaeologists posed atop a candidate Upper Gila big bump: all thumbs point down. But I still think that Mimbres, and Fremont, and other societies around the perimeter of Chaco's world would be a good place to start thinking about emulation—if, for some reason, you want to think about emulation.

Chaco's region is pretty well fixed now, four decades after the great Outlier Hunts. North, west, and east boundaries seem solid; only the south is soft. And, strangely, the south is where the least work has been done, or is being done. As summarized in Duff and Lekson (2006), Keith Kintigh's and Andrew Duff's work south of Zuni and Ruth Van Dyke's and John Kantner's work around Grants has been admirable but far less cumulative research than we've poured into northern "outliers" from Chimney Rock to Bluff with, for example, Crow Canyon's current Northern Chaco Outliers project being only the most recent of many northern Chaco projects. Compared to the north, Chaco's south is markedly underresearched. And, of importance, Chaco "outliers" extend far south beyond Zuni and Grants. How far? A matter for debate . . . shall we go down that road?

REGION: ROADS

Special agent Stephen H. Holsinger, investigating Richard Wetherill's Chaco Canyon excavations at the instigation of Edgar Hewett, may have written the first Chaco report of "roads" (Holsinger 1901). Hewett, through Holsinger, shut down Wetherill's (and George Pepper's) work at Pueblo Bonito. Two decades later, before Hewett could establish a research presence in the canyon, Neil Judd arrived with his National Geographic Society and Smithsonian Institution expedition, and worked in the canyon from 1920 to 1927. Among his other researches, Judd was intrigued by "roads." He interviewed several Navajo elders who knew them well—though they told Judd the "roads" had become less visible over the years (see Frazier 2005:110–112). (Chaco's archaeology has diminished markedly in the last 100 years, from grazing and casual vandalism: walls fell, roads faded, sherds vanished; what must Chaco have looked like, at 1500? At 1800?)

Knowledge of the "roads" never entirely vanished—Judd eventually published his reports—but outside interest waned (Frazier 2005:105–127). "Roads" intrigued Park archaeologist Gordon Vivian, who passed his interests on to his son, Gwinn Vivian; Gwinn Vivian, in the early 1970s heyday of Karl Wittfogel's "hydraulic civilizations," challenged the identification of "roads" and suggested instead that they were canals (Vivian 1970). He quickly realized he was wrong, and by the mid-1970s he and his associates fostered a renaissance in "road" studies (Vivian 1997a, 1997b). "Roads" engaged first the National Park Service (NPS) Division of Remote Sensing; and then the “outlier hunts” of the early 1980s (discussed above); and last, but most important, Cultural Resource Management Projects sponsored by the Bureau of Land Management (BLM) in the mid- to late 1980s. Thereafter, for two-plus decades, “roads” were only sporadically investigated—typically as short segments seen at “outliers.” Because of the limited scale of most projects at that time, there was an alarming tendency to localize “roads”—“roads” went nowhere, it was said, but existed only in the parts we could easily see, usually near outliers.

The most important “road” studies were the BLM projects of the 1980s, proactively researching roads ahead of proposed energy development (Kincaid 1983; Nials et al. 1987). These projects were prescient: knowing that a major but poorly understood cultural resource would be or could be threatened by energy development, the BLM decided to investigate known or possible “roads” in the to-be-impacted areas and to develop techniques and tricks to identifying and recording “roads.” This was done well in advance of actual planning and permitting; would that we were so wise today. Significant resources were expended; excellent archaeologists were hired; innovative field techniques were developed.

The maps produced by these projects and their spin-offs represent a network of considerable range and ramifying complexity. Much of the mapped “road” network was projected: a bit of road here, a bit of road there, and an alignment of sites gave us dotted lines on a map (e.g., Lekson et al. 1988)—reasonably, I think, and probably correctly but the cause of much subsequent eye rolling and teeth gnashing. First, John Roney (1992) pared “roads” back to only those segments visible on the ground; much later, James Snead (2017) would rightly complain that various “road” maps differed significantly—which should we believe? All and none, perhaps: the road network is without question far more extensive than Roney’s minimal map (an assertion to which John would surely agree), but Snead’s grievance is sound. We truly do not know the actual extent of Chaco’s “roads.” But absence of knowledge is not knowledge of absence: “roads” are surely there, but there have been no projects or programs on the scale of the BLM’s 1980s “road” studies to map them out.

The problem for today is this: because there is a long history of “road” studies, nonarchaeologists engaged with the data (e.g., land managers) seem to think that the preservation of “roads” is perfect and our knowledge of them is complete. Neither is remotely true. “Roads” are archaeological sites, and it is in the nature of archaeological sites to hide—even, sometimes, disappear. Recall Judd’s Navajo complaining that “roads” had been far more visible in earlier times; time waits for no one, as the poet said. As discussed below, the region in which "roads" surely run is threatened again with extensive energy development, but today we are not as proactive as the BLM was in the 1980s. No one is spending money to find roads ahead of development. It seems that "roads" will have to take their chances.

VIEWSHEDS

In the early 1980s, when I was crawling all over Chaco's Great Houses measuring things, I noticed that the siting of several buildings—perhaps all the buildings?—clearly addressed lines-of-sight. One Great House could see another; but if either was moved 100 m or so, those lines-of-sight vanished. I thought I'd discovered something wonderful. Not so: my elders knew all about it and had observations of their own. It went beyond Great Houses, too: Alden Hayes and Tom Windes (1975) had published their lines-of-sight observations from "shrines" at Chaco. And views of natural features: I was at Pueblo Alto with Peter Pino of Zia Pueblo, just the two of us; Mr. Pino looked hard to the southeast, and pointed out a bit of the Sandia Mountains, just visible on the horizon, over Mount Taylor's shoulder. Tom Windes continued to accumulate information on lines-of-sight, mostly through his infamous "flare-ups": nighttime exercises in which volunteers stood at potential viewpoints (Great Houses, shrines, etc.) and lit truck flares at specified times. Participants at other stations who saw a point of red light vaguely to the south (e.g.) at precisely 9:00 PM knew that they were seeing Kin Ya'a (e.g.). Tom's experiments were ingenious but messy when rain turned the roads to mud. The Solstice Project built on this work, compiling more and more line-of-sight data.

Through the years, I kept my eyes open. I was particularly interested in what I (or someone) called "notch phenomenon:" a line-of-sight through one or more restricted breaks in terrain; that is, through a notch or two in ridgelines. Working at Chimney Rock in 2009, we saw a "notch" discovered some years earlier by Katie Freeman, then a high school student working on her Science Fair project: a just-barely visible Huerfano Mesa, seen down the narrow Piedra River Valley. Huerfano Mesa had been our landmark on the northern horizon when we excavated Pueblo Alto at Chaco Canyon in the late 1970s. You can't see Alto from Chimney Rock, or vice versa. What Ms. Freeman had discovered was that Huerfano was a "repeater" station, relaying fire/smoke line-of-sight signals to and from Pueblo Alto and Chimney Rock. This was something of a revelation because there was no Great House, no Chacoan community at Huerfano. There were "shrines" and fireboxes, but no residential sites. It seemed likely that Huerfano was staffed; that is, it was someone's duty to sit atop Huerfano all the time or at specified intervals and relay the messages back and forth. That suggested that Chacoan line-of-sight communications were indeed a "system," an integrated network; and probably the "roads" and "outliers" were a system too.

In recent years Geographic Information Systems (GIS) has made it possible to research lines-of-sight and viewsheds on a regional scale. Ruth Van Dyke and her colleagues (2016) are doing exciting work with these truly intriguing data; I think line-of-sight communications (alongside "roads") could give us something like a network map or diagram of the Chacoan Regional System. As noted above, the "roads" have deteriorated and are, today, difficult or expensive to document. Lines-of-sight should remain mostly intact and readily knowable from GIS. "Ground-truthing" viewsheds will require far less investment in time and money than a full-dress road study.

LANDSCAPES: RITUAL AND SECULAR

The idea of *landscape*—if not the term itself—was applied to Chaco long before, but my public engagement with that term at that place dated to the 1990 Society for American Archaeology meetings at Las Vegas, Nevada, where John R. Stein and I presented a paper titled "Anasazi Ritual Landscapes." What happens in Vegas supposedly stays in Vegas, but the idea of "ritual landscape" had legs, coming as it did just on the cusp of British landscape studies such as Christopher Tilley's 1994 *Phenomenology of Landscape* and Richard Bradley's 1993 *Altering the Earth* and 1998 *Significance of Monuments*. (I may have had the first copies of these British landscape books between Philadelphia and Berkeley; I didn't much care for Tilley's "phenomenology," but I liked Bradley's book.) And "Anasazi Ritual Landscapes" (I think coincidently) appeared just before the remarkable rise of ritual to interpretive dominance in southwestern archaeology (Charles Adams's 1991 *Katsina Cult* and Patricia Crown's 1994 *Salado* volume opened the floodgates). "Anasazi Ritual Landscapes" was published in 1992 in a Chaco volume edited by David E. Doyel (1992), who had organized the Society for American Archaeology session, the first of a steady series of Chacoan stock-takings, of which the book you hold is—for a short while, at least—the most recent.

"Ritual landscape" was Stein's, mostly, but I contributed my bit. We bounced ideas around long before the Vegas gig. I had a brief flirtation with cognitive archaeology (Lekson 1981), but that was rather more clinical than ideological. In 1983 and part of 1984, I rented a room at chez Stein. Stein had decided to become an architect, and he was in his first year of architectural school at the University of New Mexico. I was in the midst of graduate classes at UNM, taking every class I could with Binford but staying out of his way. Most evenings for many weeks, Stein and I would convene at his pot-bellied stove (the principal heat source) and grouse about architecture school (him) and Binford (me). Sometimes simultaneously, each of us wailed to the walls about the day's provocations. Between ventings, we discussed architecture and landscape. My primary inspirations were not New Archaeologists or Brits (I had not yet met them), but architectural historians and historical geographers (Karl Sauer, George Kubler, J. B. Jackson, Vincent Scully, among others); John's were architects—I don't recall which. I do recall warning Stein away from alignments, arguing that the universal revulsion toward ley lines and New Agery made them problematic. When *Chaco Meridian* came out in 1999, it must have struck Stein as derivative. I'm sure it was; my thinking owed much to Stein.

My principal contribution to "Anasazi Ritual Landscapes" was the intracanyon argument outlined above in "Landscapes, Cityscapes." And the demonstration that earthen architecture was real at Chaco Canyon—the two platforms mounds at Pueblo Bonito being prime examples—thereby legitimized the less emphatic earthen architecture Stein was seeing at "outliers." Stein and his field colleagues (Mike Marshall, Andrew Fowler, Taft Blackhorse, Richard Friedman, and others) developed a rich, even baroque taxonomy for Chacoan earthworks, using Navajo words or anatomical terms for various forms of berms. Most berms related to "roads," particularly where "roads" arrived, circled, and departed from "outlier" Great Houses.

These, today, are part of the standard archaeological field-kit; but back then, berms were controversial. The existence of earthen architecture inside the canyon gave credence to the same at "outliers," and we both held the Bonito platform mounds (e.g., Lekson 1984a:74–77) to be such rock-ribbed, unassailable, lead-pipe certainties that no one could possibly doubt. So contrarian archaeologists doubt them (I saw one, in a conference presentation, make them disappear with a wave of the hand). But that's not our problem here.

Add to the ritual landscape a secular landscape of the *Chacoan community*—a term I have avoided until now. The term *community* came from the "outlier hunts." Recall the work of Marshall, Stein, Loose and Novotny (1979): "Anasazi Communities of the San Juan Basin." *Community* in this usage was a field taxon, not a social unit. It referred to the clustering of small sites (Unit Pueblos, "small bumps") around a Great House ("outlier," "big bump") with its attendant feature ("ritual landscape")—an ensemble, a taxon seen scores and scores of times in the outlier hunts and thereafter. While it seemed safe to assume that the residents of such a unit were part of a daily face-to-face "community" (i.e., a social unit), Nancy Mahoney (2000) pointed out that Chacoan "communities" were all too small to constitute a reproductive unit; that is, "communities" were part of a larger community for which the problematic "imagined community" (Anderson 2006) might actually be appropriate (Lekson 2018). That is, the 150-or-so Chacoan communities scattered over an area the size of Indiana were all part of an ideological "imagined community," even though they could not possibly have all known each other—rather, embodying the original, modern nation-state definition of the term (Anderson 2006).

At least a few community-level secular landscapes were planned: for example, Skunk Springs and Yellow Jacket had parallel rows or streets of Unit Pueblos, ranged side-by-side like row houses. Those were two of the largest communities; smaller communities surely had plans too, but their arrangements seem, today, more random. Perhaps we don't yet understand their landscape principles.

Extending far beyond the secular landscape of the community were agricultural landscapes. These could be remarkably extensive and elaborate, for example, the irrigated field complexes at Skunk Springs (Friedman et al. 2003) and the irrigated field systems of Chaco Canyon (Gwinn Vivian and others 2006). In Chaco Canyon small fields (for what crops? County-fair-prize-winner corn? Marigolds?) interspersed between clusters of buildings; while it is beyond the scope of this chapter, that pattern has been identified as a low-density, agrarian-based urbanism by archaeologist Roland Fletcher (2009).

And landscapes operated on even higher levels: Chacoan communities fit into natural landscapes and social landscapes. The Great House and its ritual landscape were typically on a natural rise or elevation above the community of small bumps; the Great House looked down, the small bumps looked up: viewsheds. And, as noted above, the locations of Great Houses were often fixed by line-of-sight considerations, seeing other Great Houses or natural features (Van Dyke 2009). Thus the form of a Chacoan community, as an archaeological unit, answered questions posed by multiple scales of landscapes, from the local terrain to regional intervisibilities. And probably a heavy dose of cosmology—like Fritz's north-south axis at Chaco—overarching all.

University of Arizona professor Dennis Doxtater (2002, 2003) attempted to decode the regional landscape through the intersections of alignments from major, far-distant mountain peaks. Thus, Chaco sits at the intersection of lines linking Chimney Rock to Baldy Peak, and Cabezon Peak to Brian Head, and Mount Taylor to Abajo Peak. While this is very interesting, I worry about practical implementation and, again, the pitfalls of Ley Line methodologies.

Whatever Chaco was, it was big. It was regional. Chaco itself may or may not have been unique, or extraordinary, or phenomenal, but its *regional archaeological record* is truly remarkable. Eventually the area was depopulated by the Chacoans. Today it is home to the sparse and scattered Navajo. Subsequent Native and modern impacts have been minimal, other than overgrazing. Consequently, landscape features are well preserved. We have, in Chaco's region, the trace fossils of a social system, in buildings, landscapes, "roads" and viewsheds. Chaco's unparalleled regional record is threatened today by energy development, which appears to be proceeding without the forward-looking, proactive strategies of the "outlier hunts" of the 1970s and the BLM "road" studies of the 1980s. Is it too late?

CHACO LANDSCAPES: GENESIS OF THE PROJECT

The reality of Chacoan landscapes is now firmly established and accepted. There are, of course, varying interpretations of these features and, more notably, major gaps in our knowledge of their distribution and variation. For example, there are certainly many more "roads" out there, but, as noted above, *we don't have that map*.

Concern for these remarkable, yet fragile cultural resources prompted Thomas Lincoln (then of the National Park Service) to approach me about Chaco landscapes, sometime in 2005. As the head archaeologist of the NPS's Intermontane Region (assistant director for cultural resources), Tom's purview included the Four Corners states and, with them, Chaco and its region. He had access to "year-end" funds to invest in the project—entirely his initiative, not mine—but, alas, before the year ended, the money was scooped up by someone else, somewhere else, for something else. New toilets at Yellowstone? A parking lot at Carlsbad Caverns? I don't know, but their need was greater than ours. At the time, I was relieved that I had not acquired another project: Chaco landscapes were certainly interesting, but not a front-burner issue.

Or were they? Tom Lincoln foresaw energy development in the San Juan Basin and was trying to get ahead of that threat, to have data and ideas and management concepts ready and waiting in the locker. But for the nonce, the Chaco landscape project was sidelined.

Time goes by. In 2013 Tom contacted me again about Chaco landscapes, and shortly thereafter the University of Colorado agreed to arrange and administer a "planning meeting for a seminar to identify, define, and characterize the Chaco Landscape and World Heritage values." This was a small grant, a planning grant prior to a larger, longer effort, which the NPS generously funded in 2014.

Even in the halcyon bubble of the Peoples' Republic of Boulder, I had become aware of the impending leases of federal, state, and tribal allotted lands around Chaco for drilling and fracking. Other organizations were already marshaling data and arguments against this development—of which, more below.

I could see that the need was real, but just that year I had started a "phased retirement" from my position at the Museum of Natural History at the University of Colorado. Retirement means different things to different people, but one common factor is you are old. More active, energetic scholars were needed. I asked for the help of two of our best Chacoan specialists: Dr. Ruth Van Dyke of Binghamton University, and Dr. Carrie Heitman of the University of Nebraska. Van Dyke had written a number of highly regarded studies of Chaco landscapes; Heitman had written excellently about Chaco and also controlled the online Chaco Research Archive (http://www.chacoarchive.org/cra/; originally the creation of Dr. Stephen Plog, Heitman, and other colleagues at the University of Virginia). Van Dyke and Heitman took the wheel and steered our course. The University of Colorado, Boulder, facilitated and administered the project, but the intellectual and operational leadership came from Binghamton and Lincoln.

The project advanced through a series of stages. First, a planning/listening meeting took place at San Juan College in Farmington, New Mexico, in August 2014. This meeting brought together several dozen federal agency archaeologists and managers, local cultural resource management archaeologists, and Tribal representatives from the Navajo Nation (many leases were on Navajo tribal or allotment lands). We presented ourselves not as official representatives of the National Park Service (those too were in attendance), but rather as contractors tasked by NPS to assemble histories of research, site, and landscape data and of management themes and options for Chaco landscapes. The second step was a meeting at the University of Nebraska in Lincoln in July 2015, to compile and reconcile several independent GIS datasets of Chaco "outliers" and features, with the final product to be supported on the online Chaco Research Archive.

In April and August 2015, and again in April 2016, we presented progress reports to the Chaco Native American Advisory Board and benefited from their comments and advice. We learned that there were turf issues: The cultural resources were of great interest to the various Pueblos, but Navajo families and clans also had deep ties to the land. Much of the land involved were Navajo allotments, not quite reservation and not quite private. Energy companies—we were told—had already obtained permission to develop on many allotments, dealing directly with allottees. It would be hard to deny that income to Navajo families. But at the same time there was resistance from some Navajo residents who were concerned about the effects of fracking on water and health. At several meetings we learned about federal involvement: the Bureau of Indian Affairs (BIA) was the agency most directly implicated, but BIA delegated authority for subsurface management to the Bureau of Land Management (BLM), which had more experience in that sort of thing. And, alongside the BIA and BLM, the Navajo Nation clearly wanted a say in how development would proceed. Some of the land belonged to the state of New Mexico, whose land office was mandated to generate revenue for schools. Again, it would be hard to deny those resources for education. It was . . . complicated.

The information from the Farmington, Lincoln, Advisory Board and other meetings informed a "white paper" on Chaco landscapes completed in February 2016 and authored by Van Dyke, Lekson, and Heitman (with a contribution by Julian Thomas, who had toured Chaco with Van Dyke in September 2015). The paper, titled "Chaco Landscapes: Data, Theory and Management," summarized the history of Chaco landscape studies; identified, defined, and characterized the elements of such landscapes; and offered management considerations for their Section 106 and National Register of Historic Places management. With the NPS permission, the "white paper" was distributed to agencies, tribes, and several other organizations concerned with energy development and the Chaco landscape. (It appears here as appendix A.)

The "capstone" meeting for the project was a seminar of invited archaeologists, tribal representatives, and agency archaeologists and managers held at Crow Canyon Archaeological Center, Cortez, Colorado, in August 2017. Unlike the earlier planning/listening meeting in Farmington, the Crow Canyon meeting had an agenda developed by Van Dyke, Heitman, and Lekson and ultimately resulted in the present volume and video products. We shot additional video in Chaco Canyon in October 2017 with tribal members who had been at the Crow Canyon conference.

Initially, our instructions from NPS were to not advocate against (or for) energy development, but rather to provide management considerations for NPS to use when commenting on BLM management plans, but those instructions changed as the extent of the proposed leasing and development became clearer. We were united in our concern for the Chaco landscape, and for what appeared to be an emerging BLM strategy of treating each lease as a separate undertaking rather than developing an umbrella master leasing plan that would operate on the landscape level. The complex land and political situations were difficult to engage from Boulder, Colorado; Binghamton, New York; or Lincoln, Nebraska. All politics is local, as Tip O'Neill said, and we were not local. Several regional environmental and archaeological NGOs banded together to save the "Greater Chaco Landscape." The archaeological lead was Archaeology Southwest, with Paul Reed as their principal (and outstanding) spokesman. We supported the work of Archaeology Southwest and other organizations insofar as possible, but beyond writing letters and comments and so forth, our participation in on-the-ground politicking was limited mainly to our meetings, which included Tribes and agencies.

Things looked grim for Chaco landscapes, and they still look grim. Swiftly changing news of court cases apparently won, then lost; and last-second postponements by the Secretary of the Interior of BLM leasing are too complex and dynamic to recount here. If—as seems all too likely—we lose the remarkable record of Chaco "roads" and landscapes in northwest New Mexico, perhaps someone will write a history of how that happened. Or perhaps, at the eleventh hour, a management plan will emerge that encourages small-footprint directional drilling, avoids probable "road" alignments, and saves part of the Chaco landscape—a lot? a little?

The election of 2016 sent a message to archaeology and historic preservation. In January 2017, Tom Lincoln retired—along with several other senior NPS staff—before the deluge. The book you are holding and the videos you are viewing are the product of Tom Lincoln's archaeological vision, commitment to historic preservation, and professional expertise. Tom wanted tools and products for the NPS to use in its comments on the drilling that will soon begin around Chaco. We hope that our "White Paper" will prove tactically useful in the trenches, and we hope that this volume will be strategically helpful in presenting the broader issues to larger audiences. Chaco and its landscape are World Heritage Sites: whoever you are, this is your heritage under threat.

REFERENCES

Adams, E. Charles. 1991. *The Origin and Development of the Pueblo Katsina Cult*. University of Arizona Press, Tucson.

Altschul, Jeffrey H. 1978. The Development of the Chacoan Interaction Sphere. *Journal of Anthropological Research* 34:109–146.

Anderson, Benedict. 2006. *Imagined Communities: Reflections on the Origins and Spread of Nationalism*. Rev. ed. Verso, New York.

Ashmore, Wendy. 1991. "Site-Planning Principles and Concepts of Directionality among the Ancient Maya." *Latin American Antiquity* 2(3):199–226.

Bannister, Bryant. 1964. *Tree-Ring Dating of the Archaeological Sites in the Chaco Canyon Region, New Mexico*. Technical Series 6(2). Southwest Parks and Monuments Association, Tucson.

Bradley, Richard. 1993. *Altering the Earth*. Society of Antiquaries of Scotland, Edinburgh.

Bradley, Richard. 1998. *Significance of Monuments*. Routledge, London.

Crown, Patricia. 1994. *Ceramics and Ideology*: *Salado Polychrome Pottery*. University of New Mexico Press, Albuquerque.

Doxtater, Dennis. 2002. "A Hypothetical Layout of Chaco Canyon vis Large-Scale Alignments between Significant Natural Features." *Kiva* 67(5):23–47.

Doxtater, Dennis. 2003. "Parallel Universes on the Colorado Plateau: Indications of a Chacoan Integration of an Earlier Anasazi Focus at Canyon de Chelly." *Journal of the Southwest* 45(1–2):33–62.

Doyel, David E., ed. 1992. *Anasazi Regional Organization and the Chaco System*. Anthropological Papers No. 5. Maxwell Museum of Anthropology, University of New Mexico, Albuquerque, NM.

Duff, Andrew I., and Stephen H. Lekson. 2006. "Notes from the South." In *Archaeology of Chaco Canyon*, edited by Stephen H. Lekson, 315–337. SAR Press, Santa Fe, NM.

Fletcher, Roland. 2009. "Low-Density, Agrarian-Based Urbanism: A Comparative View." *Insights* 2(4):2–19.

Fowler, Andrew P., and John R. Stein. 1992. "The Anasazi Great House in Space, Time and Paradigm." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 101–122. Anthropological Papers 5, Maxwell Museum of Anthropology, Albuquerque.

Frazier, Kendrick. 2005. *People of Chaco: A Canyon and Its Culture*. 3rd ed. W.W. Norton, New York.

Friedman, Richard A., John R. Stein, and Taft Blackhorse Jr. 2003. "A Study of a Pre-Columbian Irrigation System at Newcomb, New Mexico." *Journal of GIS in Archaeology* 1 (April 2003): 4–10.

Fritz, John M. 1978. "Paleopsychology Today: Ideational Systems and Human Adaption in Prehistory." In *Social Archaeology: Beyond Subsistence and Dating*, edited by Charles Redman, 37–59. Academic Press, New York.

Grebinger, Paul. 1973. "Prehistoric Social Organization in Chaco Canyon, New Mexico: An Alternative Reconstruction." *Kiva* 39(1):3–23.

Hayes, Alden C., and Thomas C. Windes. 1975. "An Anasazi Shrine in Chaco Canyon." In *Collected Papers in Honor of Florence Hawley Ellis*, edited by Theodore R. Frisbie, 143–156. Papers of the Archaeological Society of New Mexico No. 2. University of Oklahoma Press, Norman.

Heitman, Carrie C., Ruth Van Dyke, Matthew Peebles, and Kyle Bocinsky. 2016. "Greater Chaco Landscapes Great House Communities GIS Integration Dataset." GIS dataset submitted to the National Park Service in partial fulfillment of Rocky Mountain Cooperative Ecosystems Study Unit Task Agreement Number: P14AC01703, Project #: UCOB-109.

Holsinger, S. J. 1901. "Report on Prehistoric Ruins of Chaco Canyon, New Mexico. Ordered by General Land Office Letter 'P,' December 18, 1900." Submitted to General Land Office. Manuscript on file, National Anthropological Archive, Washington, DC.

Kantner, John, ed. 2003. "The Chaco World," special edition. *Kiva* 69(2):83–232.

Kantner, John, and Nancy M. Mahoney, eds. 2000. *Great House Communities across the Chacoan Landscape*. Anthropological Papers of the University of Arizona 64. University of Arizona Press, Tucson.

Kincaid, Chris, ed. 1983. *Chaco Roads Project Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin*. Bureau of Land Management, New Mexico State Office, Albuquerque District Office, Albuquerque and Santa Fe.

Kluckhohn, Clyde. 1939. "Discussion." In *Preliminary Report on the 1937 Excavations, Bc 50–51, Chaco Canyon New Mexico*, edited by Clyde Kluckhohn and Paul Reiter, 151–162. Bulletin 342, Anthropological Series vol. 3, no. 2. University of New Mexico, Albuquerque.

LeBlanc, Steven A. 1989. "Cibola: Shifting Cultural Boundaries." In *Dynamics of Southwest Prehistory*, edited by Linda S. Cordell and George J. Gumerman, 337–369. Smithsonian Institution Press, Washington, DC.

Lekson, Stephen H. 1981. "Cognitive Frameworks and Chacoan Architecture." *New Mexico Journal of Science* 21(1):27–36.

Lekson, Stephen H. 1984a. *Great Pueblo Architecture of Chaco Canyon*. Publications in Archaeology 18B. National Park Service, Albuquerque.

Lekson, Stephen H. 1984b. "Standing Architecture at Chaco Canyon and the Interpretation of Local and Regional Organization." In *Recent Research on Chaco Canyon*, edited by W. James Judge and John D. Schelberg, 55–73. Reports of the Chaco Center 8. National Park Service, Albuquerque.

Lekson, Stephen H. 1991. "Settlement Patterns and the Chaco Region." In *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest*, edited by Patricia L. Crown and W. James Judge, 31–55. School of American Research Press, Santa Fe, NM.

Lekson, Stephen H. 1999a. *The Chaco Meridian*. Altamira Press, Walnut Creek, CA.

Lekson, Stephen H. 1999b. "Unit Pueblos and the Mimbres Problem." In *La Frontera: Essays in Honor of Patrick H. Beckett*, edited by Meliha Duran and David Kirkpatrick, 105–125. Archaeological Society of New Mexico, Albuquerque.

Lekson, Stephen H. 2013. "Thinking about Fremont: The Later Prehistory of the Great Basin and the Southwest" In *Archaeology in the Great Basin and Southwest: Papers in Honor of Don D. Fowler*, edited by Joel Janetski, 109–117. University of Utah Press, Salt Lake City.

Lekson, Stephen H. 2018. *A Study of Southwestern Archaeology*. University of Utah Press, Salt Lake City.

Lekson, Stephen H., Thomas C. Windes, and Peter J. McKenna. 2006. "Architecture." In *The Archaeology of Chaco Canyon*, edited by Stephen H. Lekson, 67–116. SAR Press, Santa Fe, NM.

Lekson, Stephen H., Thomas C. Windes, John R. Stein, and W. James Judge. 1988. "The Chaco Community." *Scientific American* 296(7):100–109.

Mahoney, Nancy M. 2000. "Redefining the Scale of Chacoan Communities." In *Great House Communities across the Chacoan Landscape*, edited by John Kantner and Nancy M. Mahoney, 19–38. Anthropological Papers of the University of Arizona 64. University of Arizona Press, Tucson.

Marshall, Michael P., John R. Stein, Richard W. Loose, and J. E. Novotny. 1979. *Anasazi Communities of the San Juan Basin*. Public Service Company of New Mexico, Albuquerque, NM.

Nials, Fred, John Stein, and John Roney. 1987. *Chacoan Roads in the Southern Periphery: Results of Phase II of the BLM Chaco Roads Project*. Cultural Resource Series 1. Bureau of Land Management, Albuquerque.

Peeples, Matthew, Barbara Mills, Jeff Clark, Ben Bellorado, and Tom Windes. 2016. "Social Networks and the Scale of the Chaco World." Paper presented at the 81st annual meeting of the Society for American Archaeology, Orlando, FL.

Reed, Paul F., ed. 2006. *Thirty-Five Years of Archaeological Research at Salmon Ruins, New Mexico*. 3 vols. Center for Desert Archaeology, Tucson.

Roney, John R. 1992. "Prehistoric Roads and Regional Integration in the Chacoan System." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 123–131. Anthropological Papers 5, Maxwell Museum of Anthropology, Albuquerque.

Schelberg, John D. 1984. "Analogy, Complexity, and Regionally Based Perspectives." In *Recent Research on Chaco Prehistory*, edited by W. James Judge and John D. Schelberg, 5–21. Reports of the Chaco Center. National Park Service, Albuquerque.

Sebastian, Lynne. 1992. *The Chaco Anasazi: Sociopolitical Evolution in the Prehistoric Southwest*. Cambridge University Press, Cambridge.

Snead, James E. 2017. "Introduction: 'Forgotten Maps' and the Archaeology of Chaco Roads." *Kiva* 83(1):1–5.

Stein, John R., Richard Friedman, Taft Blackhorse Jr., and Richard Loose. 2007. "Revisiting Downtown Chaco." In *The Architecture of Chaco Canyon*, edited by Stephen H. Lekson, 199–223. University of Utah Press, Salt Lake City.

Stein, John R., and Stephen H. Lekson. 1992. "Anasazi Ritual Landscapes." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 87–100. Anthropological Papers 5, Maxwell Museum of Anthropology, Albuquerque.

Tilley, Christopher. 1994. *Phenomenology of Landscape*. Berg, Oxford.

Van Dyke, Ruth M. 2007. *The Chaco Experience: Landscape and Ideology at the Center Place*. SAR Press, Santa Fe, NM.

Van Dyke, Ruth M. 2009. "Chaco Reloaded: Discursive Social Memory on the Post-Chacoan Landscape." *Journal of Social Archaeology* 9(2):220–248.

Van Dyke, Ruth M., R. Kyle Bocinsky, Thomas C. Windes, and Tucker J. Robinson. 2016. "Great Houses, Shrines, and High Places: Intervisibility in the Chacoan World." *American Antiquity* 81(2):205–230.

Vivian, Gordon, and Tom W. Mathews. 1965. *Kin Kletso: A Pueblo III Community in Chaco Canyon, New Mexico*. Technical Series 6(1). Southwest Parks and Monuments Association, Tucson.

Vivian, R. Gwinn. 1970. "An Inquiry into Prehistoric Social Organization in Chaco Canyon, New Mexico." In *Reconstructing Prehistoric Pueblo Societies*, edited by William A. Longacre, 59–83. University of New Mexico Press, Albuquerque.

Vivian, R. Gwinn. 1989. "Kluckhohn Reappraised: The Chacoan System as an Egalitarian Enterprise." *Journal of Anthropological Research* 45(1):101–113.

Vivian, R. Gwinn. 1990. *The Chacoan Prehistory of the San Juan Basin*. Academic Press, San Diego.

Vivian, R. Gwinn. 1997a. "Chacoan Roads: Morphology." *Kiva* 63(1):7–34.

Vivian, R. Gwinn. 1997b. "Chacoan Roads: Function." *Kiva* 63(1):35–67.

Vivian, R. Gwinn, Carla R. Van West, Jeffrey S. Dean, Nancy J. Akins, Mollie S. Toll, and Thomas C. Windes. 2006. "Ecology and Economy." In *Archaeology of Chaco Canyon: An Eleventh Century Pueblo Regional Center*, edited by Stephen H. Lekson, 45–65. School of American Research Press, Santa Fe, NM.

Ware, John A. 2014. *A Pueblo Social History: Kinship, Sodality, and Community in the Northern Southwest*. School for Advanced Research Press, Santa Fe, NM.

Wilcox, David R. 1999. "A Peregrine View of Macroregional Systems in the North American Southwest, A.D. 750–1250." In *Great Towns and Regional Polities*, edited by Jill E. Neitzel, 115–141. New World Studies Series No. 3. Amerind Foundation, Inc., Dragoon, Arizona, and University of New Mexico Press.

II

Understudied Landscape Dimensions

3

Landscapes, Horticulture, and the Early Chacoan Bonito Phase

Thomas C. Windes
and Carla R. Van West

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 15, 2017.

https://doi.org/10.5876/9781646421701.c003.v000

This chapter discusses the settlement history of a sample of early great houses and associated communities outside Chaco Canyon, including their likely population sources and reasons for settlement. Our primary goals are to highlight the research significance of key Chacoan sites outside the national park boundary and to argue that their continued protection from energy extraction and landscape intrusion is of critical importance (Udall 2018). These early sites are not only sources of essential knowledge on the rise of Chaco culture but also meaningful elements of contemporary culture and heritage to Native descendant communities. It is within these noncanyon settings that the origins of the Classic Bonito phase developments will be found, the homelands of its participants and creators will be identified, and a richer understanding of the diverse agricultural strategies and technologies that enabled Chacoan communities to thrive will be achieved.

The setting of our sample is the San Juan Basin of northwestern New Mexico (figure 3.1), defined by major mountain masses along its margins: the Jemez Mountains along the east; Mt. Taylor, the Dutton Plateau and Zuni uplands to the south; the Chuska,

DOI: 10.5876/9781646421701.c003

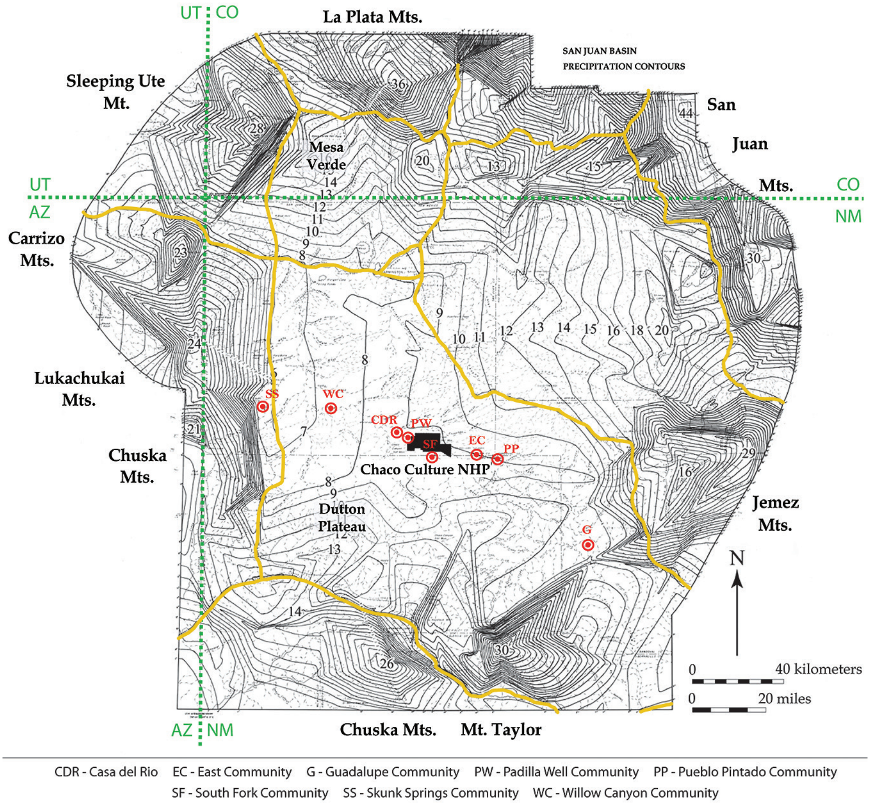


Figure 3.1. *Isopluvial contours across the San Juan Basin. Courtesy of the National Park Service, Chaco Archives (CHCU 65034) with Chaco community sample locations in red.*

Lukachukai, and Carrizo Mountains to the west; and Sleeping Ute Mountain, Mesa Verde, and the La Plata and San Juan Mountains to the north. These highlands represent powerful places in a cultural landscape that provides deep meaning for contemporary Pueblo and Navajo peoples and, we infer, for their ancient ancestors.

Our sample comprises eight Chacoan communities, distributed along a roughly east-to-west transect with Chaco Culture National Historical Park at its center. The sample "bookends" are two well-known great house communities with spectacular and far-reaching viewsheds: Guadalupe on the east and Skunk Springs on the west. In between are six other Chacoan communities: Pueblo Pintado, Chaco East, South Fork–Fajada Wash, Padilla Wash (i.e., Padilla Well), Casa del Rio, and Willow Canyon.

The following brief summaries represent what we currently know about these Chacoan communities. Tables 3.1 and 3.2 compile data for each community.

GUADALUPE COMMUNITY

Guadalupe Ruin (LA2757) and its associated community comprise the easternmost site in our sample. It also is the easternmost of all currently known Chacoan communities and is located in the Middle Rio Puerco valley (MRPV), some 90 km southeast of Chaco Canyon. The Guadalupe great house, with initial construction in the early-to-mid AD 900s, is a single-story structure located on La Mesa Encantada (also known as Enchanted Mesa) rising about 60 m (197 ft.) above the valley floor. The area Puebloan community had its origins, however, in the Basketmaker III period and persisted through late Pueblo III.

Unlike the other sites in our sample, the Guadalupe Community has been subject to both extensive survey and limited excavation (e.g., Baker 2003; S. Durand and R. Durand 2000; Durand et al. 2012; Flam 1974; Pippin 1987; Proper 1997; Roney 1996). Pueblos, Navajos, and Hispanos also occupied this portion of the Rio Puerco valley in the Protohistoric and post-1600 Historic period. Documented history of Hispanic settlement and farming techniques between about 1870 and 1950 in the MRVP (e.g., García 1987, 1992, 1994, 1997, 2002, 2015; Widdison 1958, 1959) provides information useful for understanding the Chacoan period occupation of the valley.

The MRPV exhibits a stunning array of physiographic features that must have held deep significance to its ancient inhabitants (figure 3.2); it continues to be a place of sacred places and community memory for Puebloan, Navajo, and Hispanic peoples. The dominant feature is Cabezón Peak (elevation 2373 m), a volcanic peak that rises 500 m above the surrounding valley; along with eight other volcanic peaks (2063–2404 m), they create a dramatic local landscape.[1] Cabezón Peak was and is a culturally significant place. On its summit, which may have once been part of the Chacoan shrine visual communication system (Van Dyke et al. 2016), is a large active shrine that replaced an earlier 1970s shrine. From here, the Sandia, Ortiz, Sangre de Cristo, and Jemez mountains are visible, and far to the south, Ladrón Peak between Socorro and Albuquerque. Contemporary Zia and Santa Ana pueblos are visible to the east.[2]

The members of the Guadalupe Community chose their settlement locale for its great visibility, protection, and access to two major adjacent side drainages (figure 3.3). Their great house was on top of a high narrow mesa and its community houses clustered below on hills and ridges. The attraction of this

Table 3.1. A sample of early Chaco settlements across the San Juan Basin.

Community	*Great House Present*	*Great Kiva (GK) Present*	*Prehistoric Roads/Segments*	*Pioneer N. San Juan–style PI house*	*No. of Small Houses*[a]	*Puebloan Start–End (AD)*	*Origins/Occupation Affiliations*[b]
Guadalupe	Medium	None; Court Kiva?	Yes	None	PII = 16 + 5 on top	875–1200s	Local Chaco, NSJ, Hispano
Pueblo Pintado	Large	None	Yes	1 Medium	PII E = 16 PII W = 16 LPII–EPIII S = 18	875–1200s	NSJ and Southern Chaco, Navajo
Chaco East	Medium	None	Yes	None	EPII = 11 LPII = 25 PIII = 35	900–1200s	Unknown Chaco, NSJ, Navajo
S. Fork– Fajada	Proto	PI GK	Yes	1 Medium	PI = 26	750–800	SCR
Padilla Wash	Small	PI GK; nearby PII GK	Yes	1 Small?	PI = 13+ PII = 15±	875–1200s	Local Chaco, NSJ, Navajo
Casa del Rio	Small	None	Yes	1 Large	PII = 3	850; 875–1130	Western Chaco, Navajo
Willow Canyon	None	None	Yes	1 Medium	PI = 7± PII = 12±	875–1130	Western Chaco, Navajo
Skunk Springs	Medium	PI? GK; PII GKs (2)	Yes	1 Huge	PII = 80±[c]	800±1130+	Western? Chaco, NSJ, Navajo

[a] EP = Early Pueblo; LP = Late Pueblo; P = Pueblo.
[b] NSJ = Northern San Juan region; SCR = Southern Chaco Region (southern San Juan Basin).
[c] The Michael Marshall et al. (1979:110) map does not show all of the PI–PII houses and none of the fifteen below the Skunk Springs Wash.

Table 3.2. Environment, landscape, and topographic features.

Site Area Community	*Shrines*[a]	*Visible Peaks*	*Water Source*[b]	*Drainage(s)*[c]	*Total Annual Precipitation (in.)*	*Summer Precip. (in.)*
Guadalupe	Cabezón Peak, unknown others?	Cabezón + many other volcanic necks	Floodwater (P); irrigation (H)	Rio Puerco (G, I, S); Tapia and Salado side canyons (I, S); Local tributaries (I); springs	Cabezón Village: 10.21 Montaño Grant: 7.49	Unknown
Pueblo Pintado	29Mc 187	Jemez	Floodwater (N, P)	Chaco River (G, S); Chacra tributaries (I)	9.7 ± 2.2 (21 yrs.)	5.3 ± 1.8
Chaco East	29Mc 187 29Mc 567	None	Floodwater (P); dams (N)	Chaco Wash (S); three main side drainages (I, S) incl. Wild Horse Canyon	Wild Horse Canyon (mouth): 9.2 ± 1.8 (26 yrs.) Wild Horse Canyon (head): 9.7 ± 1.8 (26 yrs.)	4.8 ± 1.7 4.9 ± 2.0
S. Fork–Fajada	29Mc 187 29SJ 710 29SJ 2386	Fajada, Huerfano	Floodwater; ditches (P)	Fajada Wash (S); South Fork–Fajada Wash (G?, S)	6.6 ± 1.5 (21 yrs.)	3.6 ± 1.5
Padilla Wash	29SJ 1088	Hosta Butte (head of valley)	Floodwater; groundwater (N, P)	Chaco River (G, S); Padilla Wash (I, S)	Near Pueblo Bonito: 8.6 ± 2.8 (51 yrs.) Near South Gap: 8.2 ± 2.1" (25 yrs.)	4.4 ± 1.8 4.0 ± 1.4
Casa del Rio	29SJ 1088	None?	Floodwater; groundwater (N, P)	Chaco River (G, S); Kin Klizhin Wash mouth; Ah-shi-sle-pah Canyon	Less than 8.0	Unknown

continued on next page

Table 3.2—*continued*

Site Area Community	*Shrines*[a]	*Visible Peaks*	*Water Source*[b]	*Drainage(s)*[c]	*Total Annual Precipitation (in.)*	*Summer Precip. (in.)*
Willow Canyon	White Mesa?	Ford Butte, Bennett Peak, Shiprock	Floodwater; groundwater (N?, P)	Chaco River (G, S); Willow Canyon (G, I)	Approx. 7.0	Unknown
Skunk Springs	LA 7000, Shiprock?, Ford Butte?, Ute Mt., Huerfano	Sleeping Ute, Ford Butte, Bennett Peak, Shiprock	Runoff irrigation (N, P)	Skunk Springs; Tuntsa and Captain Tom Washes (G, S, Irrigation); springs	Approx. 6.0–7.0	Unknown

[a] Not all shrines may be contemporaneous with the Puebloan occupation (e.g., for the South Fork–Fajada Community). See also Chapter 6, this volume.
[b] H = Hispano, N = Navajo, P = Pueblo.
[c] I = Intermittent, S = Seasonal, G = Groundwater.

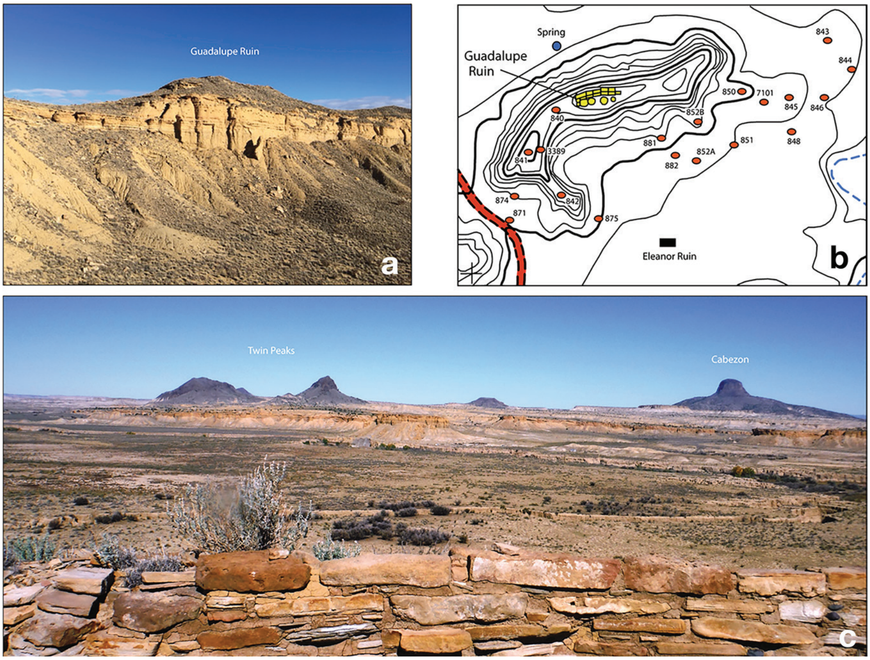


Figure 3.2. *Composite of the Guadalupe–Cabezón Peak area. (a) La Mesa Encantada (a.k.a. Enchanted Mesa) with the Guadalupe great house on top; photo by Christine Gilbertson, January 4, 2017. (b) Cabezón and the Twin Peaks to the north beyond the masonry rooms of Guadalupe Ruin in the foreground; photo by Tom Windes, October 14, 2017. (c) The plan of the Guadalupe Chacoan Community; from S. Durand and K. Durand 2000:104. From* Great House Communities across the Chacoan Landscape *by John Kantner and Nancy M. Mahoney, © 2000 The Arizona Board of Regents; reprinted by permission of the University of Arizona Press.*

portion of the MRPV to agriculturalists of all times, however, is its surface water and arable land (figure 3.4). The primary drainage of the MRVP is the 240-km-long Rio Puerco, an intermittent and ephemeral stream, which heads in the San Pedro Mountains northeast of Cuba some 57 km north of Cabezón Peak. A major tributary to the Puerco that provides seasonal runoff is Arroyo Chico, which originates from Mt. Taylor's high northern Mesa Chivato and joins the Puerco not far north of La Mesa Encantada. Local arroyos on the east and west sides of the Rio Puerco near Guadalupe Ruin provided water for Hispanic settlements, and we presume they were exploited by ancient farmers as well. Byrd C. Bargman et al. (1999:table 2.19) report that they recovered

Figure 3.3. *The possible Chacoan "court" kiva-size depression (see Windes 2014) at the top of a cinder cone looking southeast from La Mesa Encantada, which overlooks the potential farming area along the Tapia Wash floodplain. Photograph by Christine Gilbertson, April 2, 2017.*

maize dating to circa 1700–1200 BC from site LA 110946 just north of Cabezón Peak on the Rio Puerco floodplain, yielding seven shallow structures and fifty-two storage pits, along with many manos and basin, trough, and slab metates.

This portion of the MRPV supported several medium-size prehistoric Puebloan communities. During the 1971–1982 Rio Puerco Valley Project, led by Eastern New Mexico University's Cynthia Irwin-Williams, archaeologists surveyed two large block areas—an earlier northern one centered on

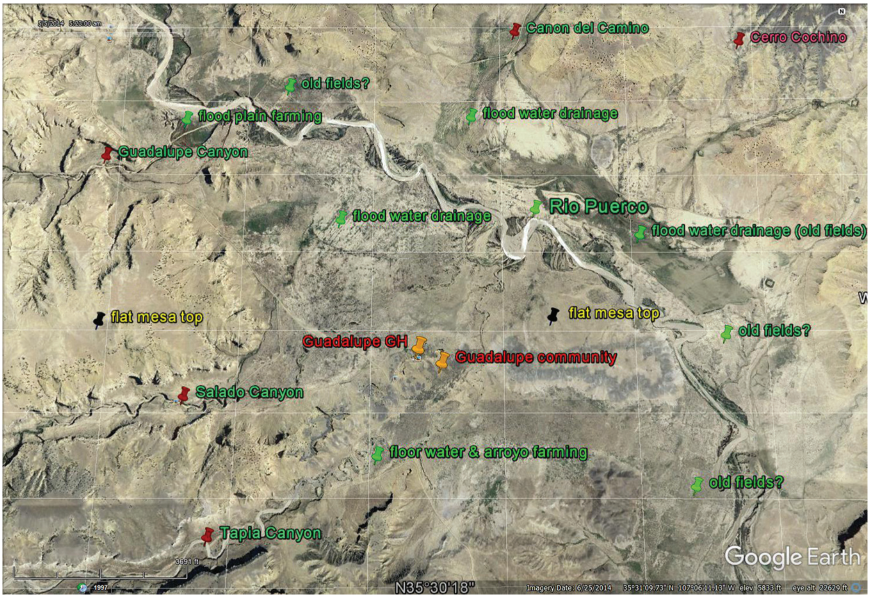


Figure 3.4. *Google Earth view of the Guadalupe community area shown with agricultural areas marked by old fields and potential floodwater usage with green pins.*

Guadalupe Ruin and a southern one about 20 km distant. In both cases most early occupation was located on and along the mesas west of the Rio Puerco, a location also favored during the early Navajo and Hispanic settlements in the 1700s. In the late 800s and early 900s, the number of pueblo house sites in the northern area increased only from 25 to 34, but their estimated room numbers concurrently rose from 89 to 218 (Baker 2003:table 8.2). Afterward, house numbers increased through time until about 1100, when a rapid decline in room numbers by half occurred, the number not exceeding previous levels again until the early 1200s. In the southern survey area, which began to grow in the mid-to-late 900s, a sudden rise in house sites and room numbers occurred in the late 1000s but showed the greatest numbers of rooms in the 1200–1250 period, greatly exceeding the northern area's numbers.

Although little is known of the subsurface deposits in the sixteen small houses below the Guadalupe great house (figure 3.2b), most of which were along the south side, the great house was not built until after the small houses were established. It closely resembles in form, size, and location the later-dating great house at Bis sa'ani along the Escavada Wash north of Chaco Canyon (Breternitz et al. 1982). In 2001, archaeologists excavated a test pit

2.5 m below the highest part of small house ENMU 848 to examine the sequence of Puebloan occupation and the juxtaposition of two contrasting masonry styles, of sandstone overlain by vesicular basalt (Durand et al. 2012). The senior author examined 4,300 ceramics recovered from this excavation unit and found a small but persistent presence of wide neckbanded and probable Kiatuthlanna Black-on-white pottery that marks the earliest occupation of the house and probably others nearby by at least the late 800s. This ceramic pattern mirrors the establishment and abandonment of early Chacoan communities across the San Juan Basin and beyond.

After a few centuries of scant land use, Navajos and Hispanos reoccupied this portion of the MRPV in the 1700s. Historic Puebloan groups from Jemez, Zia, and Santa Ana also used the general area, comprising both immigrant and indigenous populations who continue to reside in the nearby Middle Río Grande (see Ellis and Dodge 1989:50–51).

A LIKELY ANALOGUE: HISPANIC OCCUPATION AND AGRICULTURE IN THE MIDDLE RIO PUERCO VALLEY

The initial 1700s Hispanic settlement of the MRPV failed due to raiding by nearby Navajos, but Hispanos returned in the 1870s after the US government incarcerated many Navajos in Bosque Redondo (1864–1868) and created a Navajo reservation. Hispanos reestablished four small villages and scattered homesteads along the edges of the floodplain near Cabezón Peak around 1872: San Luis, north of the peak; Cabezón village, near the base of the peak; Guadalupe village, just upstream from the Chacoan Guadalupe Community; and Casa Salazar, about 7 to 8 km south of Guadalupe Ruin.

Hispanic subsistence practices and methods were similar to prehistoric practices, with two major exceptions: Hispanos possessed livestock and had access to metal tools. Nevertheless, these subsistence advantages failed to prevent the hard times that eventually led to the eventual abandonment of the Guadalupe area. As with their Puebloan predecessors, historic period farmers experienced highly variable farming conditions in terms of yearly temperatures and precipitation, particularly those multiyear "warm and dry" or, worse, "cold and dry" periods (Van West 1994; Van West et al. 2013) that are the most detrimental to crop success (figure 3.5).[3]

Historic research indicates Hispanos from these four villages used Pueblo-style dryland farming and *ak'chin*-type farming where it was possible to capture seasonal water flow from side drainages. Hispanos also irrigated their crops in small streamside fields from ditch water temporarily impounded behind

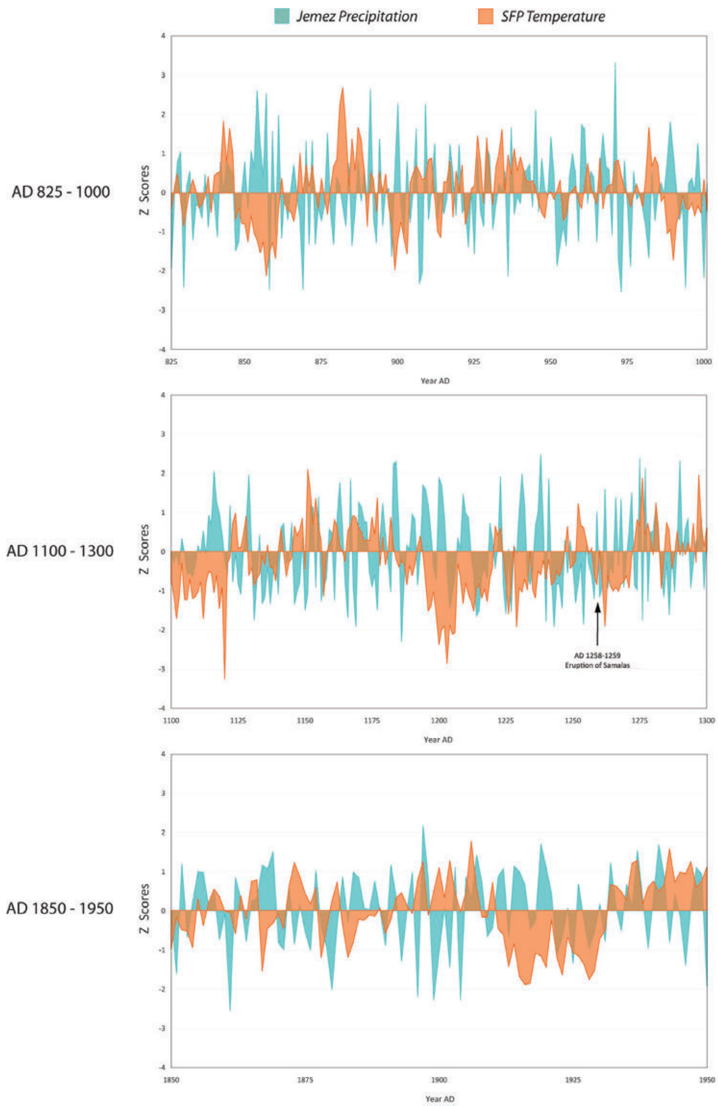


Figure 3.5. *Temperature and precipitation graphs for the Guadalupe area using the San Francisco Peaks temperature and Jemez Mountain precipitation dendrochronological indices. Note the cold period (in orange) for* AD *1258–1272 (see arrow), a worldwide northern hemispheric event caused by Java's Samalas* AD *1257 volcanic megaeruption, and the cold era between ca. 1910 and 1930. These were periods of depopulation in the Four Corners region and the MRPV, respectively. See endnote 3.*

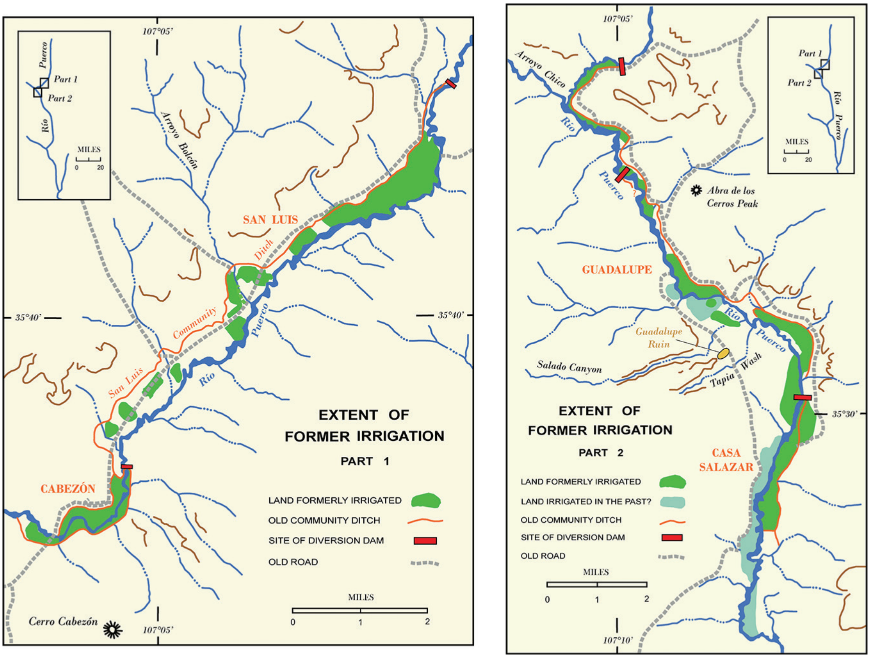


Figure 3.6. *The Hispanic irrigation ditches (orange) and dams (red) along the Rio Puerco in the Cabezón area. Revised from Widdison 1958, 1959.*

simple dams during unpredictable floods on the Rio Puerco. Except for late summer storm flooding, the Rio Puerco provides little reliable water by the time it reaches the MRPV (Widdison 1958:19; 1959:251–253).[4] Occasionally, when the Rio Puerco flooded beyond the channel, water would cover fields and result in successful crop production, before the Rio Puerco became too deeply entrenched (Widdison 1959:267). Figure 3.6 illustrates the distribution of dams, ditches, and irrigated land near Guadalupe Ruin that supported Guadalupe and Casa Salazar and those near San Luis and Cabezón to the north. Periodic fires and floods eventually destroyed the dams, and farmers were compelled to capture ditch water from side-drainage flooding to irrigate their crops. Despite the MRPV's reputation as "the bread basket of New Mexico" for its fruits and vegetables (Widdison 1959:266), farming here was always a struggle, and gradually the valley lost population. Residents began abandoning their villages in the 1930s and 1940s, with termination at Cabezón and Guadalupe in the early 1950s at the beginning of the severe and widely experienced 1950s drought.[5] A graph of period June–August precipitation

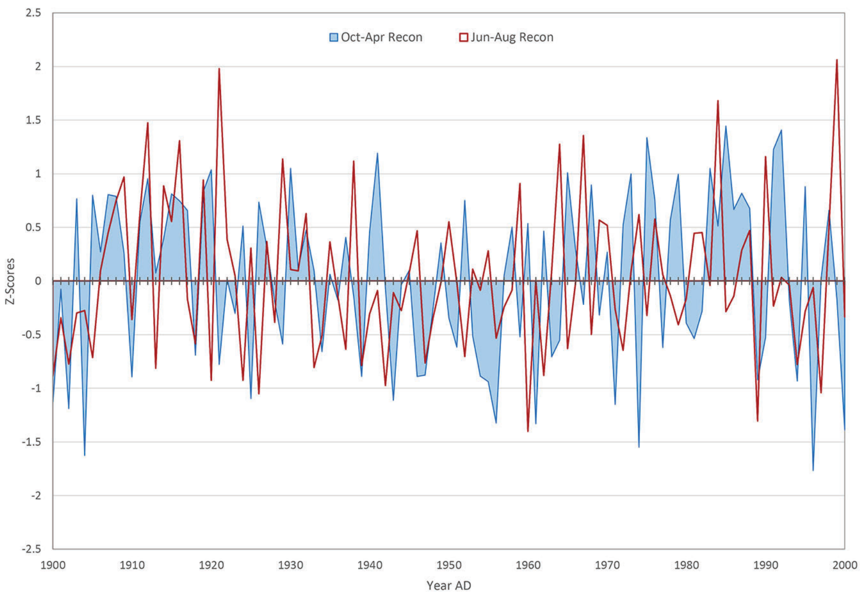


FIGURE 3.7. *Subannual precipitation graph for areas south of the Middle Rio Puerco Valley, using the North American Monsoon (NAMI) Region 2 (Albuquerque, New Mexico, west to Prescott, Arizona, on the north, and Chihuahua City, Chihuahua, west to Hermosillo, Sonora, on the south) as a proxy dataset (Griffin et al. 2013). Note the favorable wet periods (cooccurrence of moist cool seasons and strong summer monsoons) between about 1905 and 1919 that facilitated agricultural production in the MRPV followed by persistent drought in the 1940s and 1950s (cooccurrence of dry cool seasons and weak summer monsoons) that negatively affected Hispanic farming in the Middle Rio Puerco Valley. See endnote 3.*

reconstructed for the region south of Guadalupe reveals the perilous weather the farmers faced (figure 3.7).

PUEBLO PINTADO GREAT HOUSE COMMUNITY

The Pueblo Pintado (29Mc 166) Great House Community (figure 3.8) is located at the head (east end) of Chaco Canyon, along the north foothills of Chacra Mesa. Archaeologists know little about the vast area between Pueblo Pintado and Guadalupe Ruin, but it may contain other great house communities. The Pintado Community (figure 3.9) links to the central canyon via a prehistoric road and the shrine-visual communications network. Notably, there was no prior occupation before immigrants established

Figure 3.8. *The Pueblo Pintado great house situated along the snowy ridgeline overlooking the eastern subcommunity area in the foreground. Looking southeast. Photograph by Tom Windes, March 13, 2013.*

community houses there in the late 800s at two separate loci adjacent to the prehistoric road.

Pintado's eastern subcommunity first contained five houses between the western prehistoric road and Chaco Wash, which later grew to seventeen houses, while a western subcommunity 2.5 km away initially established sixteen approximately coeval houses along the western prehistoric road across alluvial fans at the mouths of several small tributaries draining northward from Chacra Mesa. The eastern subcommunity is marked by a 50-m-long pioneer late Pueblo I slab-lined house (29Mc 765) similar to those common in the Northern San Juan. Many of the painted early ceramics associated with this eastern locus have crushed rock temper from the Northern San Juan area. The western subcommunity's ceramics are thick-slipped, crazed, and crackled, unlike any others from the Chaco Wash area; these did not have rock temper. Inhabitants likely came from the south near Mt. Taylor. Pioneer late Pueblo I houses at this location are not visible. Residents of

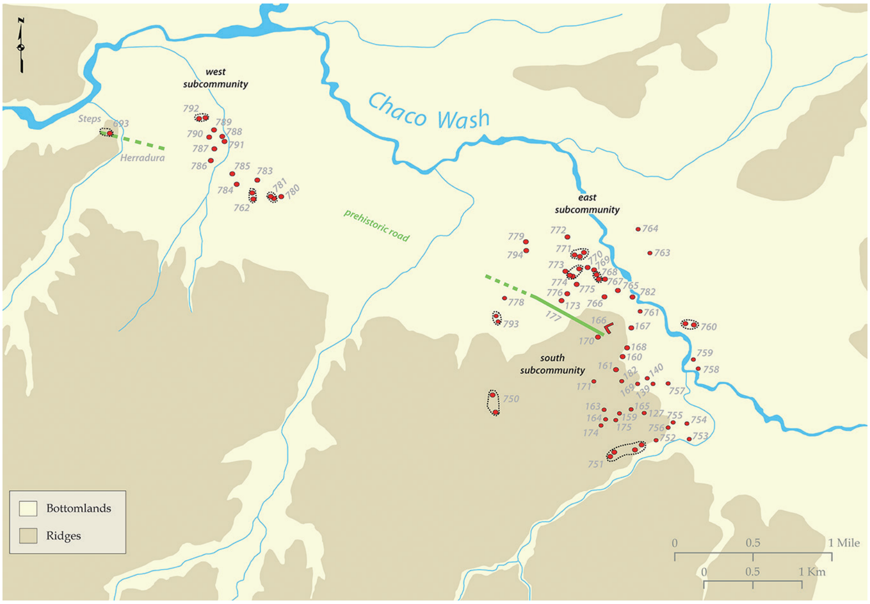


Figure 3.9. *Pueblo Pintado Chacoan subcommunity settlements,* AD *875–1130; after Windes 2018:548. The great house is 166.*

both the eastern and western subcommunities mostly left their homes in the mid/late 1000s.

These two subcommunities probably provided the labor for the great house construction in the late 900s. There is no great kiva here, despite published references and maps to the contrary (e.g., Marshall et al. 1979:83). A third subcommunity of about twenty-four houses formed in the late 1000s/early 1100s directly south of the great house above and below the ridge, which also may have had nonlocal origins. New residents augmented the occupation of the Pintado great house in the early 1100s and built a house in the former enclosed plaza; another reoccupation occurred in the 1200s. Massive midden deposits date almost entirely to the 1000s, with sparse ash and vegetal remains, similar to most other 1000s canyon great house middens. The prehistoric occupation of this site ended by 1300. During the historic period, Navajos used part of the great house plaza as a corral, and Anglos used several rooms as a trading post.

The Pintado landscape allows visibility east to the Jemez Mountains and northwest to Sisnathyel Mesa, but the local setting is otherwise enclosed by the surrounding hills, ridges, and lesser highlands. The eastern subcommunity's chosen location adjacent to Chaco Wash is no accident, as the floodplain

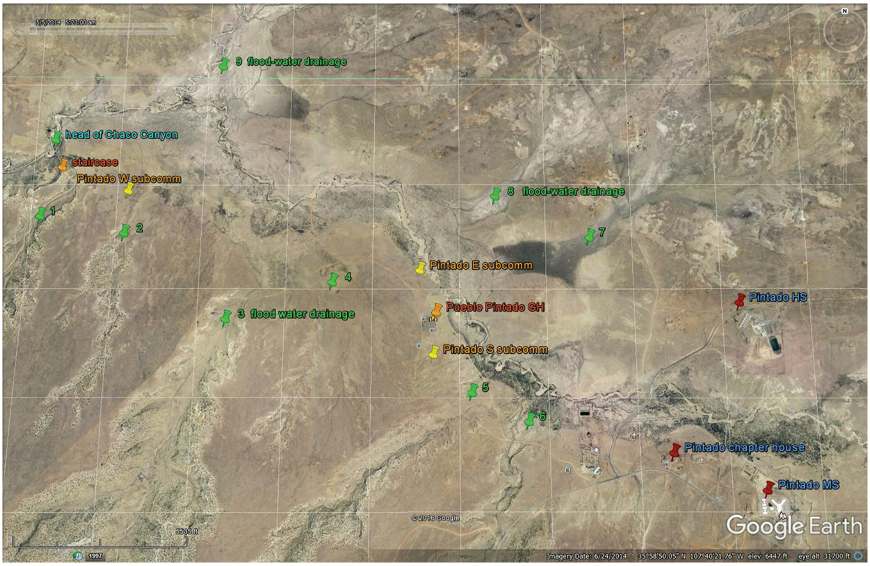


Figure 3.10. *Google Earth view of the Pueblo Pintado area shown with potential agricultural plots in flood-runoff areas marked by green pins 1–9.*

collects some 780 sq km of runoff before dropping into Chaco Canyon. Two broad and non-incised drainages across the wash to the northeast are regularly green with grasses during moist periods and would have made for the area's best fields (figure 3.10). It is important to note that very few mapped soil types identified in Chaco Canyon and surrounding areas are considered suitable for modern agriculture by the US Natural Resource Conservation Service (formerly the US Soil Conservation Service; see Windes 2018:36–39), but some of these same soil types are arable when the labor-intensive methods used by Puebloan and Navajo farmers are utilized (see figure 3.26). As always, precipitation is the most important factor for sustainable agriculture in this arid region, but no drainages had reliable long-term stream flows.

Despite local plundering, the two initial subcommunities are surface-littered with manos and metates, which attests to much corn production and probable surpluses that could have been carried into Chaco Canyon (see Benson et al. 2019). A nearby rain gauge records twenty-four years (1993–2017) of local precipitation data (see table 3.2) with an annual average of 246 ± 56 mm (9.7 ± 2.2 in.) including 135 mm (5.3± in.) during the growing season—totals exceeding those in the lower Chaco Canyon.

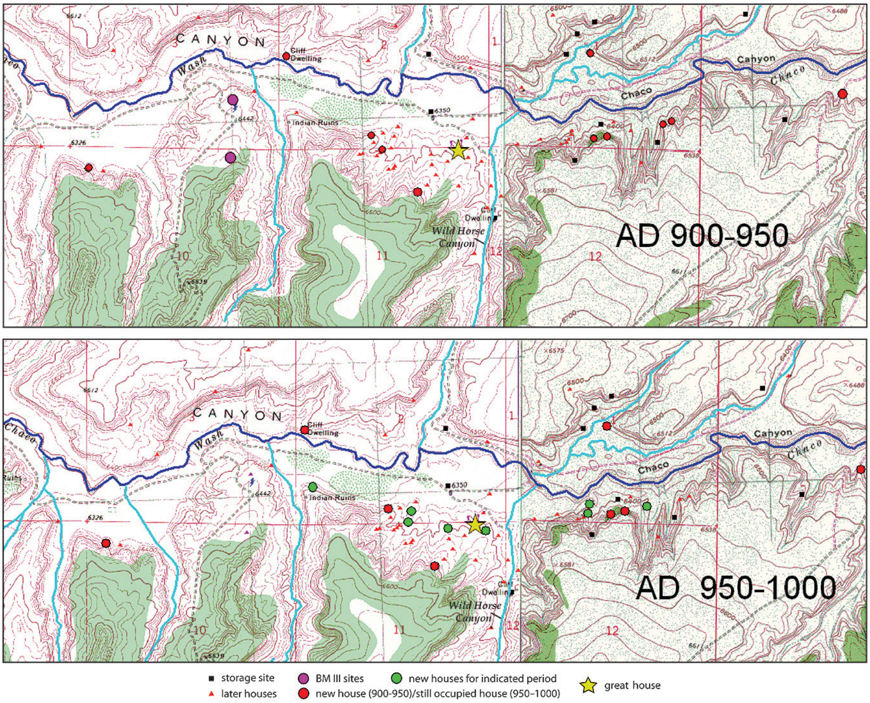


Figure 3.11. *The Chaco East Community during the* AD *900–950 and 950–1000 periods; note preference for a south-side house location, indicative of seasonal occupations, within the narrow canyon. From* Great House Communities across the Chacoan Landscape *by John Kantner and Nancy M. Mahoney, © 2000 The Arizona Board of Regents; reprinted by permission of the University of Arizona Press.*

THE CHACO EAST COMMUNITY

Seven kilometers downstream from Pueblo Pintado is a community started at about AD 900 on virgin lands centered on Wild Horse Canyon (Windes 1993:459–463, 2018:552–555; Windes et al. 2000). First identified by the Chaco Canyon National Monument staff in the 1950s but later forgotten, Chaco Project staff rediscovered the Chaco East community in 1989 (figure 3.11). The tenth-century settlers established eleven houses, most of which were on the south side of Chaco Wash, east and west of the mouth of Wild Horse Canyon. Community members built the tall single-story great house (29Mc 560) in the late 900s with classic Type I masonry (exposed in a twentieth-century bulldozer cut), which typically marks early great house construction. A prehistoric road looped south around the great house from the Chaco Wash floodplain.

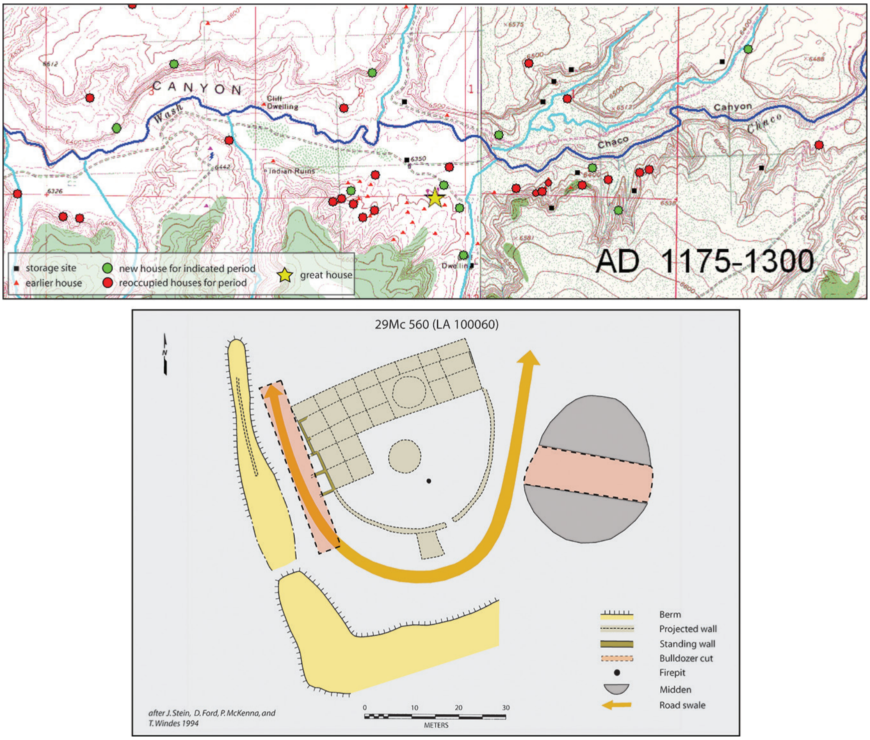


Figure 3.12. *The Chaco East Community great house and the* AD *1175–1300 small house community occupation; note expansion of small house settlement to the north canyon side. From* Great House Communities across the Chacoan Landscape *by John Kantner and Nancy M. Mahoney, © 2000 The Arizona Board of Regents; reprinted by permission of the University of Arizona Press.*

The great house changed little in the eleventh century, but laborers enclosed the plaza with a curved wall and a large midden east of the structure sometime in the mid-1000s. By the end of the thirteenth century, there were thirty-five houses, some remodeled and others newly built, with many of the new houses located on the north side of the wash. Some use of the great house also occurred in the 1200s (figure 3.12).

Residents established the settlement astride Chaco Wash and two of its tributaries across from one another (Windes 2018:fig. 4.3). One tributary, Wild Horse Canyon, runs south over 2 km into Chacra Mesa, is not incised, and is rich in grasses during wetter years even today. Two rain gauges established by the senior author at the head and mouth of Wild Horse Canyon have

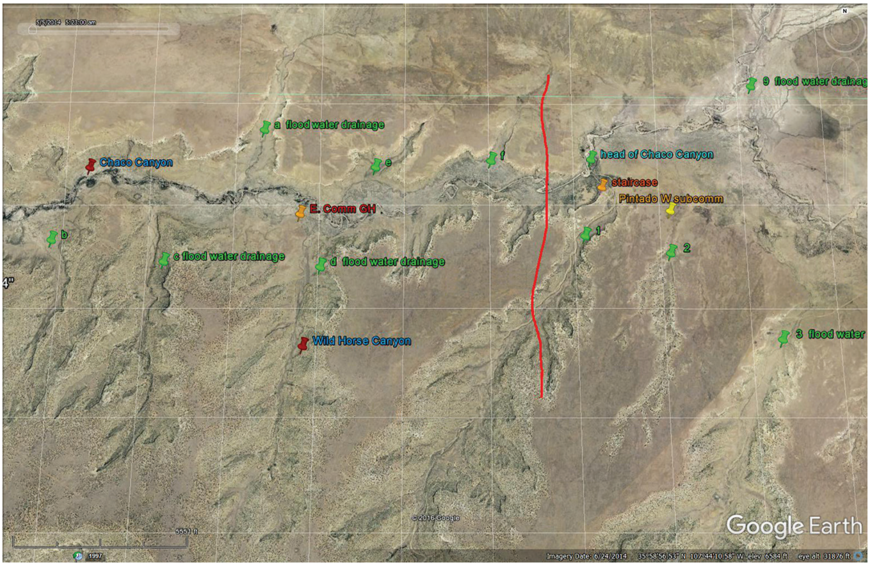


Figure 3.13. *Google Earth view of the Chaco East Community and the Pueblo Pintado western subcommunity area shown with potential agricultural lands marked by green pins (1–3, and 9 for the Pintado western subcommunity and a–f for the East Community, separated by the heavy vertical orange line). Note the potential overlapping agricultural lands for the two community areas.*

recorded data for the past twenty-six years (1992–2017). The head gauge (see table 3.2) measured more mean precipitation than the mouth gauge (246.9 mm versus 232.7 mm, or 9.72 in. versus 9.16 in.), where a stock dam is now located, indicating that runoff is generated during storm events. Such a source of water likely permitted community residents to successfully grow crops within Wild Horse Canyon and along the margins of the Chaco Wash floodplain (figure 3.13). Despite these horticultural advantages, the near absence of surface groundstone artifacts on locality sites suggests this community was perhaps seasonally self-sufficient but incapable of producing reliable surpluses that would benefit neighboring communities.

The immediate physical setting of the East Community restricts landscape views from the residential area and its great house to an outside view. The narrowness of the canyon also imposes limited solar advantages during the cold season; community members' initial south-side selection defies interpretation for a year-round occupation during the Chaco period, as do the house orientations (figure 3.14) (see Windes et al. 2000). Nevertheless, the community was

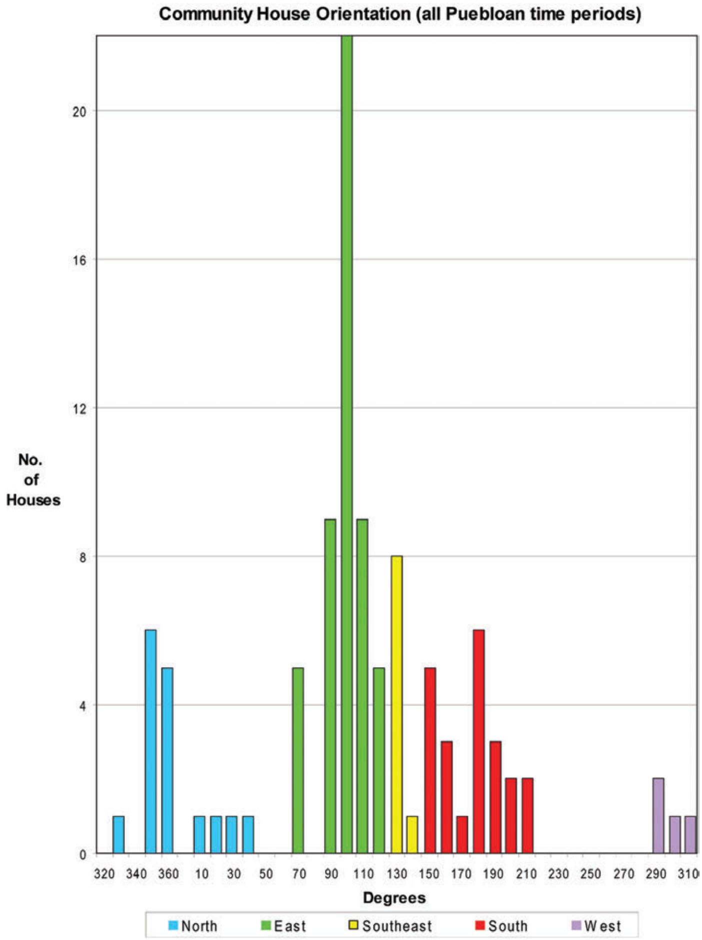


Figure 3.14. *House orientations for the Chaco East Community sites. Note preference for nontraditional orientations (those other than southeast and south) that indicate seasonal occupations. From* Great House Communities across the Chacoan Landscape *by John Kantner and Nancy M. Mahoney, © 2000 The Arizona Board of Regents; reprinted by permission of the University of Arizona Press.*

not culturally isolated. It is associated with a canyon-long prehistoric road and is connected to downtown Chaco and to Pueblo Pintado via two separate visual line-of-sight shrines (Windes et al. 2000:fig. 4.2) and their communication relay locations.

THE SOUTH FORK–FAJADA WASH COMMUNITY

This community provides us with insights into a failed early community and its relationship to the inhabitants of Chaco Canyon. Clustered about 10 km south of the national park and along State Route 57, it is the only large clustered Pueblo I community in and around Chaco Canyon dating to about AD 800 (Windes 2004, 2018). It exhibits many aspects of the later Pueblo II great house communities that give rise to the Chaco Phenomenon, but it did not persist beyond the mid-800s.

Unusual for the times, the South Fork–Fajada Wash Community has two small houses partially built with Type I masonry (29Mc 184); perhaps "proto-great houses," but not great houses, aligned with two small adobe houses (figure 3.15) connected to a rare great kiva via a short prehistoric roadway. All other members of the twenty-eight mostly one-to-two-domicile houses within the community can see these two diminutive stone house "bumps" as well as Fajada Butte and Huerfano Mesa (figure 3.16).[6] Huerfano Mesa visually connects, via a possible communications shrine, with Aztec Ruin, Salmon Ruins, and Chimney Rock Pueblo (Van Dyke et al. 2016; Windes et al. 2000:42–43), among great houses.

Rain gauge data for twenty-one years (1995–2015) marks this as the driest Chacoan community within the canyon area (168.4 ± 38.6 mm, or 6.63 ± 1.52 in.), growing season of 92.5 ± 38.6 mm (3.64 ± 1.5 in.) (table 3.2). The locality is *devoid* of precious wood and water resources, and almost no later Pueblo III nor Navajo occupation occurred here—a testament to its unfavorable horticultural potential. Ceramics with chalcedonic temper and high percentages of yellow-spotted chert (up to 40% of total chipped stone) derive from the eastern Zuni Mountain Range (LeTourneau 1997, 2000), suggesting southern community origins in the Mt. Taylor / Red Rock Valley area.

THE PADILLA WASH COMMUNITY

The southwestern area of the national park is one of the most densely settled, with occupations dating from Basketmaker III through Pueblo III. Yet, this area is generally unfamiliar to Chacoan scholars because of its difficult access and remoteness. The Padilla Wash Community contains a small great house connected to a nearby AD 1000s great kiva (both 29SJ 352) by a short prehistoric road (figure 3.17). From its architecture and ceramics, the great house dates to the 1000s, but its eastern midden reveals much late 800s and early 900s trash, which indicates an earlier structure exists underneath the present one. A number of Pueblo I and Pueblo II houses are within

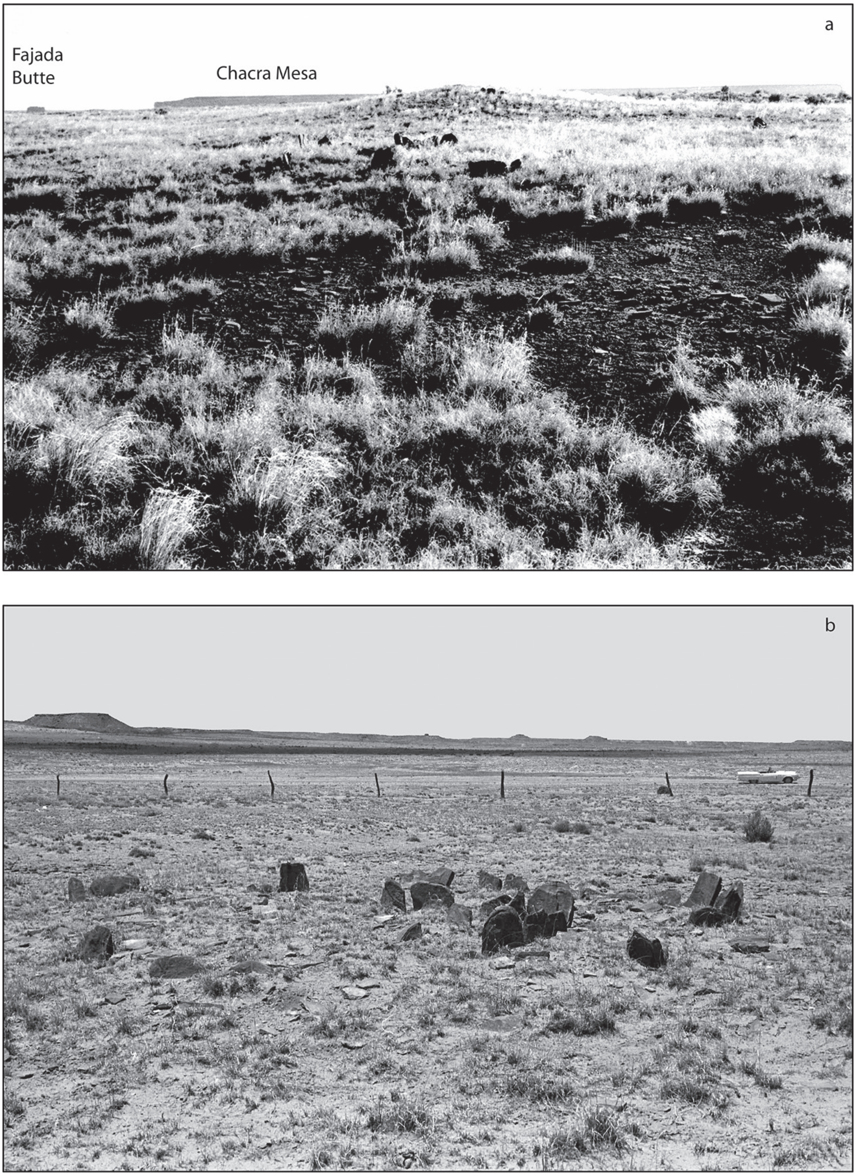


Figure 3.15. *Pueblo I houses at 29Mc 184, South Fork Community: (a) Proto–great house (House B mound), looking northeast; photo by Tom Windes, 2000s. (b) Upright house foundation slabs (note lack of house mounding) of House C, a typical Chacoan adobe house of the period. Looking west; 1957 Thunderbird vehicle for scale; photo by Tom Windes in 1976, courtesy of the National Park Service, Chaco Archives 2/2.004-n12110.*

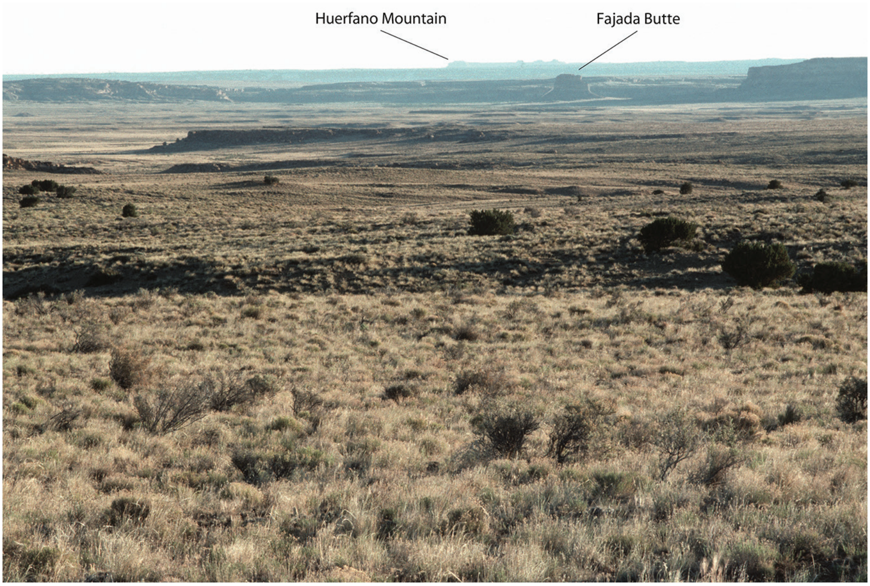


Figure 3.16. *The South Fork Valley at left looking north to Fajada Butte and Chaco Canyon, with Huerfano Mesa along the far horizon. Photo by Tom Windes, May 11, 2005.*

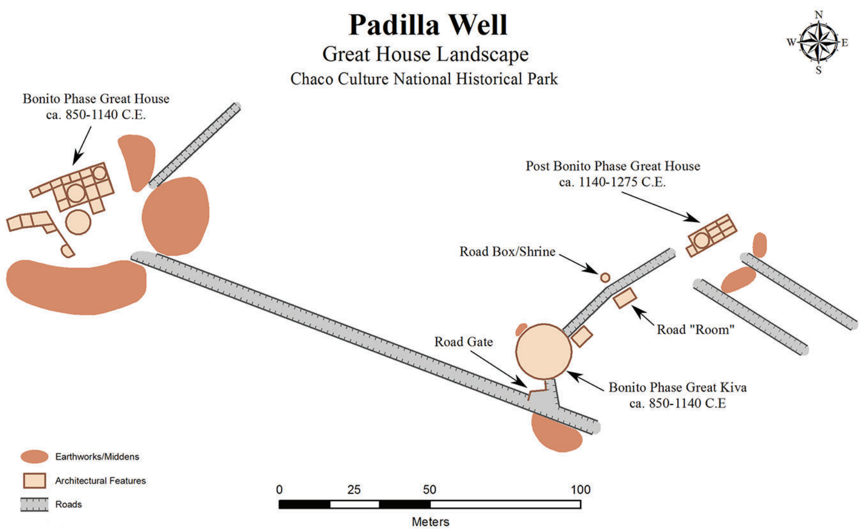


Figure 3.17. *The Padilla Wash Valley great house, great kiva, and connecting prehistoric roads. Modified by Friedman 2017, after Richard Friedman, Dabney Ford, and John Stein, July 16, 1999.*

250 m of the great house, but whether a pioneer late Pueblo I community led the way for a later immigration is unknown (see Windes 2018:593–600). This community may be a home-grown product, given the long occupational use of the valley.

Kellam Throgmorton (2019) recently conducted intensive surface recording and magnetometry in the community as part of his dissertation research. Throgmorton's findings confirm and clarify the senior author's observations. Throgmorton's work also suggests 29SJ 1882, in the southeast part of the community, may be a proto–great house.

Despite the valley's small size (about 2.5 km long with a drop of about 20 m from head to mouth), the location of this Chaco River tributary is likely key to its settlement. Whereas badlands of clayey hills border the western side of Padilla Wash Valley, the high imposing cliffs of West Mesa (part of Chacra Mesa) flank the eastern side. On the summit of West Mesa, a Chacoan visual communication shrine (29SJ 1088) and a series of barrel-shaped stone cairns line the cliff edge (figure 3.18). Of importance, the western side of West Mesa is the location of one of the two giant early Basketmaker III communities (29SJ 423, along with Shabik'eschee) in the national park, with 100+ possible pit houses scattered north to south across the mesa and exhibiting a series of superimposed great kivas starting in the early 500s (Windes 2018:88–120, 586–591). It also contains buried in Basketmaker III trash, a Pueblo II/III communications shrine—the key feature discovered by the Chaco Project for the existence of the Chacoan visual communication system (Hayes and Windes 1975). There are also hills of "Red Dog" shale and selenite used for local ornament manufacture.

The two most likely sources of water for crop production are valley floodwater runoff and groundwater within the broad, braided, and sandy Chaco River floodplain (figure 3.19). Three years into the 2000–2007 drought, the Chaco River was the only green area in the dry, parched brown land across the Chaco Basin. During that same period, the senior author sampled the depth to groundwater in the Chaco Wash/River channel from Pintado to Shiprock, found it was a constant 50 cm (20 in.) deep, and concluded that alluvial sediments could have supported crops during most drought years. A local Navajo land lessee reported to Windes that his parents and grandparents successfully grew melons, squash, and corn in the side drainages to Chaco Wash, near the buttes south of Casa del Rio, and along the margins of and within the Chaco River floodplain (Windes 2018:697). These former field areas are visible from the mouth of Padilla Wash Valley. Navajos also grew crops in the riverbed further upstream.

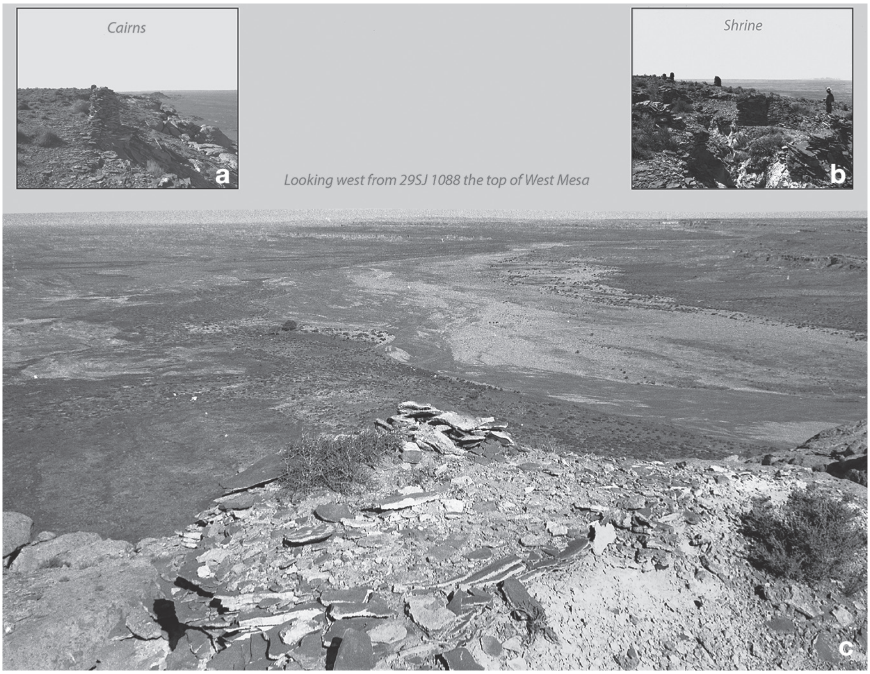


Figure 3.18. *The shrine and cairns at 29SJ 1088 on the top west end of West Mesa. (a) Some of the cairns; photo by either C. Mindeleff or F. Russell in ca. 1890. Courtesy of the National Anthropological Archives, Smithsonian Institution Photo Lot 14: NM-284-B. (b) Shrine (split by cliff fissures; cairns in background) by Buck Cully in 1972 (CHCU n31694); courtesy of the National Park Service, Chaco Archives. (c) Overview looking west past the Chaco visual communications shrine to the mouth of Padilla Wash Valley (left center) and the Chaco River below by Nancy Akins in 1979 (CHCU n28394); courtesy of the Chaco Archives, National Park Service.*

CASA DEL RIO GREAT HOUSE

Located just west of the national park boundary and Chaco Canyon, this isolated great house (LA17221) was well established by the early AD 900s (figure 3.20). It is part of a cluster that includes the Peñasco Blanco, Padilla Wash, and Kin Klizhin great houses. It also is one in a series of small great houses along the margins of the Chaco River running west to the "Great Bend" before the river turns north. Despite their diminutive size, these sites are incredibly dense with cultural material. Before downtown Chaco was a cultural center, these great houses connected with the Chuskan area where large quantities of cultural material were procured and produced. There is neither a formal

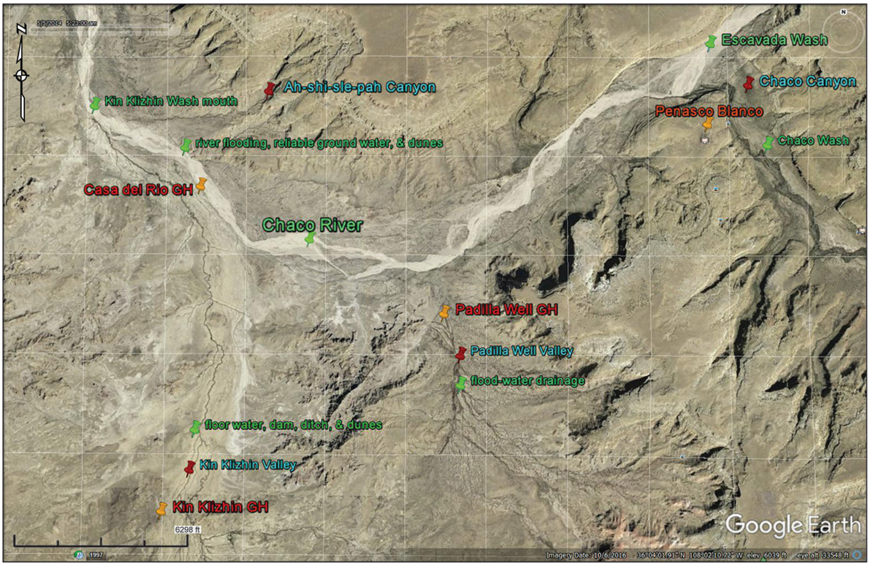


Figure 3.19. *Google Earth view of the Padilla Wash Valley dominated by the Chaco River with its reliable ground waters suitable for farming. Note the proximity of the Casa del Rio, Kin Klizhin, Padilla Wash Valley, and the Peñasco Blanco great houses to one another, and the Escavada Wash/Chaco River and Chaco Canyon. Some areas for potential agricultural lands marked by various green pins.*

community nor a great kiva at Casa del Rio, but the prehistoric Great West Road passes close by (Windes 2018:692) and the communication shrine and cairns at 29SJ 1088 are clearly visible to the southeast. The presence of other small buttes and distinctive geological features in the area suggest this area was an important location during the development of Chaco.

The curvilinear-shaped late Pueblo I/early Pueblo II great house is preceded by a huge mid-800s Pueblo I arc-shaped adobe-and-slab house—the largest in the Chaco Canyon area—stretching in a 112-m-long arc, representing an estimated sixteen households. The size and form of this house are reminiscent of those in the Northern San Juan (Windes 2018:690–698). In front of the mid-800s house are three associated middens (#2–4). This early house was mistakenly designated a sizable multistory great house with 100 ground-floor rooms built at about 1000 (Marshall et al. 1979:31–32). Sometime around the late 800s, however, the Pueblo I house was abandoned and the small single-story, Type I masonry great house built on top, with seemingly little interval between the occupations. This great house has a mere twenty-one to

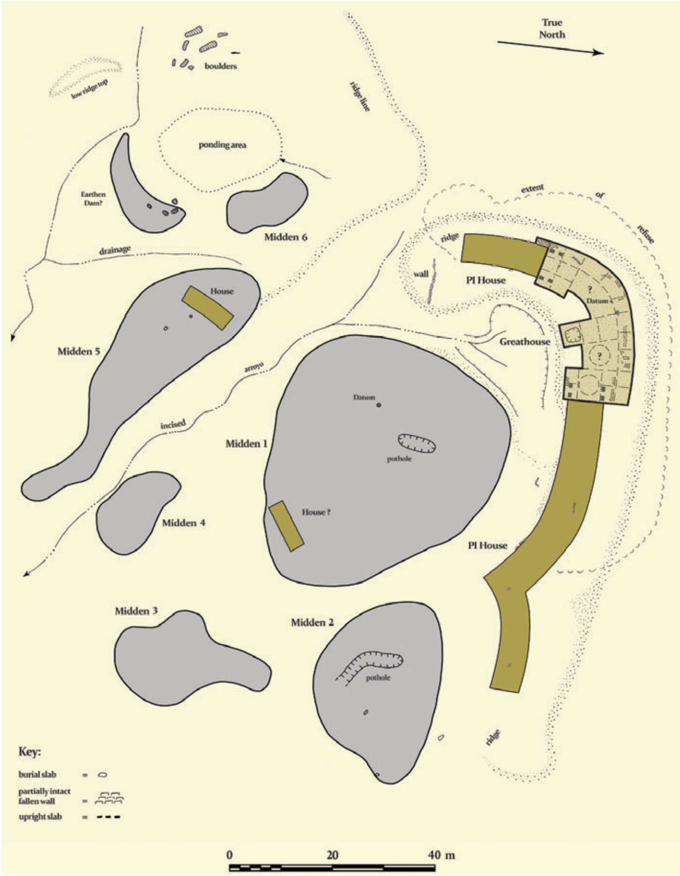


Figure 3.20. *Casa del Rio great house (in tan, marked by room outlines) underlain by a very long pioneer Pueblo I house. From Windes 2018:691. Note the prolific associated gray midden deposits.*

twenty-seven rooms, but the elevated midden (#1) to its southeast towered 5.5 m high, contains a staggering 1,480 to 1,849 m^3 of cultural material, and partially blocks a view east to the nearby Chaco River. This Pueblo II midden does not yield the clean sandy deposits of the typical 1000s great house middens; instead it is filthy with firepit charcoal and ash, as well as sherds, lithics, and ornaments in various stages of production—much of it Chuskan derived. A badger's retrieval of two complete ceramic vessels suggests there are burials within the midden. These deposits are household material along with much debris and tools from ornament and ritual artifact manufacture.

The local landscape is one of badlands and seemingly unfavorable for successful horticulture. As discussed above, however, the Chaco River provides a reliable shallow water table for crops (see figure 3.19). There are also dunes along the river's eastern terraces and high cliffs, which may catch summer storms. Deeply cut arroyos running downslope from the cliffs attest to storm action. The mouth of Kin Klizhin Wash enters the Chaco just upstream from the site, and the long, deep Ah-shi-sle-pah Canyon tributary is just northeast downstream; both provide storm runoff possibilities. The head of this tributary canyon is connected by a short prehistoric road to the huge Peñasco Blanco great house in the park. The presence of more than 500 broken manos and metates on the middens of Casa del Rio attests to the probable occurrence of surplus food production in the locality. Without doubt, this is an important site for understanding the early origins of the Chaco Phenomenon. Use of the site diminished by the 1000s, possibly signaling the increasing importance of great house activities in downtown Chaco Canyon.

WILLOW CANYON COMMUNITY

The Willow Canyon Community is situated on the east side of Willow Canyon, a deep gorge that drains north into the Chaco River about a 1.5 km away and a few kilometers east of the Great Bend great house (LA6419). There is a scatter of small Pueblo I houses along the west side ridges of Willow Wash, plus a few houses of modest size and partial stone masonry located on the mesa tops (Marshall et al. 1979:91–94; Windes 2018:705–711).

The main community is a tight cluster of at least twelve masonry houses, many of Type 1 masonry, within a 200-by-200-m area (figure 3.21). There is a massive amount of refuse, covering 7,700 sq m, much of it forming distinctive mounds. The Great West Road passes through the community, and there is a stone circle, a *herradura* (Kincaid 1983), and a possible shrine on the low, flat mesa to the north. A 21-m-long late Pueblo I adobe-and-upright-slab foundation pioneer house lies in the middle of the community. Two small masonry houses, founded circa AD 875, are similar in plan (LA139389 and LA139390) and slightly higher than the community at its southern end. The mesa directly behind and south of the community exhibits a single room of Type I masonry and a low-walled special use plaza (16 by 18 m). Architectural styles and ceramic dates suggest most of the residential community was in place by the late 800s, but there is neither an associated great house nor a great kiva. The Willow Canyon Community exemplifies the continuum of the varied early migration settlements into the interior Basin.

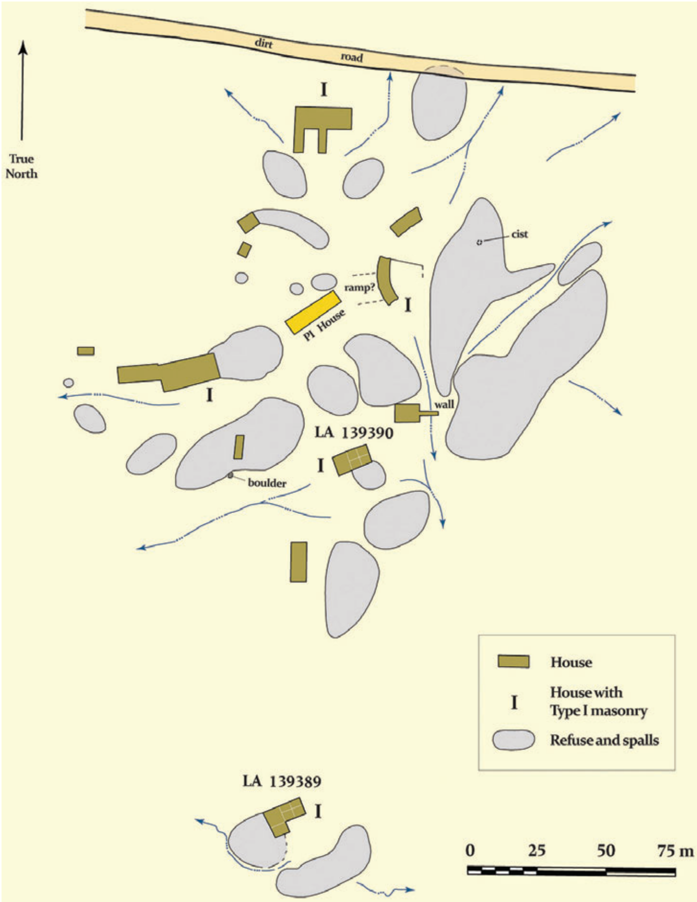


Figure 3.21. *The Willow Canyon Community. Note the centrally located late pioneer Pueblo I house in orange, the unusual widespread use of Type I masonry, the prolific gray midden deposits, and the lack of a great kiva and great house. From Windes 2018:707.*

From the highest point of the south mesa, much of the Chuska Valley is visible to the northwest, including the Chuska, Lukachukai, Ute, La Plata, and San Juan mountains. The Dutton Plateau and Hosta Butte are visible to the south and Huerfano Mesa to the northeast. Willow Wash is not incised, and the valley bottom is often green with grasses that the local Navajos use for grazing livestock. The canyon area is, however, without tree cover, and the east side of the valley borders badlands. Most likely, the canyon wash bottom and

Figure 3.22. *Google Earth view of the Willow Canyon Community area shown with some potential agricultural areas marked by various green pins.*

nearby Chaco River floodplain margin served as primary farmlands, as both contain shallow alluvial groundwater (figure 3.22). Otherwise, annual precipitation here is minimal (see table 3.2).

SKUNK SPRINGS COMMUNITY

The Skunk Springs Community is on the eastern slope of the Chuska Mountains, southwest of Newcomb, New Mexico. It is a gigantic community with 50 to 100 houses. Its great house (LA7000), three great kivas, and a shrine are located on the flat ridge (Gray Mesa) above and north of the community (Marshall et al. 1979:109–113; Windes and Ford 1992:80). Occupation spans the Pueblo I, II, and III periods, circa AD 850 to 1250.

Marshall et al. (1979:109–111) recognized the western room block and the westernmost of the three great kivas as the Pueblo I component of the Skunk Springs great house. The long, crescent-shaped Pueblo I house extends east under later portions of the multistory structure. Laborers built the great house with Type I masonry in the late 800s or early 900s and created long tiers of rooms similar to those of early great houses in Chaco Canyon (figure 3.23). Community residences are aligned along streets or walkways, akin

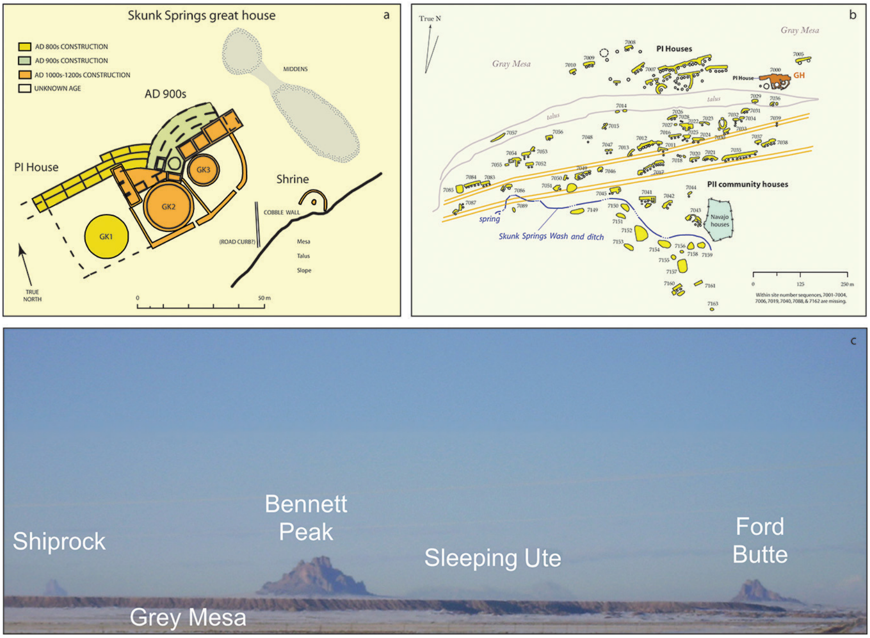


Figure 3.23. *Composite map of the Skunk Springs area: (a) The great house plan, from Windes and Ford (1992:80). (b) The plan view of the community with possible pathways or streets (in orange), based on a site map for LA 7000 created by Stewart Peckham in 1962, held by the Archaeological Records Management Section [ARMS] of the New Mexico Historic Preservation Division, NMCRIS No. 21545; community site number sequences run from LA 7000–7057, 7083–7089, to 7146–7163, though some site locations are missing. (c) A photo showing the many prominent peaks to the north, courtesy of Ruth Van Dyke.*

to community house alignments mapped by Windes at Navajo Springs, yet another Chacoan great house community, along the Puerco River of the West.

The position of the great house on high ground enables awe-inspiring views to the north and south, including many mountain ranges and peaks, and to the east toward Chaco Canyon country (see Bernardini and Peeples 2015:227, 231; Van Dyke et al. 2016). Ute Mountain is the most prominent landmark for the communities near the Four Corners, and oral traditions regarding it as a special place are still present among the Puebloan descendants in the Northern Río Grande (Ortman 2012).

Archaeologists have proposed connections between Skunk Springs and downtown Chaco for many years. For example, a Navajo informant told Harold Gladwin (1928), who was surveying the Chuska Valley in the 1920s, that the Chuskas were the source of roofing timbers taken by road to Chaco Canyon and Pueblo Bonito, and segments of a prehistoric road were still in use by Navajo people (Marshall et al. 1979:113). In the 1970s researchers identified a prehistoric road running east from the great house toward the Chaco River's Great Bend and Chaco Canyon, later identified as part of the Great West Road. More recently, Valerie King (2003) demonstrated that people transported pottery made in the Skunk Springs area to Chaco Canyon and Pueblo Bonito.

Local Navajos still practice agriculture by running water down ditches adjacent to the prehistoric community houses at Skunk Springs and at nearby Two Gray Hills and Newcomb. These ditches are thought to be part of three prehistoric Puebloan systems (Friedman et al. 2003), so it is instructive to examine the present practices as possible antecedes of prehistoric ones. The one at Newcomb, 7 km in length, uses water captured from Captain Tom Wash to irrigate 794 ha of arable land (figure 3.24). Despite their location within the Chuskan Valley east-side rain shadow, these three communities are close enough to the mountain slopes to take advantage of local springs, spring snowmelt, and summer storm runoff (figure 3.25).

SUMMARY AND CONCLUSIONS

These eight cases represent a sample of Early Bonito phase (AD 850–950) Chacoan communities across the San Juan Basin and into the Middle Rio Puerco Valley. Each community began in the late Pueblo I/Early Pueblo II developmental period (ca. 875–925) and most experienced occupation or use through the mid-1050s or longer. All were along intermittently flowing streams and had access to groundwater and/or seasonal runoff for domestic and agricultural use. Only one community (South Fork–Fajada Wash), in a particularly resource-poor location, did not endure for more than a generation or two. Seven of the eight communities contain early architecture interpreted as a great house or proto–great house; only Willow Canyon lacks a great house of any form. Three of the eight Chacoan communities have one or more great kivas, each constructed in the 1000s, long after the founding of the community. Most communities were visible to at least one other Chacoan community across the Chaco Basin and had elevated topography or architecture from which special mountains, mesas, and buttes are discernible.

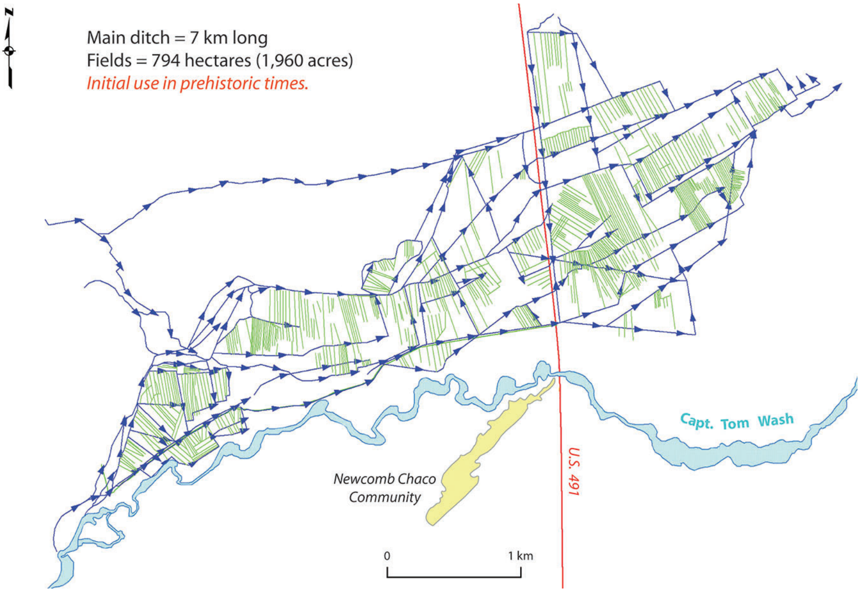


Figure 3.24. *View of the present ditch-irrigated fields (marked by multiple fine light-green parallel lines) at Newcomb, New Mexico, which may have prehistoric origins. After Friedman et al. 2003.*

Taken as a group, the compiled data reveal several common themes for our understanding of early Chacoan community development: (1) who were the founding settlers, (2) what were the critical factors in selecting a suitable community setting, (3) where and when did these settlers inhabit these residential and communal centers, and (4) possibly why they were drawn to the Chaco area.

Immigration and Founding of New Communities

It is the contention of the senior author that immigrant populations originating from earlier settlements primarily north but also west and south of the San Juan Basin seeking arable lands for maize agriculture founded these early Bonito phase communities. These immigrations likely occurred in response to environmental changes in former homelands that negatively affected food supply and personal security and created societal discord. Persistent drought, short growing seasons, and possibly the prolonged effects of volcanic eruptions are often-cited environmental forcing factors for prehistoric population

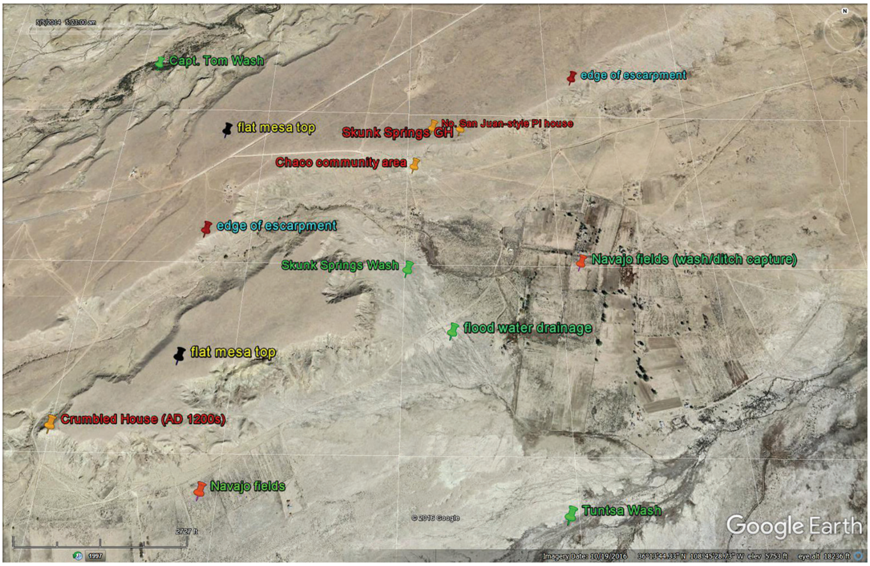


Figure 3.25. *Google Earth view of the Skunk Springs Community area shown with present Navajo agricultural areas that probably overlap the prehistoric ones (green pins). The area still is irrigated from springs and ditches by local Navajos.*

movement in the US Southwest (Elson et al. 2002; Guillet et al. 2017; Kohler and Varien 2012; Kohler, Varien, and Wright 2010; Salzer 2000; Stahle et al. 2009; Windes 2019). Anthropogenic factors—such as resource depletion, competition for scarce resources, and warfare—may have also contributed to emigration (Driver 2002; Duff, Adams, and Ryan 2012; Kuckelman 2010).

Several communities and/or great houses were initiated by new settlers to the area, which closely followed a pioneer large Pueblo I house pattern reminiscent of those found in the Northern San Juan and outside the basin interior. Many of these communities occurred in previously uninhabited or marginally Puebloan-occupied areas, with freedom to choose house locations. The senior author suggests pioneers probably established a small outpost to test the feasibility of the locale for successful horticulture and multiyear, seasonal, and/or year-round settlement (see Burmeister 2000). The evidence for their presence is the recovery of much wide neckbanded Kana'a Gray-style pottery, which is introduced to the San Juan Basin region by 850–875, along with Kiatuthlanna Black-on-white, in deposits associated with larger-than-normal-size late Pueblo I houses (Windes 2018:459–463). It is possible these houses were the residences and storage features for community pioneers.

Notably, there is considerable diversity in site layout and community elements, perhaps indicative of the influx of various peoples from different parts of the region. Some early communities lacked great houses, some great houses lacked adjacent communities, and most lacked great kivas. We also include a short-lived Pueblo I community (South Fork–Fajada Wash) that is an earlier footprint of the Pueblo II house settlements that occurred throughout the San Juan Basin, which bares additional inspection. Whether this was a community rejected from moving to better farmlands within nearby Chaco Canyon, or a temporary settlement quickly accepted into a more sustainable community, is unknown. Whatever its true history, it was a community that largely dispersed before about AD 850. For now, we consider it a failed community that could not support itself, given resource limitations.

In all eight cases the original settlers chose locations they anticipated would fulfill basic requirements for a sustainable farming community: access to potable water, arable land, fuelwood, construction timber, local building materials, and wild resources for supplemental subsistence. Settlers also selected habitation settings that would minimize cold-air drainage and enhance sunshine and warmth if they anticipated year-round occupation. We also suspect that more subtle requirements and intangible considerations influenced the choice of location. Whereas the six interior communities are along prominent intermittent drainages in narrow valleys with restricted vistas, all eight communities have access to an unusual feature or structure on higher ground that enables a visual connection to one or more prominent peaks within the basin or along its margin. Among these were vistas to suspected former homelands rich with positive memories and alignments to cardinal directions and other important features such as springs, prominent peaks, and other regional markers. Each community also had access to travel routes linked to natural resources and other communities—past and present.

The presence of an elevated natural or cultural feature overlooking the larger landscape is typical of early and later great house sites. These locations provided a view of the associated households below, the movement of peoples and weather conditions, fields and other subsistence areas, and distant landscapes that held important topographical features critical to the religious ideology and interrelationships of a society (e.g., Anschuetz 2005; Bernardini and Peoples 2015; Ford 2014; Lewis 2017; Snead 2004, 2008; Tosa 2016; Van Dyke 2003, 2007, 2011, 2017a–b; Varien and Wilshusen 2002).

Although some researchers have identified Chaco Canyon, and specifically Pueblo Bonito, as the source of the great house phenomenon, we now know that many early great houses were of similar age and that downtown Chaco was not the ninth-century center (Windes 2018).[7] Despite Pueblo Bonito's fame and unique history of excavation, the key site to understanding early great houses is Peñasco Blanco. From its position at the west end of the canyon, it has a commanding view of both Chaco Canyon and the Chaco River, as well as Chaco Wash and its junction with the Escavada Wash / Chaco River. It also has a view down river to the Padilla Wash area, and is likely the initial starting point for the Great West Road. Its enormous early refuse piles are similar to the household refuse deposits marking Casa del Rio—cultural deposits unlike those at other early great houses within the park.

Land-Use Practices

The suite of agricultural strategies pursued in the new lands likely was not the same as those employed in the former homelands. Differences in elevation, landforms, primary water sources (direct precipitation, surface water, groundwater), and soil characteristics influenced the selection of field locations and required a reformulation of farming techniques and technologies. Some of these same variables also influenced season of residence. Given the Chaco Basin's reputation for cold temperatures from the late fall through early spring, we suspect that community members of some low-lying communities in the Chaco Basin resided in these homes during the warm season but not the cold season.

Except for the failed community at South Fork, all others arose in areas where multiple water sources and diverse topographies were available, a necessity in the arid environment of the San Juan Basin. From our sample, every community received less than 254 mm (10 in.) of mean annual precipitation. Migrants coming into the interior region from higher, wetter elevations must have employed farming strategies that did not rely on direct precipitation—a source of water only effective during exceptionally wet periods in the San Juan Basin. Founders of the interior basin communities chose areas where convergent large drainages associated with storm runoff and high-water tables existed (Dean 1988, 1992). In contrast, founders of the Guadalupe and Skunk Springs communities in the eastern Rio Puerco and along the Chuskas selected locations adjacent to reliable mountain springs, winter snowmelt, and summer runoff that permitted more successful crop production.

Researchers have documented numerous strategies and techniques used by Indigenous southwestern peoples to successfully grow maize and other cultigens, and encourage the growth of useful wild plants in and near fields (e.g., Anschuetz 1998; Bradfield 1971; Hack 1942; Kennard 1979:554–557; Maxwell 2000). Depending on the source, volume, and predictability of water to nurture

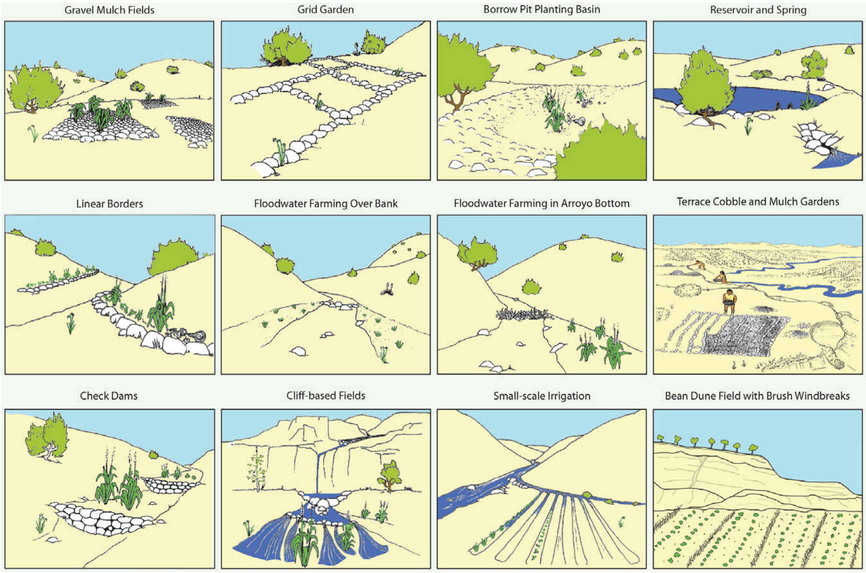


Figure 3.26. *Various watering strategies used by historic Puebloan farmers in arid regions. Modified from Ford and Swentzell (2015) and Moore (2009). Most drawings by Roxanne Swentzell, from* Traditional Arid Lands Agriculture: Understanding the Past for the Future, *edited by Scott E. Ingram and Robert C. Hunt, © 2015; reprinted by permission of the University of Arizona Press. Terrace Cobble drawing by Rob Turner, Office of Archaeological Studies, Museum of New Mexico (Moore 2009: frontispiece). Bean Dune Field by Thomas Windes with permission. Digital renderings by Clay Mathers.*

plant growth, farmers can harvest, conserve, and direct water to fields in a variety of landscape positions with one or more of the following agricultural systems (figure 3.26). Among the most common agricultural systems are the following: (1) direct precipitation for dryland fields (with and without cobble borders, terraces, grids, and rock mulch); (2) intermittent rain and snowmelt captured for runoff fields below mesas, cliffs, and moderate slopes; (3) water diverted from rivers, intermittent streams, and springs to irrigated fields; and (4) accessible alluvial groundwater present in both permanent and intermittent streams for floodplain fields.

Recent work in the Chama River valley has demonstrated the importance of shallow groundwater in floodplain for successful crop production (Eiselt et al. 2017; Huckleberry and Billman 1998). We suggest the presence of shallow groundwater within the Chaco River was an attraction for the early Chacoan communities west of Chaco Canyon and could have been exploited for crop production and potential drinking water (see Benson 2016; Windes 2018). We also suspect that farmers regularly used runoff agriculture where topography permitted this strategy to be effective. Finally, we suggest that members of the Guadalupe Community impounded and diverted water from local drainages to raise crops, using methods similar to those documented for nineteenth- and twentieth-century Hispanos.

Mobility as Response to Environmental Variability, Conflict, and Extra-Local Attractions

The principle of movement is an essential tenet of Puebloan life (Naranjo 1995; Nelson and Strawhacker 2011). In the often harsh, dry, highly variable environment of the San Juan Basin and the broader Colorado Plateau (figure 3.27), the recurrent need to relocate one's homesite and community is a requirement of sustainable living.

A significant event in the origins of the Chaco Phenomenon was the late Pueblo I (ca. 850/875–925) abandonments of large villages in the Northern San Juan region and perhaps elsewhere, affected by diminished frost-free seasons (Peterson 1987, 2012; Peterson and Clay 1987). This depopulation of the Northern San Juan was coeval with a massive influx of community houses into the Southern San Juan region, including the San Juan Basin. The timing of these two events are linked, with population movement from north to south in the late 800s and early 900s (Wilshusen 1999; Wilshusen and Ortman 1999; Wilshusen and Van Dyke 2006; Wilshusen et al. 2000; Wilshusen et al. 2012; Windes 2004, 2018; Windes and Van Dyke 2012).

At about the same time, there are strong material culture links between early sites in "downtown" Chaco Canyon and new great house communities along the Chaco River with existing settlements in the Chuska Valley, which suggests population movement from east to west or vice versa (Windes 2018). Some Pueblo I/early Pueblo II sites in Chaco Canyon also appear to have come from southern source areas (Toll and McKenna 1997; Windes 2018). The late Pueblo I/early Pueblo II period in the San Juan Basin appears, then, to have been an era of marked social disruption and the movement of many people (Mills et al. 2018).

Of significance, the late Pueblo I/early Pueblo II period is not the only example of mass movement in the region that affected the Chaco system. The founding of many later great houses in the Northern San Juan region in the late 1000s and early 1100s suggests a return migration of some peoples from

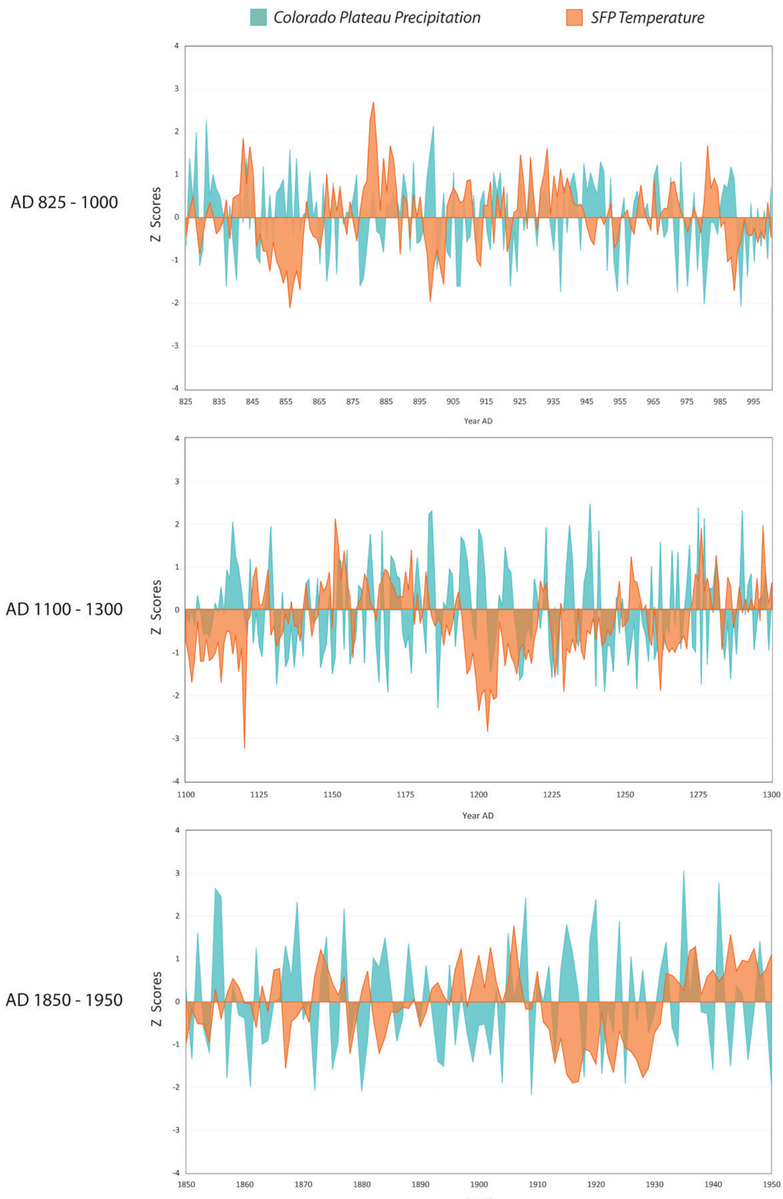


FIGURE 3.27. *Temperature (orange) and precipitation (blue/green) graphs for Chaco Canyon and northwest New Mexico,* AD *825–1000, 1100–1300, 1850–1950, using the San Francisco Peaks temperature and Chaco Canyon precipitation dendrochronological indices. See endnote 3.*

the south to the north, and a subsequent return of some Northern San Juan region migrants to the San Juan Basin in the early 1100s. At a local scale, there is evidence for major depopulation of Chaco in the middle and late 1000s, the arrival of new villagers in Chaco Canyon in the very late 1000s and early 1100s, and another wave of migration out of Chaco Canyon in the middle 1100s—the latter not long after the arrival of immigrants in the early 1100s. A steady migration out of the Northern San Juan region occurred in the middle and late 1100s and early 1200s, followed by a major exodus of remaining Northern San Juan populations in the middle to late 1200s, when the region was totally depopulated by Puebloan peoples.[8]

Concurrently, there is a poorly documented but noticeable influx of Northern San Juan region peoples throughout the San Juan Basin and beyond in the late 1100s and early 1200s, including Chaco, and another influx of Northern San Juan peoples in Chaco Canyon, along Chacra Mesa, throughout the Colorado Plateau and beyond in the late 1200s (e.g., Cameron 2010; Lekson and Cameron 1995).

In brief, this recurring pattern of population movement between adjoining but contrasting geographic regions is a long-standing practice for Puebloan peoples that has continued into historic times. The option to undertake short-term but long-distance migration was still common during the early Historic period (ca. 1600–1800) among the Hopi, Zuni, and Eastern Pueblos as a response to lengthy or severe periods of drought, pestilence, and strife, as well as to undertake short-distance seasonal migrations to occupy distant field areas (e.g., Dockstader 1979:525, 529; Woodbury 1979:472).

Future Research

Although archaeologists and land managers are aware of the 100 or more Chacoan communities and great houses in northwest New Mexico and adjacent areas (Fowler and Stein 1992), there is a surprising dearth of information on communities just outside the national park and especially east of the canyon and west into the San Juan Basin interior. Some poorly known communities are located on private land not subject to federal and state inventory requirements, others are difficult to access by vehicle, and many are far from centers of archaeological research. Nevertheless, these near-park communities have been the focus of the senior author's research for over forty-five years (e.g., Windes 2018; Windes et al. 2000; Windes and Ford 1992; Windes and Van Dyke 2012) and are essential resources for understanding the origins and nature of the early and later Chacoan world.

Chacoan scholars and park staff need additional information to understand and interpret these extracanyon resources. We need to know more detail concerning the source populations and life histories of these communities, including whether community residents were self-sufficient relative to subsistence. To obtain these data, we need additional inventory around and between communities as currently defined to expand our understanding of territory and permanence. We need to conduct subsurface survey with nondestructive technologies to reveal the nature and extent of the built environment near community centers. We need to remap some of the earliest recognized Chacoan communities, such as Skunk Springs, to better assess the presence and sizes of small houses and their occupation spans. We need to undertake targeted programs of limited testing and analysis to retrieve artifacts and environmental samples that can be associated with their sources. We need to conduct studies addressing local agricultural potential and environmental change. Finally, we need to engage in geographically comprehensive analyses of Chacoan communities with and without great houses to generate better models of how Chacoan society evolved, thrived, declined, and perhaps still persists within extant descendant communities. Most important, protection is needed to ensure that these many resources survive to enable future research and to persist as important places for Native cultures to interact with and acknowledge as part of their ancestral history.

ACKNOWLEDGMENTS

Our deepest thanks to the many folks who provided information, maps, photos, and/or assistance for this paper: Larry Baker, Kathy Durand, Ruth Van Dyke, Nasario Garcia, Christine Gilbertson, Clay Mathers, and Jerold Widdison.

NOTES

1. Chaco Project archaeologists climbed Cabezón Peak in May 1977 and found a standing historic C-shaped shrine facing east-southeast with lots of turquoise (Windes, shrine notes) and two Archaic points, which were not evident in 2017. A new shrine has replaced the previous shrine. From the top we observed Hosta Butte, the small peaks at the Cerrillos turquoise mines area, and the area of a key Chacoan shrine on Chacra Mesa (29Mc 187) connecting downtown Chaco with the Chaco East Community and Pueblo Pintado (Windes et al. 2000:43). Three other small rock structures are also scattered across the top of Cabezón.

2. In historic times Santo Domingo was part of an extensive visual communications network in the nearby Middle Río Grande Valley that reached Santa Ana Pueblo, among many other present-day villages and topographic points (Florence Ellis, archive notes, Maxwell Museum). It is probably not fortuitous that the long axis of the old Santa Ana mission church is directly aligned with Cabezón Peak (Windes 2015) and the Ortiz Mountains.

3. Tree-ring data used in this chapter. Figure 3.5 displays reconstructed October–June precipitation values for the Jemez Mountains, northern New Mexico (see Touchan et al. 2011 for a full chronology spanning AD 824 to AD 2007), and reconstructed annual mean-maximum temperature for the San Francisco Peaks (SFP), northern Arizona (see Salzer and Kipfmueller 2005 for a full chronology spanning 663 BC to AD 1996). Van West obtained the Jemez Mt. dataset from the NOAA Paleoclimate website (Touchan et al. 2011; see Stahle et al. 2009) and the SFP data from the Laboratory of Tree-Ring Research (LTRR). Van West converted each chronology to Z scores (standard deviation units) and overlaid each chronology on the same graph. Note: The zero line represents the long-term average value for the entire chronological series. Positive values represent wetter or warmer than long-term normal; negative values represent drier or cooler than long-term normal. Whereas total annual precipitation is a local phenomenon, temperature is a geographically widespread phenomenon.

Figure 3.7 displays the reconstructed Region 2, North American Monsoon Index (NAMI) subannual precipitation indices for the years AD 1900 to AD 2000 (Griffin et al. 2013). Their full reconstruction spans the AD 1896 to AD 2007 period. Van West obtained this NAMI dataset from the NOAA Paleoclimate website. Cumulative moisture values reconstructed for the cool season months of October through April are depicted in blue, whereas the cumulative moisture reconstructed for the summer monsoon months of June through August are depicted in red. These values can be independent of each other. When they are both greater than the long-term mean, they often result in abundant harvests; when both are less than the long-term mean, they often result in drought conditions.

Figure 3.27 displays reconstructed annual total precipitation for the Chaco Canyon area and northwest New Mexico (Dean and Funkhouser 2002) and reconstructed annual mean-maximum temperature for the San Francisco Peaks, northern Arizona (Salzer and Kipfmueller 2005). Van West obtained both tree-ring datasets from the LTRR. She converted each chronology to Z scores and overlaid each chronology on the same graph. Note: The zero line represents the long-term average value for the entire chronological series. Positive values represent wetter or warmer than long-term normal; negative values represent drier or cooler than long-term normal. Whereas total annual precipitation is a local phenomenon, temperature is a geographically widespread phenomenon.

4. Floodwaters measured at a gauge on the Rio Puerco near Cabezón Peak (1952–2012) yielded the highest yearly mean flooding at a mere 24 cfs in August for the 1,088 sq km drainage area above the gauge (BLM 2012:1-4). This is not a reliable amount of water for irrigated farming. Neither is direct rainfall. Near the village of Cabezón, average annual precipitation is 259 mm (10.2 in.), but at the Montano Grant further south, it is only 190 mm (7.5 in.) (Widdison 1958:table 1). Here, as elsewhere across the Colorado Plateau, precipitation is extremely variable.

5. Many former residents moved in with relatives in Albuquerque and other nearby towns. Descendants occasionally visit and a few have returned in recent years to San Luis, where they have refurbished the church and some homes. The other three villages are ghost towns. Individuals continue to use the area for livestock grazing.

6. Huerfano Mesa is the Navajo home of Goods of Value Boy and Girl and First Man and Woman (Van Valkenburgh 1999:55), which overlooks the Dinetah initial homeland. It is a traditional cultural property and a sacred place to Navajo people.

7. Although the early deposits at Pueblo Bonito are buried, it and the other early great houses along tributaries of the Chaco River appear to have been little used in the late AD 800s / early 900s, if we use refuse mound volume as a measurement of activity. Despite early construction, the Kin Bineola, Kin Nahasbas, Una Vida, and probably Chaco East great houses lack substantial early deposits.

8. The recent discovery of a unique megaevent in the last 2,000 years—the massive AD 1257 eruption of Mt. Samalas's volcano on Indonesia—should be of great interest to archaeologists. The ejecta from this volcanic eruption darkened much of the world in 1258 and 1259 and caused widespread starvation from crop failure across the northern hemisphere (Guillet et al. 2017:fig. 4; see Windes 2019:45–48). Interestingly, this was a period of greatly decreased precipitation and cooler temperatures in the Northern and Southern San Juan and during a widely acknowledged depopulation.

REFERENCES

Anschuetz, Kurt F. 1998. "Not Waiting for the Rain: Integrated Systems of Water Management for Intensive Agricultural Production in North-Central New Mexico." PhD dissertation, Department of Anthropology, University of Michigan, University Microfilms, Ann Arbor.

Anschuetz, Kurt F. 2005. "Landscape as Memory: Archaeological History to Learn from and Live by." In *Engaged Anthropology: Research Essays on North American Archaeology, Ethnobotany, and Museology. Papers in Honor of Richard Ford*, edited by Michelle Hegmon and B. Sunday Eiselt, 52–72. Anthropological Papers No. 94. Museum of Anthropology. University of Michigan, Ann Arbor.

Baker, Larry L. 2003. "Anasazi Settlement Distribution and the Relationship to Environment." In *Prehistory of the Middle Rio Puerco Valley, Sandoval County, New Mexico*, edited by Larry L. Baker and Stephen R. Durand, 155–177. Special Publication No. 3. Archaeological Society of New Mexico, Portales.

Bargman, Byrd C., Peggy A. Gerow, and Janette M. Elyea. 1999. "San Luis de Cabezón Site." In *Data Recovery along the 1995 MAPCO Four Corners Pipeline: Sites in the San Juan Basin/Colorado Plateau, Sandoval, San Juan, and McKinley Counties, New Mexico*. Vol. 2, compiled by Kenneth L. Brown, 11–46. Office of Contract Archeology, University of New Mexico, Albuquerque.

Benson, Larry. 2016. "The Chuska Slope as an Agricultural Alternative to Chaco Canyon: A Rebuttal of Tankersley et al. (2016)." *Journal of Archaeological Science: Reports* 16(2017):456–471.

Benson, Larry, John R. Stein, and Richard W. Loose. 2019. "Prehistoric Chaco Canyon, New Mexico: Empty Pilgrimage Center of the Anasazi Hegemony." https://doi.org/10.13140/RG.2.2.30889.95842. Last accessed 26 October 2020.

Bernardini, Wesley, and Matthew A. Peeples. 2015. "Sight Communities: The Social Significance of Shared Visual Landmarks." *American Antiquity* 80(2):215–235.

Bradfield, Maitland. 1971. *The Changing Pattern of Hopi Agriculture*. Occasional Paper No. 30. Royal Anthropological Institute of Great Britain and Ireland, London.

Breternitz, Cory D., David E. Doyel, and Michael P. Marshall, eds. 1982. *Bis sa'ani: A Late Bonito Phase Community on Escavada Wash, Northwest New Mexico*. Navajo Nation Papers in Anthropology No. 14. Navajo Nation Cultural Resource Management Program, Window Rock, AZ.

Bureau of Land Management (BLM). 2012. *Rio Puerco Resource Management Draft Plan and Environmental Impact Statement*, *August 2012*. Vol. 3 (appendices). Bureau of Land Management Rio Puerco Field Office, Albuquerque District, Albuquerque.

Burmeister, Stefan. 2000. "Archaeology and Migration: Approaches to an Archaeological Proof of Migration." *Current Anthropology* 41(4):539–567.

Cameron, Catherine M. 2010. "Advances in Understanding the Thirteenth-Century Depopulation of the Northern Southwest." In *Seeking the Center Place: Archaeology and Ancient Communities in the Mesa Verde Region*, edited by Mark D. Varien and Richard H. Wilshusen, 347–363. University of Utah Press, Salt Lake City.

Dean, Jeffrey S. 1988. "Dendrochronology and Paleoenvironmental Reconstruction on the Colorado Plateaus." In *The Anasazi in a Changing Environment*, edited by George J. Gumerman, 119–167. Cambridge University Press, Cambridge.

Dean, Jeffrey S. 1992. "Environmental Factors in the Evolution of the Chacoan Sociopolitical System." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 35–43. Maxwell Museum of Anthropology, Anthropological Papers No. 5. University of New Mexico, Albuquerque.

Dean, Jeffrey S., and Gary Funkhouser. 2002. "Dendroclimatology and Fluvial Chronology in Chaco Canyon." In *Relation of "Bonito" Paleo-channels and Base-Level Variations to Anasazi Occupation, Chaco Canyon, New Mexico*, by Eric R. Force, R. G. Vivian, Thomas C. Windes, and Jeffrey S. Dean, Appendix A, 39–41. Arizona State Museum Archaeological Series 194, University of Arizona, Tucson.

Dockstader, Frederick J. 1979. "Hopi History, 1850–1940." In *Southwest*, edited by Alfonso Ortiz, 524–532. Handbook of North American Indians. Vol. 9, general editor William C. Sturtevant. Smithsonian Institution, Washington, DC.

Driver, Jonathan, C. 2002. "Faunal Variation and Change in the Northern San Juan Region." In *Seeking the Center Place: Archaeology and Ancient Communities in the Mesa Verde Region*, edited by Mark D. Varien and Richard H. Wilshusen, 143–160. University of Utah Press, Salt Lake City.

Duff, Andrew I., Karen R. Adams, and Susan C. Ryan. 2010. "The Impact of Long-Term Residential Occupation of Community Centers on Local Plant and Animal Resources." In *Leaving Mesa Verde: Peril and Change in the Thirteenth-Century Southwest*, edited by Timothy A. Kohler, Mark D. Varien, and Aaron M. Wright, 156–179. University of Arizona Press, Tucson.

Durand, Kathy R., David C. Batten, and Stephen R. Durand. 2012. "Recent Research at the Guadalupe Community." Manuscript on file, Department of Anthropology and Applied Archaeology, Eastern New Mexico University, Portales.

Durand, Stephen R., and Kathy R. Durand. 2000. "Notes from the Edge: Settlement Pattern Changes at the Guadalupe Community." In *Great House Communities across the Chacoan Landscape*, edited by John Kantner and Nancy M. Mahoney, 101–109. Anthropological Papers of the University of Arizona, No. 64. University of Arizona Press, Tucson.

Eiselt, B. Sunday, J. Andrew Darling, Samuel Duwe, Mark Willis, Chester Walker, William Hudspeth, and Leslie Reeder-Myers. 2017. "A Bird's Eye View of Proto-Tewa Subsistence Agriculture: Making the Case for Floodplain Farming in the Ohkay Owingeh Homeland, New Mexico." *American Antiquity* 82(2):397–413.

Ellis, Florence H., and Andrea E. Dodge. 1989. "The Spread of Chaco/Mesa Verde/McElmo Black-on-White Pottery and the Possible Simultaneous Introduction of Irrigation into the Rio Grande Drainage." *Journal of Anthropological Research* 45(1):47–52.

Elson, Mark D., Michael H. Ort, S. Jerome Hesse, and Wendell A. Duffield. 2002. "Lava, Corn, and Ritual in the Northern Southwest." *American Antiquity* 67(1):119–135.

Flam, Louis. 1974. "Excavations at the Eleanor Site, ENM883: A Brief Interim Report." Manuscript on file, Agency for Conservation Archaeology, Eastern New Mexico University, Portales.

Ford, Richard I. 2014. "The Ancestors' Legacy at Spiritual Places: Water and Shrines in the Pueblos." *Newsletter of the New Mexico Archaeological Council, Sacred Landscapes* (1):3–9.

Ford, Richard I., and Roxanne Swentzell. 2015. "Precontact Agriculture in Northern New Mexico." In *Traditional Arid Lands Agriculture*, edited by Scott E. Ingram and Robert C. Hunt, 303–357. University of Arizona Press, Tucson.

Fowler, Andrew P., and John R. Stein. 1992. "The Anasazi Great House in Space, Time, and Paradigm." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 101–122. Maxwell Museum of Anthropology, Anthropological Papers No. 5. University of New Mexico, Albuquerque.

Friedman, Richard A., John R. Stein, and Taft Blackhorse, Jr. 2003. "A Study of a Pre-Columbian Irrigation System at Newcomb, New Mexico." *Journal of GIS Archaeology* 1 (April 2003): 4–10.

García, Nasario. 1987. *Recuerdos de los Viejitos: Tales of the Río Puerco*. University of New Mexico Press, Albuquerque.

García, Nasario. 1992. *Abuelitos: Stories of the Río Puerco Valley*. University of New Mexico Press, Albuquerque.

García, Nasario. 1994. *Tata: A Voice from the Río Puerco*. University of New Mexico Press, Albuquerque.

García, Nasario. 1997. *Másantes: Hispanic Folklore of the Río Puerco Valley*. Museum of New Mexico Press, Santa Fe.

García, Nasario. 2002. *Compadres: Hispanic Women of the Río Puerco Valley*. Reissued. Western Edge Press, Santa Fe, NM. Originally published 1997, University of New Mexico Press, Albuquerque.

García, Nasario. 2015. *Hoe, Heaven, and Hell: My Boyhood in Rural New Mexico*. University of New Mexico Press, Albuquerque.

Gladwin, Harold S. 1928. Field Notes—Wingate 8:4 site data form. Gila Pueblo, Globe, AZ.

Griffin, Daniel, Connie A. Woodhouse, David M. Meko, David M. Stahle, Holly L. Faulstich, Carlos Carrillo, Ramzi Touchan, Christopher L. Castro, and Steven W. Leavitt. 2013. "North American Monsoon Reconstructed from Tree-Ring Latewood." *Geophysical Research Letters* 40 (5):954–958. https:/doi.org/10.1002/grl.50184. Last accessed 26 October 2020.

Guillet, Sébastien, et al. 2017. "Climate Response to the Samalas Volcanic Eruption in 1257 Revealed by Proxy Records." *Nature Geoscience* 10 (January): 123–128. http://doi.org/10.1038/ngeo2875. Last accessed 26 October 2020.

Hack, John T. 1942. *The Changing Physical Environment of the Hopi Indians of Arizona*. Papers of the Peabody Museum of American Archaeology and Ethnology, No. 35. Harvard University, Cambridge.

Hayes, Alden, and Thomas C. Windes. 1975. "An Anasazi Shrine in Chaco Canyon." In *Collected Papers in Honor of Florence Hawley Ellis*, edited by Theodore R. Frisbie, 143–156. Papers of the New Mexico Archaeological Society No. 2. New Mexico Archaeological Society, Santa Fe.

Huckleberry, Gary A., and Brian R. Billman. 1998. "Floodwater Farming, Discontinuous Ephemeral Streams, and Puebloan Abandonment in Southwestern Colorado." *American Antiquity* 63(4):595–616.

Kennard, Edward A. 1979. "Hopi Economy and Subsistence." In *Southwest*, edited by Alfonso Ortiz, 554–563. Handbook of North American Indians. Vol. 9, William C. Sturtevant, general editor, Smithsonian Institution, Washington, DC.

Kincaid, Chris, ed. 1983. *Chaco Roads Project, Phase 1: A Reappraisal of Prehistoric Roads in the San Juan Basin*. Bureau of Land Management, Albuquerque.

King, Valerie C. 2003. "The Organization and Production of Chuska Grayware Ceramics for Distribution and Consumption in Chaco Canyon, New Mexico." PhD dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Kohler, Timothy A., and Mark D. Varien, eds. 2012. *Emergence and Collapse of Early Villages: Models of Central Mesa Verde Archaeology*. University of California Press, Berkeley.

Kohler, Timothy A., Mark D. Varien, and Aaron M. Wright, eds. 2010. *Leaving Mesa Verde: Peril and Change in the Thirteenth-Century Southwest*. University of Arizona Press, Tucson.

Kuckelman, Kristin A. 2010. "Catalyst of the Thirteenth-Century Depopulation of Sand Canyon Pueblo and the Central Mesa Verde Region." In *Leaving Mesa Verde: Peril and Change in the Thirteenth-Century Southwest*, edited by Timothy A. Kohler, Mark D. Varien, and Aaron M. Wright, 180–199. University of Arizona Press, Tucson.

Lekson, Stephen H., and Catherine M. Cameron. 1995. "The Abandonment of Chaco Canyon, the Mesa Verde Migrations, and the Reorganization of the Pueblo World." *Journal of Anthropological Archaeology* 14(2):184–202.

LeTourneau, Phillippe D. 1997. "Sources and Use of Yellowish Brown Spotted Chert in Northwest-Central New Mexico." Paper presented at the Sixty-Second Annual Meeting of the Society for American Archaeology, Nashville, TN.

LeTourneau, Phillippe D. 2000. "Folsom Toolstone Procurement in the Southwest and Southern Plains." PhD dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Lewis, Barnaby V. 2017. "The Unrealized Presence of the Ancestors." *Phoenix Underground: Archaeology Southwest Magazine* 31(2–3):9–11.

Marshall, Michael P., John R. Stein, Richard W. Loose, and Judith E. Novotny. 1979. *Anasazi Communities of the San Juan Basin*. Public Service Company of New Mexico, Albuquerque and New Mexico Historic Preservation Division, Santa Fe.

Maxwell, Timothy D. 2000. "Looking for Adaptation: A Comparative and Engineering Analysis of Prehistoric Agricultural Technologies and Techniques in the Southwest." PhD dissertation, University of New Mexico, Albuquerque.

Mills, Barbara J., Matthew A. Peeples, Leslie Aragon, Benjamin Bellorado, Jeffrey J. Clark, Evan Giomi, and Thomas C. Windes. 2018. "Chaco Regional Networks and Migration Scenarios." *Antiquity* 92(364):922–939.

Moore, James L. 2009. *Living on the Northern Rio Grande Frontier: Eleven Classic Period Pueblo Sites and an Early Twentieth-Century Spanish Site near Gavilan, New Mexico*. Museum of New Mexico, Office of Archaeological Studies, Archaeology Notes 315. Santa Fe.

Naranjo, Tessie. 1995. "Thoughts on Migration by Santa Clara Pueblo." *Journal of Anthropological Archaeology* 14(2):247–250.

Nelson, Margaret C., and Colleen Strawhacker, eds. 2011. *Movement, Connectivity, and Landscape Change in the Ancient Southwest*. University Press of Colorado, Boulder.

Peterson, Kenneth L. 1987. "Concluding Remarks on Prehistoric Agricultural Potential in the Dolores Project Area." In *Dolores Archaeological Program: Supporting Studies: Settlement and Environment*, compiled by Kenneth Lee Peterson and Janet D. Orcutt, 235–246. Bureau of Reclamation, Engineering and Research Center, Denver.

Peterson, Kenneth L. 2012. "Paleoenvironmental Context for the AD 1–1700 Period in the Northern Santo Domingo Basin Area." In *Excavations along NM 22: Agricultural Adaptation from AD 500 to 1900 in the Northern Santo Domingo Basin, Sandoval County, New Mexico*. Vol. 1, *Introduction to the Peña Blanca Project and Excavation Results from the Small Sites or Small-Scale Investigations*, compiled by Stephen S. Post and Richard C. Chapman, 49–81. Archaeology Notes 385. Office of Archaeological Studies, Department of Cultural Affairs, Museum of New Mexico, Santa Fe.

Peterson, Kenneth L., and Vickie L. Clay. 1987. "Characteristics and Archaeological Implications of Cold Air Drainage in the Dolores Project Area." In *Dolores Archaeological Program: Supporting Studies: Settlement and Environment*, compiled by Kenneth Lee Peterson and Janet D. Orcutt, 187–214. Bureau of Reclamation, Engineering and Research Center, Denver.

Pippin, Lonnie C. 1987. *Prehistory and Paleoecology of Guadalupe Ruin, New Mexico*. University of Utah Anthropological Papers No. 107. University of Utah Press, Salt Lake City.

Proper, Michael J. 1997. "Standing at the Foot of Guadalupe Ruin: Eleanor Site (ENM 883)." Manuscript on file, Anthropology Program, Eastern New Mexico University, Portales.
Ortman, Scott G. 2012. *Winds from the North: Tewa Origins and Historical Anthropology*. University of Chicago Press, Chicago.
Roney, John R. 1996. "The Pueblo III Period in the Eastern San Juan Basin and Acoma-Laguna Areas." In *The Prehistoric Pueblo World, AD 1150–1350*, edited by Michael A. Adler, 145–169. University of Arizona Press, Tucson.
Salzer, Matthew W. 2000. "Temperature Variability and the Northern Anasazi: Possible Implications for Regional Abandonment." *Kiva* 65(4):295–318.
Salzer, Matthew W., and Kurt F. Kipfmueller. 2005. "Reconstructed Temperature and Precipitation on a Millennial Timescale from Tree Rings in the Southern Colorado Plateau." *Climatic Change* 70(3):465–487.
Snead, James E. 2004. "Ancestral Puebloan Settlement Dynamics: Landscape, Scale, and Context in the Burnt Corn Community." *Kiva* 69(3):242–269.
Snead, James E. 2008. *Ancestral Landscapes of the Puebloan World*. University of Arizona Press, Tucson.
Stahle, David W., Malcolm K. Cleaveland, Henri D. Grissino-Mayer, Richard D. Griffin, Falko K. Fye, Matthew D. Therrell, Dorian J. Burnette, David M. Meko, and J. Villanueva Diaz. 2009. "Cool- and Warm-Season Precipitations over Western New Mexico." *Journal of Climate* 22(13):3729–3750.
Throgmorton, Kellam. 2019. "Peoplehood and the Political Power of Landscape Change: Chacoan Interventions in the Northern San Juan." PhD dissertation, Binghamton University–State University of New York.
Toll, Wolcott H., and Peter J. McKenna. 1997. "Chaco Ceramics." In *Ceramics, Lithics, and Ornaments of Chaco Canyon: Analyses of Artifacts from the Chaco Project 1971–1978*. Vol. 1, *Ceramics*, edited by Frances Joan Mathien, 1–215. Publications in Archeology 18G, Chaco Canyon Studies. US Department of the Interior, National Park Service, Santa Fe, NM.
Tosa, Paul. 2016. "The Hemish Footprint." *Fire Adds Richness to the Land: The Jemez FHiRE Project. Archaeology Southwest Magazine*. Fall, 7.
Touchan, Ramzi, Connie A. Woodhouse, David M. Meko, and Craig Allen. 2011. "Millennial Precipitation Reconstruction for the Jemez Mountains, New Mexico, Reveals Changing Drought Signal." *International Journal of Climatology* 31(6):896–906.
Udall, Tom. 2018. S. 2907–Chaco Cultural Heritage Area Protection Act of 2018. Committee on Energy and Natural Resources, Subcommittee on Public Lands, Forests, and Mining. 115th United States Congress, Washington, DC. https://www

.tomudall.senate.gov/news/press-releases/udall-heinrich-introduce-legislation-to-protect-chaco-canyon-area. Last accessed 25 October 2020.
Van Dyke, Ruth M. 2003. "Memory and the Construction of Chacoan Society." In *Archaeologies of Memory*, edited by Ruth M. Van Dyke and Susan E. Alcock, 180–200. Blackwell, Malden, MA.
Van Dyke, Ruth M. 2007. *The Chaco Experience: Landscape and Ideology at the Center Place*. School for Advanced Research Press, Santa Fe, NM.
Van Dyke, Ruth M. 2011. "Anchoring Identities: Iconic Landforms across San Juan Time and Space." In *Changing Histories, Landscapes, and Perspectives: The Twentieth Anniversary Southwest Symposium*, edited by Margaret C. Nelson and Colleen A. Strawhacker, 389–408. University Press of Colorado, Boulder.
Van Dyke, Ruth M. 2017a. "Sacred Geographies." In *The Oxford Handbook of the Archaeology of the American Southwest*, edited by Barbara J. Mills and Severin Fowles, 729–745. Oxford University Press, Oxford. https://doi.org/10.1093/oxfordhb/9780199978427.013.37. www.oxfordhandbooks.com.
Van Dyke, Ruth M. 2017b. "The Chacoan World: Light and Shadow, Stone and Sky." In *The Oxford Handbook of Light in Archaeology*, edited by Constantinos Papadopoulos. Oxford University Press, Oxford. https://doi.org/10.1093/oxfordhb/9780198788218.013.9. www.oxfordhandbooks.com.
Van Dyke, Ruth M., R. Kyle Bocinsky, Thomas C. Windes, and Tucker J. Robinson. 2016. "Great Houses, Shrines, and High Places: A GIS Viewshed Analysis of the Chacoan World." *American Antiquity* 81(2):205–230.
Van Valkenburgh, Richard F. 2000. *Navajo Country, Diné Bikéyah: A Geographic Dictionary of Navajo Lands in the 1930s*. Reprinted. Time Traveler Maps, Mancos, CO. Originally published 1941, Department of the Interior, Office of Indian Affairs, Navajo Service, Window Rock, AZ.
Van West, Carla R. 1994. *Modeling Prehistoric Agricultural Productivity in Southwestern Colorado: A GIS Approach*. Reports of Investigations 67. Department of Anthropology, Washington State University, Pullman, WA, and Crow Canyon Archaeological Center, Cortez, CO.
Van West, Carla R., Thomas C. Windes, Frances Levine, Henri D. Grissino-Mayer, and Matthew W. Salzer. 2013. "The Role of Climate in Early Spanish–Native American Interactions in the US Southwest." In *Native and Spanish New Worlds: Sixteenth-Century Entradas in the American Southwest and Southeast*, edited by Clay Mathers, Jeffrey M. Mitchem, and Charles M. Haecker, 81–98. University of Arizona Press, Tucson.
Varien, Mark D., and Richard H. Wilshusen, eds. 2002. *Seeking the Center Place: Archaeology and Ancient Communities in the Mesa Verde Region*. University of Utah Press, Salt Lake City.

Widdison, Jerold Gwayn. 1958. "Historic Geography of the Middle Río Puerco Valley, New Mexico." MA thesis, Department of Anthropology, University of Colorado, Boulder.

Widdison, Jerold Gwayn. 1959. "Historic Geography of the Middle Río Puerco Valley, New Mexico." *New Mexico Historical Review* 34(4):248–284.

Wilshusen, Richard H. 1999. "Pueblo I (AD 750–900)." In *Colorado Prehistory: A Context for the Southern Colorado Drainage Basin*, edited by William D. Lipe, Mark D. Varien, and Richard H. Wilshusen, 166–195. Colorado Council of Professional Archaeologists, Denver.

Wilshusen, Richard H., and Scott G. Ortman. 1999. "Rethinking the Pueblo I Period in the San Juan Drainage: Aggregation, Migration, and Cultural Diversity." *Kiva* 64(3):369–399.

Wilshusen, Richard H., Scott G. Ortman, Shanna Diederichs, Donna M. Glowacki, and Grant Coffey. 2012. "Heartland of the Early Pueblos: The Central Mesa Verde." In *Crucible of Pueblos: Early Pueblo Period in the Northern Southwest*, edited by Richard H. Wilshusen, Gregson Schachner, and James R. Allison, 14–34. Cotsen Institute of Archaeology Monograph 71. University of California, Los Angeles.

Wilshusen, Richard H., Leslie M. Sesler, and Timothy D. Hovezak. 2000. "Things Just Went Nuts." In *The Frances Mesa Alternative Treatment Project: New Interpretations of the Ancestral Pueblo and Navajo Occupations in the Navajo Reservoir Area*, compiled by Richard H. Wilshusen, Timothy D. Hovezak, and Leslie M. Sesler, 111–158. Research Paper, No. 3. La Plata Archaeological Consultants, Dolores, CO.

Wilshusen, Richard H., and Ruth M. Van Dyke. 2006. "Chaco's Beginnings: The Collapse of Pueblo I Villages and the Origins of the Chaco System." In *The Archaeology of Chaco Canyon, An Eleventh-Century Pueblo Regional Center*, edited by Stephen H. Lekson, 221–259. School of American Research Press, Santa Fe, NM.

Windes, Thomas C. 1993. *The Spadefoot Toad Site: Investigations at 29SJ 629, Chaco Canyon, New Mexico*. Vol. 1, Reports of the Chaco Center, No. 12. US Department of the Interior, National Park Service, Branch of Cultural Research, Division of Anthropology, Santa Fe, NM.

Windes, Thomas C. 2004. "The Rise of Early Chacoan Great Houses." In *In Search of Chaco: New Approaches to an Archaeological Enigma*, edited by David Grant Noble, 14–21. School of American Research Press, Santa Fe, NM.

Windes, Thomas C. 2014. "The Chacoan Court Kiva." *Kiva* 79(4):337–379.

Windes, Thomas C. 2015. *Dendrochronology and Structural Wood Use at the Santa Ana Mission Church, Pueblo of Santa Ana, New Mexico*. Report to the New Mexico Office of Historic Preservation Division, Santa Fe, New Mexico and the Pueblo

of Santa Ana (Tamaya), Santa Ana, New Mexico. Professional Services Contract # 35-13-51938.28. NMCRIS #131870.
Windes, Thomas C. 2018. *Early Puebloan Occupations in the Chaco Region, Parts 1–2: Excavations and Survey of Basketmaker III and Pueblo I Sites, Chaco Canyon, New Mexico*. Rev. ed. Arizona State Museum Archaeological Series 214. University of Arizona, Tucson.
Windes, Thomas C. 2019. "Report of 2016 and 2017 Field Activities on BLM Lands, Monticello District, SE Utah. BLM Wood Project # MTFO18023 (Utah State Project #U-18-BL-0100)." Unpublished manuscript, BLM Monticello District Office, Bureau of Land Management, Monticello, UT.
Windes, Thomas C., Rachel M. Anderson, Brian K. Johnson, and Cheryl A. Ford. 2000. "Sunrise, Sunset: Sedentism and Mobility in the Chaco East Community." In *Great House Communities across the Chacoan Landscape*, edited by John Kantner and Nancy M. Mahoney, 39–59. Anthropological Papers of the University of Arizona, No. 64. University of Arizona Press, Tucson.
Windes, Thomas C., and Dabney Ford. 1992. "The Nature of the Early Bonito Phase." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 75–85. Maxwell Museum of Anthropology, Anthropological Papers No. 5. University of New Mexico, Albuquerque.
Windes, Thomas C., and Ruth M. Van Dyke. 2012. "Pueblo I Settlement in the Greater Chaco Basin." In *Crucible of Pueblos: Early Pueblo Period in the Northern Southwest*, edited by Richard H. Wilshusen, Gregson Schachner, and James R. Allison, 72–100. Cotsen Institute of Archaeology Monograph 71. University of California, Los Angeles.
Woodbury, Richard B. 1979. "Zuni Prehistory and History to 1850." In *Southwest*, edited by Alfonso Ortiz, 467–473. Handbook of North American Indians, Vol. 9, general editor William C. Sturtevant, Smithsonian Institution, Washington, DC.

4

Linear Cultural Alignments in the Western San Juan Basin

Phillip Tuwaletstiwa and Michael P. Marshall

Watch the video of this chapter, recorded at Crow Canyon Archaeological Center on August 14, 2017.

https://doi.org/10.5876/9781646421701.c004.v000

Hopi geodesist Phillip Tuwaletstiwa shares the results of recent work conducted with Mike Marshall in the western San Juan Basin, on a 290°–292° alignment between Kin Klizhin and Skunk Springs. They carried out their independent research over the last few years with permission from the Navajo Nation. With the help of John Stein and John Roney, Tuwaletstiwa and Marshall revisited several well-known sites along this alignment (Escalon, El Llano, Willow Canyon, Great Bend East, Great Bend West). They identified, mapped, and recorded several new sites (Falcon House, Pablo House, Slab House) and features (a herradura and a stone circle) along the 16 km stretch of the alignment between Falcon House and Great Bend West. A 2.5-km-long Chacoan road segment, including a ramp, is well defined in the area of Escalon and Willow Canyon. The authors speculate—with strong caveats—regarding the possible lunar significance of the 290°–292° alignment.

DOI: 10.5876/9781646421701.c004

Figure 4.1. *Phillip Tuwaletstiwa at Escalon. Photo by Mike Marshall.*

5

Rock Art in the Chaco Landscape

Dennis Gilpin

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 15, 2017.

https://doi.org/10.5876/9781646421701.c005.v000

INTRODUCTION

Chaco Canyon contains the largest concentration of rock art in the San Juan Basin. In contrast to the large amount of rock art in Chaco Canyon, relatively little rock art has been reported at Chacoan outliers and at small house sites on the floor of the San Juan Basin (that is, the Chuska Valley, Chaco Plateau, and South Chaco Slope). Major rock art sites are present along the San Juan River between Shiprock and Bloomfield, in the Dinétah (the ancient Navajo homeland on the plateau drained by Largo and Gobernador Canyons and their tributaries), and on the Dutton Plateau and headwaters of the Rio Puerco of the West. Beyond the San Juan Basin in areas incorporated into the Chaco system of outlying great houses, great kivas, and roads (e.g., the Zuni area, the Little Colorado River and lower Rio Puerco of the West, the Black Mesa Basin, and the lower San Juan River), rock art traditions that preceded the rise of the Chacoan system continued to develop and change during the period of Chacoan construction, circa AD 1025–1130, and later.

Most analyses of rock art in the Chacoan landscape have focused on classifying rock art by style to determine rock art date and cultural affiliation, but a few

DOI: 10.5876/9781646421701.c005

studies have attempted to go beyond just classification and dating to illuminate the meanings of Chacoan rock art, the functions of Chacoan rock art in Chacoan society, and the insights that rock art offers into Chacoan society and culture. Furthering the understanding of Chacoan society and culture through the study of rock art will require expanded and more detailed recording of rock art in the region, development of more comprehensive databases on Chacoan rock art, more analysis of the chronological and geographical distributions of specific motifs and the combinations and associations of these motifs into broader styles, and additional study of the relationships between rock art and social function and meaning.

HISTORY OF RESEARCH

Nearly 150 years of scientific study of rock art in the Four Corners region has generally followed three approaches to research: (1) observation, (2) classification, and (3) analytical studies. Scientific documentation of rock art in the San Juan Basin began in 1875, when William Henry Holmes documented the Pictured Cliffs Site (now known as the Waterflow Site) along the San Juan River west of Farmington (Holmes 1878). Holmes's designation of the site provided the name for the Pictured Cliffs Sandstone geological formation.

In the early 1900s, working in the Kayenta region to the west of the area penetrated by Chacoan architecture, Alfred Kidder and Samuel Guernsey (1919:192–199, figs. 96–102, pl. 89–97) recognized that rock art might be classified, and therefore they recorded it and presented the data. They generalized that the primary motifs in the Kayenta region were mountain sheep and human figures. They recognized that Basketmaker peoples depicted human figures with broad shoulders, and they also recognized Navajo rock art as distinct from ancient rock art in subject matter and technique. They stated that it was "idle to speculate on the purpose or meaning" of the rock art but suggested that clues to understanding rock art might come from "a study of the motives which have led other people in other regions to produce like inscriptions" (Kidder and Guernsey 1919:192–193).

The National Geographic Society investigations in Chaco Canyon from 1921 to 1927, which included the excavations of Pueblo Bonito and Pueblo del Arroyo, paid scant attention to rock art. In 1924, Frans Blom (with the National Geographic Society crew) "made some field sketches and notes on various petroglyph panels between Chetro Ketl and Kin Kletso" (Bane 2008:38). Neil Judd (1954:239) mentions axe-grinding grooves behind Pueblo

Bonito, and (Judd 1964:129, 135) describes painted and incised designs on architectural stone at Bonito.

In contrast, Frank Roberts (1932:149–152, pl. 61–63) discussed the rock art (which he called petroglyphs) at the Village of the Great Kivas in some detail. Roberts (1932:149–150) said that interpretations of rock art ranged from ancient writing to merely doodling, each of which had some measure of truth and fancy. Roberts interviewed Zunis about the rock art at the Village of the Great Kivas, and the Zunis told him that some motifs represented specific concepts, some motifs were pecked to achieve a specific outcome (specifically in war), and one panel was a narrative. "Whether their [the Zuni] meanings are the ones which the prehistoric people had in mind or whether they are entirely removed from the original conception no one can tell. The Zuñi interpretations are more in keeping with the Indian point of view [as opposed to non-Indian interpretations], however, and for that reason are presented as a suggestion of what the drawings may possibly have stood for" (Roberts 1932:150).

In 1934 Chaco Canyon National Park archaeologist Gordon Vivian used Public Works Administration funding to survey rock art on the north side of the lower 5 mi. of Chaco Canyon (Bane 2008:39; Hayes 1981:12). During Clyde Kluckhohn's 1936 University of New Mexico field school, "students drew rock art panels on the south side of the canyon" (Bane 2008:39, citing Mulloy 1941). In 1942 Ted Sowers of the Wyoming Archaeological Survey published a three-page article (Sowers 1942) in *El Palacio*, one page of which is a figure, in what may be the first published attempt to characterize Chacoan rock art.

In 1963 Polly Schaafsma and Christy Turner reported on their inventories of the rock art of the Navajo Reservoir area (Schaafsma 1963) and the rock art of the Glen Canyon area (Turner 1963), respectively, which enabled them to define stages in the content and style of rock art in two regional traditions. The work by Schaafsma and Turner initiated a new interest in the rock art of the Southwest, reinvigorating the classificatory approach pioneered by Kidder and Guernsey nearly fifty years earlier.

In 1972 Schaafsma reported on her reconnaissance of rock art across the state of New Mexico, which allowed her to define regional traditions and changes in style across the state. Schaafsma (1972:fig. 1) examined four sites in the northern Chuska Valley; the Waterflow Site on the San Juan River (Holmes's Pictured Cliffs Site); five sites in Largo, Gobernador, and Blanco Canyons; five sites in Chaco Canyon; and two sites in the Rio Puerco of the West near Gallup (including Cliff Dwellers Canyon). As anticipated by Kidder and Guernsey (1919:192–193), Schaafsma demonstrated that it was possible to define regional traditions and stages of development within regional traditions, which in turn showed that rock art was not merely random doodling but instead was patterned in time and space and therefore could be classified in terms of content and style, providing insights about the function, meaning, and socially constructed manner of representation in rock art. Schaafsma's bibliography contained only a handful of references to previous rock art studies in New Mexico, indicating both the limited effort expended on rock art study up to 1972 and the extent to which her book encouraged the subsequent florescence of rock art study in the Southwest.

In his 1974 MA thesis at Eastern New Mexico University, Howard Smith recorded rock art, 263 panels, along the San Juan River from the Waterflow Site to the Dinétah and tallied the presence or absence of 96 motifs at each of these panels. He then used cluster analysis and factor analysis to try to characterize each panel in terms of a style of rock art. He expected that the panels would factor out into two broad clusters, ancient Puebloan and early Navajo, and then break out into additional clusters, perhaps east versus west, by time period, or by some other variable. Instead, the clusters mixed ancient Puebloan and early Navajo panels and were uninterpretable to Smith. To some degree, Smith's results were probably due to using panels, many with mixtures of Puebloan and Navajo elements, as his units of analysis. In addition, his classification of elements into motifs might have obscured significant variability.

The 1971–1972 survey of Chaco Canyon recorded rock art at 404 of the 2,220 archaeological sites recorded during the survey (Hayes 1981:38). Many of these 404 sites contained exclusively Navajo rock art, but the majority contained Chaco-era rock art. From 1975 to 1981 the New Mexico Archaeological Society Rock Art Recording Field School, under the direction of James Bain, conducted detailed recording of these 404 sites and at almost 100 previously unidentified rock art sites they found during their fieldwork. In 1977 Jay Crotty and Anna Sofaer of the New Mexico Archaeological Society Rock Art Recording Field School discovered the "Sun Dagger" (Crotty 2000:113), a pair of spiral petroglyphs on Fajada Butte that are struck by shafts of sunlight during the equinoxes and solstices (Schaafsma 1992:17). Anna Sofaer et al. (1978, 1979) published articles describing how this remarkable find might have functioned as a calendar, though Michael Zeilik (1985) contends that the Sun Dagger was less a calendar than a sun shrine (Schaafsma 1992:17). Paul Steed (1980) published a preliminary report on the Archaeological Society of New Mexico Rock Art Recording Field School, which was the most comprehensive report on Chaco Canyon rock art at the time. In 1982 Joan Mathien prepared a history of Chaco Canyon rock art studies (Bane 2008:39).

At a twenty-year reunion of the start of the field school, held in Chaco Canyon, return visits to rock art sites in the canyon convinced original members of the field school that even their earlier recording had not been detailed enough; on the return visits to sites they found previously unrecorded rock art and previously unrecorded rock art sites. After the reunion, in 1996, several of the original team members, led by Jane Kolber and Donna Yoder, initiated a new and continuing effort to upgrade the Chaco rock art records. As of July 2017, Kolber was working with a database of 233 ancient rock art sites with 3,051 panels and 18,950 elements. Even as their research has continued, Kolber and Yoder have published a number of articles on aspects of their work. Donna Yoder and Jane Kolber (2002) and Kolber (2003) provided general overviews and preliminary findings of the Reassessment Recording Project. Kolber and Yoder (2002) described the large, complex, and highly visible "Great Panels" of Chaco Canyon. Kolber and Yoder (2008) discussed the ubiquitous spirals in Chaco Canyon rock art.

Several other researchers conducted studies of Chaco Canyon rock art in the years after the comprehensive archaeological survey. Hans Bertsch (1986) reconsidered the grooves behind Bonito; Zuni ethnography suggests fertility (Bane 2008:38). James Farmer (2003) related geometric rock art motifs in Chaco Canyon to iconography of Hopi women's seasonal ceremonies (Bane 2008:39).

People produce rock art for a wide range of purposes, including initiation, pilgrimage, hunting magic, fertility, rainmaking, making prayers and offerings, creating shrines, vision questing and the acquisition of spirit helpers, place making, demarcating travel routes, marking boundaries, commemoration, instruction, denoting identity (by representing ancestors, clans, sodalities, and such), symbolizing power, astronomical observation, and expressing cosmology. Since about 2000, researchers have increasingly analyzed Chacoan rock art to understand the social and political organization and ideology of the Chacoan era.

In 2006 Schaafsma used Chaco Canyon rock art to assess interpretations of complexity and hierarchy in Chacoan society, concluding that Chacoan rock art was typical of Pueblo II (AD 900–1100) rock art and did not support interpretations that Chaco Canyon housed a distinct culture with complex social hierarchy (Schaafsma 2006).

In a 2008 MA thesis at Northern Arizona University, Barbara Bane compiled data on rock art in the vicinity of four great houses in Chaco Canyon (Pueblo Bonito, Chetro Ketl, Casa Chiquita, and Wijiji) and two areas not associated with specific great houses in the canyon (the Petroglyph Trail between Casa Chiquita and Escavada Wash and a small site on Chaco Wash between the Chaco Canyon visitor center and Wijiji). Bane classified each element at these sites in terms of broad categories (human figure, animal figure, reptile, vegetative, geometric, abstract, and other) and technique, and she ranked each panel by complexity. Spatial patterning, similarities in rock art, and the messages encoded in rock art indicated ritual integration between Pueblo Bonito and Chetro Ketl and shared community messages between Wijiji and the small houses in its vicinity, but not with other great houses, while rock art was not especially significant at Casa Chiquita. The Petroglyph Trail was a processional way, with great diversity in messages that were highly visible.

During the years after the completion of the original comprehensive archaeological survey of Chaco Canyon, researchers documented Chaco-era rock art in the San Juan Basin outside of Chaco Canyon. Prior to the improvement of US Highway 550, the Museum of New Mexico documented the Waterflow Site (Fallon 1979) and conducted excavations within the highway right-of-way (Farwell and Wening 1985). In 1981 D. J. Joyce of the Field Museum recorded rock art in the vicinity of Red Rock State Park east of Gallup (Joyce 1981, as cited by Nabahe 1993). Joyce's field notes are on file at the Laboratory of Anthropology in Santa Fe (Joyce 1981). Most of the effort in recording rock art in the San Juan Basin after the 1970s, however, was conducted in conjunction with archaeological surveys performed to comply with Section 106 of the National Historic Preservation Act, which requires that federal agencies consider the effects of their actions on historic properties. Recording of rock art in the course of Section 106 compliance varied greatly in quality, with some archaeologists merely recording the presence of rock art; some tallying the numbers of different types of elements and almost none recording rock art at the level of detail of Kolber, Yoder, and their colleagues.

ORIGINS OF CHACO ROCK ART

Rock art researchers have documented relatively continuous production of rock art in the Four Corners region from Archaic times (circa 5,000–1,000 BC) to the present. Production of rock art in the San Juan Basin is documented from Basketmaker II times (ca. 1,000 BC–AD 500) to the present. Changes in rock art during these long histories reflect changing social organization (especially gender relations), political organization (especially leadership), and ideology (cosmology).

During the Archaic period, from about 5,500 to 2,000 BC, peoples of the Four Corners region practiced a hunting-and-gathering subsistence pattern and were probably organized as patrilineal bands in which part-time ritual specialists received ritual knowledge, supernatural power, and spirit helpers through apprenticeship, vision quests, or both. Vision quests sought to induce trances in which the novitiate experienced entoptic (within the eyeball) phenomena such as auras, which might be depicted in rock art as abstract designs or watery imagery, including lines of dots, wavy lines, zigzags, herringbone, diamond chains, and rakes. Anthropomorphic figures have rakelike bodies and two-pronged headdresses and may represent shamans. Other figures may represent spirit helpers. From Archaic times through the Basketmaker III period, the centers of rock art production were southeastern Utah, the Little Colorado River, and the Defiance Plateau. Archaic rock art in the Four Corners region is perhaps best represented in the Palavayu region (Petrified Forest and the confluence of the Rio Puerco of the West and the Little Colorado River) as described by Patricia McCreery and Ekkehart Malotki (1994; see also Schaafsma and Young 2007).

People began to grow maize on the Colorado Plateau about 2,000 BC, initiating the Early Agricultural or Basketmaker II period (2,000 BC to AD 500). People probably continued to live in patrilineal bands ministered by part-time ritual specialists. Rock art seems to have "emphasized life-cycle rituals such as initiation rites" (Wilshusen et al. 2012:209, following Robins and Hays-Gilpin 2000). Michael Robins and Kelley Hays-Gilpin (2000:table 12.1) summarize Basketmaker II rock art (2000 BC–AD 200) and Basketmaker II–III rock art (AD 200–500) as being focused on the adorned human figure. The most striking images in the rock art of Basketmaker II times are broad-shouldered human figures with small heads, necklaces, sashes, and bags and carrying atlatls and spears. Other human figures of the Basketmaker II period have large, drooping hands and feet (Robins and Hays-Gilpin 2000; Schaafsma 1972:fig. 18, 1992:fig. 19). According to Grant (1978:168–170), the handprint is the second-most-common motif (after the human figure) in Basketmaker II rock art in Canyon de Chelly. McCreery and Malotki (1994:fig. 2.2a) also depict examples of quadrupeds with outlined rectangular or oval bodies sometimes partly filled in with crosshatching and often with antlers and curving horns, which they see as similar to the Basketmaker II Glen Canyon Linear Style. Other elements of Basketmaker II rock art include brushes, rakes, centipedes, wavy lines, rayed circles, rows of dots, spiral, and concentric circles. Solidly pecked quadrupeds with oval or crescent-shaped bodies are similar to the Basketmaker II San Juan Anthropomorphic Style (McCreery and Malotki 1994:fig. 2.2b). McCreery and Malotki (1994:fig. 2.3) depict examples of quadrupeds, birds,

Figure 5.1. *Large Basketmaker II human figure near Pueblo Bonito. Courtesy Kelley Hays-Gilpin.*

and birdlike figures in the Palavayu Linear (similar to Glen Canyon Linear) and Majestic Basketmaker (similar to San Juan Anthropomorphic) styles, along with wavy lines, rakes, spirals, concentric circles, and rows of dots. Tabbed circles (or lobed circles) appear in Basketmaker II times (Robins and Hays-Gilpin 2000:237–238).

Basketmaker II rock art is widely distributed from Canyonlands to the Little Colorado River and from Glen Canyon to Navajo Reservoir. Schaafsma and Young (2007) see an expanse of Basketmaker III–II rock art running from Palavayu to the lower San Juan, but the core area is along the lower San Juan extending south as far as Canyon de Chelly and east into the Prayer Rock District of northeastern Arizona. Within the San Juan Basin, the centers of rock art production were the San Juan River and the Prayer Rock District. Basketmaker II rock art is not common in Chaco Canyon (figures 5.1 and 5.2) but is present on the San Juan Mine, north of the San Juan River west of Farmington (Seyfarth 1983, as cited by Schaafsma 1992:9), and in Stewart Canyon, south of the San Juan River south of Farmington, where

Figure 5.2. *Small Basketmaker II human figure near Pueblo Bonito. Courtesy Kelley Hays-Gilpin.*

Basketmaker II petroglyphs and pictographs are present (figure 5.3; Schaafsma 1980:fig. 80). An example of a Basketmaker II human figure with large, drooping hands and feet is present in Cliff Dwellers Canyon northeast of Gallup (Schaafsma 1972:fig. 18; Schaafsma 1992:fig. 19).

The Basketmaker III period (AD 500–700) marks the time when most farming peoples in the Four Corners region lived in semipermanent pit houses and produced plain pottery. Hays-Gilpin (1996) reasoned that Basketmaker III rock art in the Prayer Rock District of northeastern Arizona (and in the northwestern edge of the San Juan Basin) was gendered masculine. The geometric designs on basketry, textiles, sandals, aprons with menstrual blood stains, and pottery contrasted with the more representational and naturalistic rock art imagery. Basketmaker III peoples may have developed matrilocal postmarital residence patterns to allow matrilineages to retain control of farm fields, which would have dislocated men from their natal families (Hays-Gilpin 1996; see also Ware 2014). Men responded by developing communal rituals held in great kivas. The Basketmaker III settlement at Broken Flute Cave in

Figure 5.3. *Basketmaker II human figures in Stewart Canyon. Photograph by Dennis Gilpin.*

the Prayer Rock District of northeastern Arizona (and the northwestern edge of the San Juan Basin) was divided into a western, feminine-gendered residential area with pit houses, storage facilities, and no rock art, and an eastern, masculine-gendered ritual area with the great kiva and rock art (Hays-Gilpin 1996). Robins and Hays-Gilpin (2000:table 12.1) summarize Basketmaker III rock art (AD 500–700) as more variable than Basketmaker II rock art, depicting human figures, tools, ritual items, birds, mammals, and narratives. Other Basketmaker III rock art motifs include flute players (but not with humped backs), handprints, footprints, animal tracks, wavy lines, zigzags, rows of dots, and tabbed circles. Procession panels depicting processions of human figures converging on circular features, perhaps great kivas, are present on Butler Wash and Comb Ridge in southeastern Utah, and at Broken Flute Cave in the Prayer Rock District of northeastern Arizona (Robins and Hays-Gilpin 2000:241–243, figs. 12.7 and 12.8), and seem to document a Basketmaker III shift to communal rituals (Robins and Hays-Gilpin 2000:247; Wilshusen and Perry 2012; Wilshusen et al. 2012; L. Young and Gilpin 2012). Basketmaker III

Figure 5.4. *Basketmaker III human figures near Pueblo Bonito. Courtesy Kelley Hays-Gilpin.*

rock art is common in southeastern Utah, the Prayer Rock District of northeastern Arizona, and the Defiance Plateau, but despite the presence of large Basketmaker III sites in Chaco Canyon (Shabik'eschee and 29SJ423, each with a great kiva), Basketmaker III rock art in Chaco Canyon is limited. One Basketmaker III petroglyph panel near Pueblo Bonito depicts an adult carrying a burden basket and a child with a seed beater (figure 5.4) as well as other Basketmaker III figures.

The most distinctive manifestation of Pueblo I rock art (AD 700–900) is the Rosa style of the upper San Juan River basin. The defining element of the Rosa style is the triangular-bodied human figure (figure 5.5), often portrayed in rows of figures, usually not gendered, holding hands. Several Pueblo I White Mound Black-on-white vessels depict alternating, hand-holding, feminine figures with butterfly hair whorls and masculine figures with a feather or horn as a sort of round dance as opposed to the procession panels of the Basketmaker III period (Cordell 1997:249, fig. 8.10; Cordell and

Figure 5.5. *Rosa-style human figures in Stewart Canyon. Photograph by Dennis Gilpin.*

McBrinn 2012:182–183, fig. 6.27; L. Young and Gilpin 2012:164–166, fig. 11.6). The White Mound Black-on-white vessels with hand-holding figures constitute one of the few examples in which rock art imagery also appears on pottery. Schaafsma (1992:9) dates the Rosa Style to AD 400–950. Other than the rows of triangular-bodied hand-holders, Pueblo I rock art is not well defined and is assumed to be transitional between Basketmaker III rock art and Pueblo II rock art. Grant (1978:171–193) discusses the rock art of the Modified Basketmaker–Developmental Pueblo period (AD 450–1100) as a single time period. Common motifs are birds (especially turkeys and commonly ducks), handprints, stick figures, flute players (but not yet humpbacked), hair whorls, headdresses, zigzags, concentric circles, spirals, bird tracks, and bear tracks. Bighorn sheep are not extensively depicted in Canyon de Chelly rock art (Grant 1978:191–193). Pueblo I depictions of bighorn sheep show them with open mouths and clawlike hooves, as also depicted on a Kana'a Black-on-white jar found by Earl Morris at Mummy Cave (Grant 1978:182–183, fig. 4.32). A narrative panel in Canyon de Chelly appears to show a bighorn sheep drive (Grant 1978:fig. 4.33).

Prior to the construction of great houses in Chaco Canyon beginning about AD 850, residents of the canyon produced only limited amounts of rock art. Atlatl Cave contains some Basketmaker II rock art (Schaafsma 1992:8–9). Another Basketmaker II pictograph near Pueblo Bonito consists of a large, painted, broad-shouldered human figure and a smaller, painted, broad-shouldered human figure, on the same panel with Basketmaker III petroglyphs. Once residents of the canyon began to construct great houses, Chaco Canyon became the center of rock art production in the San Juan Basin with more rock art than anywhere else in the basin.

Schaafsma (2006) contends that Pueblo II rock art has broad distribution and expresses common, widely accessible iconography, while lacking both regional differentiation and exclusive, veiled meanings. Because of the unspecialized nature of Chacoan rock art, Schaafsma questions whether Chacoan society could have been as complex and stratified as many have proposed.

In terms of expertise and subject matter, much of the rock art in Chaco Canyon could have been made by virtually any member of Chacoan society. Some differentiation in gender, quantity, complexity, and function is recognizable, however. The gendered patterns identified by Kelley Ann Hays-Gilpin (1996) for the Basketmaker III period persisted into the Pueblo II period, with geometric basketry, textile, and pottery designs rarely appearing in rock art, which instead more commonly depicted life-forms. Although Chaco Canyon has some powerful glyphs and panels, the concentration of glyphs makes the canyon unique in the San Juan Basin. Much of the rock art in Chaco Canyon is repetition of simple glyphs, with spirals the most common, but also abundant stick figures of humans and animals. Just the sheer quantity of rock art in Chaco Canyon is a testament to Chaco's importance and conveys crowds, processions, power, wealth, and the participation of masses in Chacoan ideology.

Chaco Canyon rock art depicts a wide range of subjects, including nonrepresentational elements (figure 5.6), geometric elements (figure 5.7), life-forms (figure 5.8), and even astronomical phenomena (figure 5.9). Moreover, these subjects are represented by means of a wide range of techniques, including pecking, scratching (figure 5.10), incising, abrading (figure 5.11), drilling (figure 5.12), bas relief (figure 5.13), and painting (figure 5.14), and many elements incorporate combinations of techniques (figure 5.15). Life-forms may be represented naturalistically (figure 5.16) or more abstractly, with formal, rectilinear representations (figure 5.17). Although some elements and panels are secreted in private settings, most are highly visible behind great houses or along trails leading to great houses.

Figure 5.6. *Connected spirals in Stewart Canyon. Photograph by Dennis Gilpin.*

Figure 5.7. *Textile in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.8. *Jerusalem Cricket petroglyph in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.9. *The "Supernova" pictograph in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.10. *Scratched design in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Human figures are depicted in a variety of ways, as simple stick figures or with oval (or bulbous) or rectangular bodies, with arms and legs often upraised or downturned at right angles (figure 5.18), with hands and feet not usually emphasized, sometimes with headdresses, but usually without implements. Flute players (figure 5.19) became popular after the Basketmaker III period, and humpbacked flute players were present by the Pueblo II period. Florence Hawley (1937) reported a flute player on a Pueblo I sherd from Chaco Canyon, and flute players are a common element in Pueblo II–III rock art at Chaco Canyon, Canyon de Chelly and the Four Corners area, and Glen Canyon but

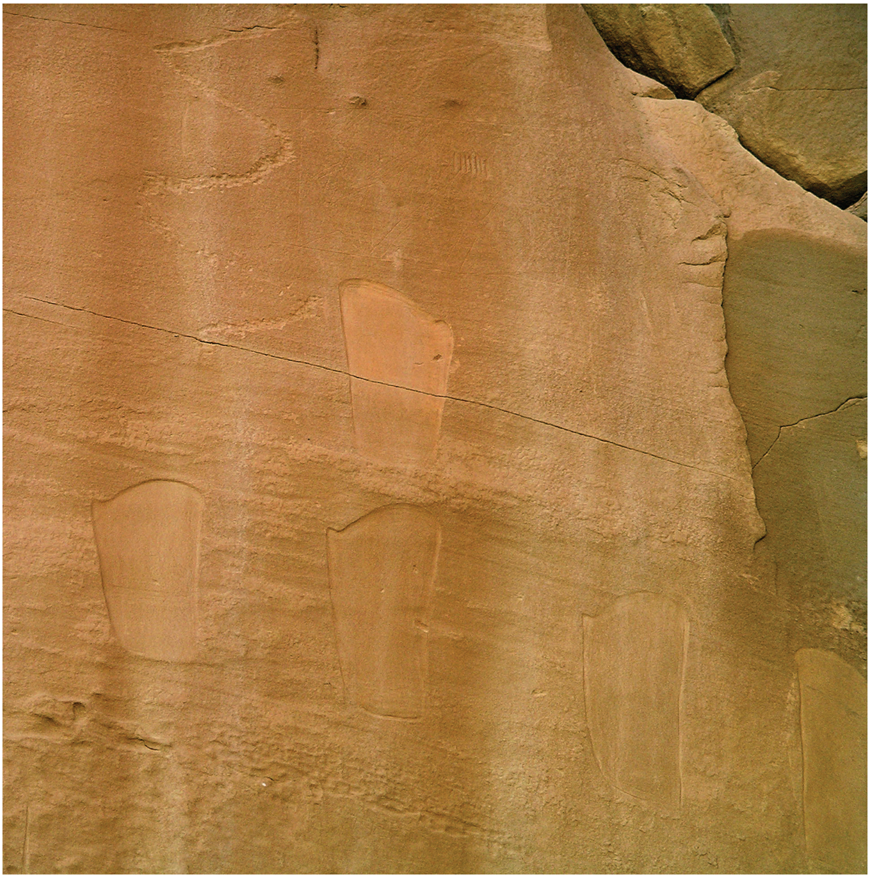


Figure 5.11. *Abraded design in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

are not at all common on the Little Colorado River and the Rio Puerco of the West (McCreery and Malotki 1994:155–158).

Like human figures, animal figures may be depicted in a variety of ways in Pueblo II rock art, as stick figures or with oval (or bulbous) bodies, crescent-shaped bodies, or rectangular bodies. Curving horns designate mountain sheep, which are not as common at Chaco Canyon or Canyon de Chelly as they are on the lower San Juan River and the Little Colorado River. The branching antlers of deer and elk are not common in Chaco rock art. Short, backward-curving horns are ambiguous, perhaps representing mountain sheep or pronghorn antelope (figure 5.20). Animal tracks—especially tracks of deer, elk, and antelope—are often depicted. Images of bears are not common at Chaco

Figure 5.12. *Drilled design in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.13. *Bas relief design in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.14. *Pictograph in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

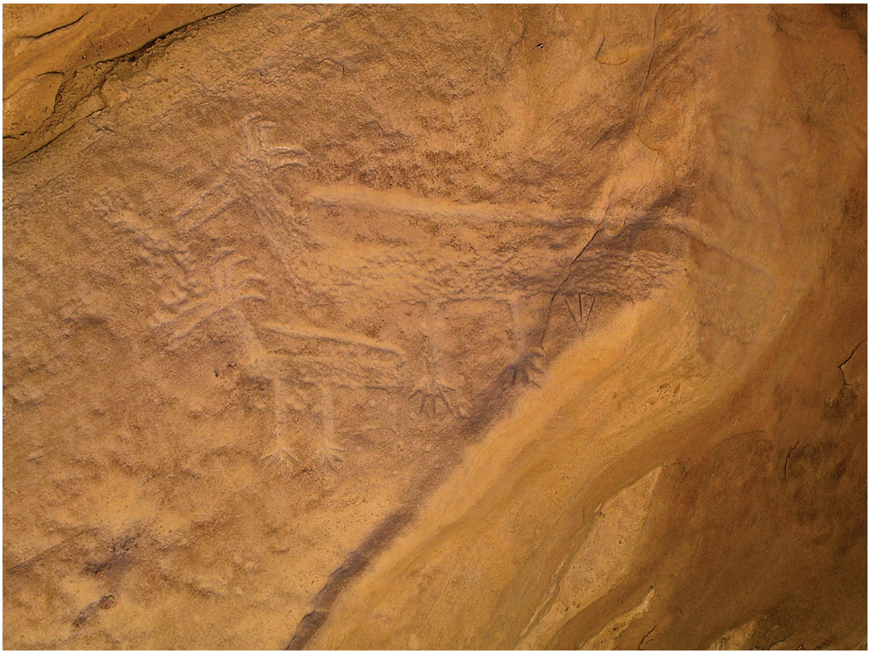


Figure 5.15. *Pronghorn antelope depicted with combined techniques (pecked, incised) in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.16. *Naturalistic treatment of animals in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.17. *Rectilinear lizard man in Chaco Canyon. Photograph by Dennis Gilpin.*

Figure 5.18. *Pueblo II human figure in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.19. *Flute player and quadruped in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.20. *Quadruped in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.21. *Oversized human figure in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Figure 5.22. *Great panel in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

Canyon, but bear paws are present. Canines are depicted in the Pueblo II rock art of Chaco Canyon rock, as are mountain lions and mountain lion tracks. Ducks, wading birds, and turkeys are common in Pueblo II rock art west of the Chuska Mountains but not so much at Chaco. Reptiles—especially snakes, lizard men, and horned lizards—are commonly represented in Pueblo II rock art. Insects and arthropods are not commonly depicted in Pueblo II rock art, except for centipedes, which were depicted as early as the Archaic period. Flute players may actually represent robber flies, locusts, or both (McCreery and Malotki 1994:155–158).

A few elements and panels exhibit monumentality, both as large elements (figure 5.21) and as what Kolber and Yoder (2002) call "Great Panels," highly visible, complex panels of large elements positioned high on the canyon walls (figure 5.22). Some elements and panels are dynamic, with visibility changing with changing conditions of light and shadow. Some panels are very complex, usually resulting from repeated additions to the initial image or images. Although there are some examples of superpositioning in Chaco rock art (suggesting that later artists felt that the older rock art was no longer powerful or meaningful), superpositioning is rare (suggesting that later artists thought the older rock art retained its power and meaning).

Figure 5.23. *Spiral in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

One of Bane's conclusions was that rock art in Chaco had multiple functions and meanings, including procession along the trail between Peñasco Blanco and downtown Chaco, connecting Bonito and Chetro-Ketl, connecting Wijiji with the small houses in its community, and limited significance around Casa Chiquita. Other studies have explored various functions of rock art at Chaco.

The spiral is the most common element in Chaco Canyon rock art (figure 5.23); if a panel has only one element, it will probably be a spiral, and if a panel has more than one element, at least one of the elements will probably be a spiral. Wavy lines and zigzags are frequently appended to spirals. Spirals, wavy lines, and zigzags may represent emergence, movement, migration, the search for the central place, journeys, life's journey, and the passage of time (Schaafsma 2006:156–157). The Sun Dagger chronicles the journey of the sun across the two spiral petroglyphs at the site. Footprints may also signify journeys of various types.

Many panels have repeated elements (figure 5.24), such as are found in other areas of the Southwest where pilgrims mark each time they make a pilgrimage by producing another example of their personal or clan symbol. At Tutuveni (Willow Springs) on the Hopi Salt Trail, people traveling from Hopi to the salt source in the Grand Canyon would carve their clan symbol each time they

Figure 5.24. *Repeated flute players in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

made the salt pilgrimage (Bernardini 2005, 2007; Michaelis 1981). Repetition of elements, often apparently by the same person, occurs in Chaco Canyon rock art. Rows of quadrupeds are common. Flute players are repeated in some places (Fluteplayer Rock, for example). Carnivores are repeated at one site. Unlike Tutuveni, clan symbols have not been identified in Chaco Canyon rock art, according to Schaafsma (2006:150–151). Much of the rock art in Chaco Canyon (especially footprints and handprints) seems to be markers that an individual makes as an individual, not as a representative of a larger group, and human and animal stick-figures seem to be too generic to be totems.

Some Chacoan rock art could represent the spirit world and spirit helpers, but Chacoan rock art rarely depicts recognizable deities, which might indicate an animistic religion much like that of the Archaic period. Chacoan rock art appears to lack trance entoptics, however. Although wavy lines and zigzags are common, they are not arrayed as large numbers of parallel wavy lines and zigzags like Archaic rock art, but instead are a single element, and since they are often appended to spirals, they may represent journeys. One recognizable deity is the flute player.

Although some Chacoan rock art could be interpreted as prayer offerings to bring about fertility by populating the canyon with spirals, human figures, quadrupeds, bear tracks, artiodactyl tracks, footprints, handprints, and other imagery of abundance, Chacoan rock art does not seem to reference the "flower world," a mythical, fertile world of abundant water, flowers, butterflies, dragonflies, and birds, which originated in Mesoamerican ideology and which appears in pottery and kiva murals in the Southwest about AD 1375 (Hays-Gilpin and Hill 2000; Hays-Gilpin and Sekaquaptewa 2006).

Pueblo II rock art almost never depicts quotidian activities such as planting, harvesting, corn grinding, or cooking, though it sometimes depicts hunting. It rarely depicts ceremonies, battles, or other specific events. In contrast, the Basketmaker III–Pueblo I procession panels show processions of people converging on great kivas, and Pueblo I hand-holding figures on rock art and pottery may depict dances, and eighteenth- and nineteenth-century Navajo rock art depicts both ceremonial gatherings (Brugge 1981:figs. 59 and 60) and battles (Brugge 1981:fig. 61; Gilpin 2001; Grant 1978).

Chacoan rock art rarely depicts artifacts (exceptions being sandals or sandal tablets) and even more rarely depicts artifacts isolated from the person wearing or holding them (as in the depiction of people wearing necklaces, earbobs, and headdresses and carrying bows and arrows).

ROCK ART IN THE SAN JUAN BASIN

In contrast to the high concentration of rock art in Chaco Canyon, Chacoan outliers in the San Juan Basin and other parts of the Chacoan landscape have limited amounts of rock art. Out of more than fifty Chacoan outliers on the floor of the San Juan Basin (the Chuska Valley, the Chaco Plateau, and the South Chaco Slope), only about six are reported to have rock art (table 5.1), and most of these sites have only a few pecked elements. In addition, at several of these great houses, the rock art is several hundred meters away from the great house. Perhaps the largest outlier-associated rock art site on the floor of the San Juan Basin is at Peach Springs, with twelve panels and ninety elements dating to the Chacoan occupation (Gilpin 2004).

Most Chacoan outliers beyond the San Juan Basin floor (i.e., beyond the Chaco Plateau, the Chuska Valley, and the South Chaco Slope) are not associated with rock art. Out of approximately forty-five great houses I have visited beyond the central San Juan Basin, I know of only about ten with associated rock art. Rock art at these outliers ranges from only a few elements to several hundred elements at Kiva Point.

Table 5.1. Great houses associated with rock art.

Site	*Location*	*Reference*
Kin Bineola	Basin floor	
Crumbled House	Basin floor	
Peach Springs	Basin floor	Gilpin (2004)
Standing Rock	Basin floor	Nials et al. (1987)
Bee Burrow	Basin floor	
Tohlakai	Basin floor	Nelson (1989)
Chimney Rock	Beyond basin floor	
Kiva Point	Beyond basin floor	
Morris 40	Beyond basin floor	
Sterling	Beyond basin floor	Smith (1974)
Point Site	Beyond basin floor	Smith (1974)
Guadalupe	Beyond basin floor	
Fenced-Up Horse Canyon	Beyond basin floor	Hopkins and Ferguson (2014)
Village of the Great Kivas	Beyond basin floor	Roberts (1932)
Kin Hocho'i	Beyond basin floor	Fowler et al. (1987)
MacStod	Beyond basin floor	Forton (2015)
Hunters Point	Beyond basin floor	Gilpin (1992)
White House	Beyond basin floor	
Burnt Corn	Beyond basin floor	Miksa (1987)

Outside of Chaco Canyon, probably the next largest concentration of rock art in the San Juan Basin is the Waterflow Site (figures 5.25 and 5.26) on the north side of US Highway 550 between Farmington and the Hogback, with 421 panels and 3,275 elements (table 5.2). At the next level down are sites like LA 67369/NM-Q-29-62, on the east side of the Gallup Hogback; Cliff Dwellers Canyon, also on the east side of the Gallup Hogback; Stewart Canyon, just south of the San Juan River across from Farmington; and the Peach Springs outlier, which have from two to thirteen panels and 90–200 elements. Finally, a search of the literature and personal familiarity with the San Juan Basin disclosed a remarkably small number of sites (approximately a dozen) that contain from one to five panels and up to fifteen elements.

The function and meaning of Chaco-era rock art outside of Chaco Canyon have not received much attention, but it should not be assumed

Table 5.2. Frequencies of rock art panels and elements at selected San Juan Basin sites.

Site	*Panels*	*Elements*
Chaco (Kolber-Yoder Database)	3,051 (233 sites)	18,970
Waterflow	421	3,275
LA 67369/NM-Q-29-62	2	150–200
Cliff Dwellers Canyon	13	127
Stewart Canyon	10	110
Peach Springs	12	90
Newby	4	16
Springstead	3	15
Sterling	1	15
Twin Lakes	1	14
Red Willow	4	10
Needle Rock	1	10
Corn-burned Hill	1	10
LA 5832	1	Several
Shash Hááyahi (Sanostee)	1	2–3
Two Cranes	1	2
Yellow Man Siphon	1	Unknown

that its function and meaning were the same as in Chaco Canyon. Richard Wilshusen et al. (2012:212–215) analyzed the Waterflow site, and particularly the procession panel as depicted by William Henry Holmes (1878), which shows three parallel lines of quadrupeds intermixed with a few human figures moving from left to right to a quartered square with flaglike elements in each quarter and guarded by two mountain lions. Wilshusen et al. interpret two figures with torso, head, and arms, but bow wings and arrow tails as similar to hunt chiefs, bow priests, or war leaders of the modern pueblos. Whereas the human figures in Basketmaker III–Pueblo I procession panels are individual people, the quadrupeds in the Waterflow procession panel (which date to the tenth century) may be a totem of a larger social group. Square elements appear elsewhere at the Waterflow site (figure 5.27) and other sites, where they often form the heads of human figures. Wilshusen et al. propose that the squares represent the village and that the square-headed human figures represent community leaders concerned about village defense.

Figure 5.25. *Waterflow Site. Courtesy Rupestrian CyberServices.*

Figure 5.26. *Waterflow Site rock art. Courtesy Rupestrian CyberServices.*

Figure 5.27. *Square elements at the Waterflow Site. Courtesy Rupestrian CyberServices.*

CHACO ROCK ART BEYOND THE SAN JUAN BASIN

Surrounding the San Juan Basin with its Chacoan rock art are several regions relatively rich in rock art (table 5.3). Schaafsma (2006) sees Pueblo II rock art as basically similar across a broad area, but various authors have defined regional styles, based primarily on variable distributions of distinctive motifs. For example, flute players are not common in Little Colorado River–Rio Puerco of the West. Mountain lions and other quadrupeds with tails extending off the back of the animal (figure 5.28) may be more common in Little Colorado River–Rio Puerco of the West than elsewhere. Bighorn sheep are more common along the lower San Juan River than at Canyon de Chelly and Chaco. Schaafsma (1980:143–153) says that Kayenta is a well-studied regional style in which bighorn sheep are common (Schaafsma 1980:148). Researchers need to more systematically define regional styles by mapping distributions of motifs and assessing whether there are correlations and clustering of some motifs. Researchers also need to examine the nature of boundaries, which Schaafsma (2006) suggests are porous. Social network analysis (Mills et al. 2013) has developed ways of representing distributions and social connections that might be useful in illuminating regional interactions. Chacoan outliers are present in most of these regions, and researchers should be examining how

Table 5.3. Regional rock art traditions.

Region	*Periods*	*References*
Little Colorado River	Archaic–Pueblo V	McCreery and Malotki (1994)
Zuni-Acoma	Basketmaker–Pueblo V	J. Young (1988)
Defiance Plateau	Basketmaker–Pueblo III	Grant (1978)
Lower San Juan	Basketmaker–Pueblo III	Cole (1990, 2009)
Middle San Juan	Basketmaker–Pueblo III	Smith (1974)
Largo-Gallina	Pueblo I	Smith (1974), B. Young and Copeland (2018)
Mesa Verde	Basketmaker–Pueblo III	Hurst and Till (2006)
Dutton Plateau	Basketmaker–Pueblo III	Schaafsma (1972)

participation in Chaco might have affected rock art in these regions. Are there motifs that can be identified as Chacoan?

The upper San Juan River basin, including Navajo Reservoir and Largo and Gobernador Canyons and their tributaries, is mostly known for Navajo rock art (Young and Copeland 2018). Prehistoric rock art of this region is dominated by Rosa phase rock art, exemplified by rows of hand-holding human figures with triangular bodies, which was produced over a short time period, primarily during the Pueblo I period. The upper San Juan River basin is notable in that it contains no Chacoan outliers, so a comparison of Pueblo II rock art in the upper San Juan River basin and in the Chacoan interaction sphere would likely provide insights about the aspects of Chacoan rock art that were most significant.

THREATS AND MANAGEMENT

Among the threats to rock art are erosion, vandalism, and construction. The soft sandstones that predominate in the Chaco world are easily eroded, and wind erosion and spalling have effaced many elements, prompting a sense of urgency to detailed recording of existing rock art. The remoteness of many rock art panels has limited vandalism to rock art, but accessible sites such as Waterflow and well-known sites such as those in the Dinétah have suffered (Young and Copeland 2018). Destruction of rock art by construction is perhaps also best documented at Waterflow, where improvement of US Highway 64 resulted in both relocation and destruction of some panels after careful recording (Farwell and Wening 1985). A few rock art sites have been recorded

Figure 5.28. *Mountain lion in Chaco Canyon. Courtesy Kelley Hays-Gilpin.*

during archaeological surveys for coal mines (Seyfarth 1983; Whitten 1982) and presumably have been destroyed by subsequent mining.

Future studies of Chacoan rock art can further address the major issues in Chacoan research, such as the organization of Chacoan society, the nature of complexity in Chacoan society, the sources and uses of social power, the centrality and importance of Chaco Canyon in the Chacoan world, and the cosmology of Chacoan peoples. The investigation of these topics will require additional field survey and recording of rock art, the development of rock art databases, and increased analysis, facilitated by new recording and analysis techniques, such as photogrammetry, geographical information systems, and social network analysis.

Data on rock art in the Chacoan landscape are currently limited and difficult of access. There is no synthesis comparable to Campbell Grant (1978) for Canyon de Chelly, Sally Cole (1990, 2009) for southeastern Utah, Schaafsma (1963) for the Navajo Reservoir District, Jane Young (1988; Schaafsma and Young 2007) for Zuni, and McCreery and Malotki (1994) for the Rio Puerco of the West. Jane Kolber, Donna Yoder, and their colleagues are working on a synthesis of the rock art at Chaco Canyon. The Museum of New Mexico recorded the Waterflow Site prior to the improvement of Highway 550 and the forms are at the Museum of New Mexico, but the survey and data recovery reports on the site are brief, and analysis is limited. Smith's 1974 MA thesis at Eastern New Mexico University on the rock art along the San Juan River from the Waterflow Site to Dinétah has a wealth of information but has limited accessibility. Information on other sites is in site forms, but the level of detail in recording is highly variable. Detailed recording of rock art, such as that being conducted at Chaco Canyon by Kolber, Yoder, and their colleagues, is extremely time consuming and has rarely been accomplished in the San Juan Basin. More common is to present a tally of the number of various types of motifs (anthropomorphic figure, zoomorphic figure, geometric, etc.) and to suggest the cultural affiliation and approximate date (ancient Puebloan, early Navajo, recent Navajo, Euro-American). In some cases only the presence of rock art is mentioned.

Documentation over time can sometimes be critical. For example, Wilshusen et al. (2012) used Holmes's (1878) drawing of the procession panel for their analysis. Comparison of Holmes's drawing with more recent photographs shows that Holmes's drawing is generally accurate, though two of the triangular-bodied Rosa phase human figures are substantially larger than shown in the Holmes drawing. On the other hand, more recent photographs show that the quartered square and two mountain lions so important to Wilshusen et al.'s analysis have been ritually obliterated.

Students of rock art can contribute to the understanding of both Chacoan culture and society and the role of rock art in creating Chacoan culture and society through continued classification and analysis. Detailed analyses of superpositioning and associations among motifs will better date rock art motifs and contribute to the understanding of the origins and sources of rock art motifs and the changing function and meaning of rock art in the Chacoan world and its antecedents. Researchers have also successfully studied meanings of rock art by tracing icons (e.g., flute players, hair whorls, mother of game animals, outlined crosses, tabbed circles and squares, dots in squares) back in time and by systematically documenting the most common associations of rock art motifs. Analyses of the major themes and subject matter of rock art will show how these relate to Chacoan social and political organization and cosmology, examining social and political organization through additional studies of how rock art reveals gender relations, leadership, social power, and ranking, and exploring cosmology through investigations about how rock art symbolizes the spirit world, migration, and central place.

Research into the social contexts of the production of rock art will elucidate the multivalent functions of rock art production, such as pilgrimage and initiation, symbolizing power, and forming social identities by demonstrating participation in shared iconography. Investigations will also require more detailed comparisons of Chaco Canyon rock art with rock art at outlying great houses and rock art not associated with great houses, as well as comparison of Chaco Canyon rock art with rock art in other regions, enhanced through new techniques of geographical information systems and social network analysis.

CONCLUSIONS

In summary and conclusion, rock art was presumably important in Chaco Canyon, because the people of Chaco Canyon produced so much of it, vastly more than at contemporaneous sites in the region. Rock art was apparently not so important in the functioning of great houses at Chacoan outliers, since the overwhelming majority of outlying great houses lack rock art. Rock art is also rare across the floor of the San Juan Basin, with only a few known sites, each consisting of only a few elements. Around the edges of the San Juan Basin and beyond, rock art resumes its importance, with notably long traditions and elaborate assemblages along the San Juan River, the Rio Puerco of the West, and the Defiance Plateau and Prayer Rock District. Advancing our understanding of the role of rock art in Chacoan culture and the significance of rock art in the Chacoan landscape will require identification and more detailed recording of Chacoan rock art, the development of a database on Chacoan rock art, and more sophisticated analysis.

ACKNOWLEDGMENTS

I would like to thank Carrie Heitman and Ruth Van Dyke for inviting me to participate in the conference and the volume. Jane Kolber and Donna Yoder have shared their knowledge of Chaco Canyon rock art with me over many years. Linda Wheelbarger showed me sites along the San Juan River. Evelyn Billo and Bob Mark of Rupestrian Cyberservices provided essential information on the Waterflow Site, and Kellam Throgmorton directed me to additional discussion and interpretation of the site. Kelley Hays-Gilpin and Jim Copeland offered useful comments on the chapter. Shortcomings of the chapter are my own (un)doing.

REFERENCES CITED

Bane, Barbara. 2008. "Prehistoric Rock Art Associated with Chaco Canyon Great Houses." MA thesis, Department of Anthropology, Northern Arizona University, Flagstaff.

Bernardini, Wesley. 2005. *Hopi Oral Tradition and the Archaeology of Identity*. University of Arizona Press, Tucson.

Bernardini, Wesley. 2007. *Hopi History in Stone: The Tutuveni Petroglyph Site*. Archaeological Series No. 200. Arizona State Museum, University of Arizona, Tucson.

Bertsch, Hans. 1986. "Hollows and Incised Grooves in Chaco Canyon Rock Art." In *Rock Art Papers* Vol. 3, edited by Ken Hedges, 201–206. San Diego Museum of Man, San Diego.

Brugge, David M. 1981. "The Historical Archeology of Chaco Canyon." In *Archeological Surveys of Chaco Canyon*, by Alden C. Hayes, David M. Brugge, and W. James Judge, 69–101. Publications in Archeology 18A. Chaco Canyon Studies. National Park Service, US Department of the Interior, Washington, DC.

Cole, Sally J. 1990. *Legacy on Stone: Rock Art of the Colorado Plateau and Four Corners Region*. Johnson Books, Boulder, CO.

Cole, Sally J. 2009. *Legacy on Stone: Rock Art of the Colorado Plateau and Four Corners Region*. Rev. and expanded ed. Johnson Books, Boulder, CO.

Cordell, Linda. 1997. *Archaeology of the Southwest*. 2nd ed. Academic Press, San Diego.

Cordell, Linda S., and Maxine E. McBrinn. 2012. *Archaeology of the Southwest*. 3rd ed. Left Coast Press, Walnut Creek, CA.

Crotty, Helen K. 2000. "The Rock Art Recording Field School of the Archaeological Society of New Mexico." In *The First 100 Years: Papers in Honor of the State and Local Archaeological Societies of New Mexico*, edited by Francis Joan Mathien, David T. Kirkpatrick, and Meliha S. Duran, 107–132. Papers of the Archaeological Society of New Mexico No. 26. Albuquerque.

Fallon, Denise P. 1979. *An Archaeological Investigation of the Petroglyphs at the Waterflow Site, LA 8970, San Juan County, New Mexico*. Laboratory of Anthropology Note No. 299. Museum of New Mexico, Santa Fe.

Farmer, James D. 2003. "Astronomy and Ritual in Chaco Canyon." In *Pueblo Bonito: Center of the Chacoan World*, edited by Jill E. Neitzel, 6–71. Smithsonian Institution Press, Washington, DC.

Farwell, Robin, and Karen Wening. 1985. *The Pictured Cliffs Project: Petroglyphs and Talus Shelters in San Juan County, New Mexico*. Laboratory of Anthropology Note No. 135. Museum of New Mexico, Santa Fe.

Forton, Maxwell. 2015. "Petroglyphs of Mac Stod: Rock Art as an Indicator of Chacoan Influence in Petrified Forest National Park." Poster presented at the 2015 Pecos Conference, Mancos, CO.

Fowler, Andrew P., John R. Stein, and Roger Anyon. 1987. "An Archaeological Reconnaissance of West-Central New Mexico: The Anasazi Monuments Project." Submitted to State of New Mexico, Office of Cultural Affairs, Historic Preservation Division, Santa Fe.

Gilpin, Dennis. 1992. "Hunters Point Rock Shelters, July 14, 1992." Manuscript on file with the author, Flagstaff, AZ.

Gilpin, Dennis. 2001. "The Talking Rocks of Carson's Wall: Navajo History and Settlement as Revealed at a Multicomponent Rock Art Site in the Chinle Valley, Arizona." In *American Indian Rock Art, Vol. 27*, edited by Steve Freers and Alanah Woody, 59–66. ARARA Publications, American Rock Art Research Association, Tucson.

Gilpin, Dennis. 2004. "Rock Art at the Peach Springs Chacoan Community." Manuscript on file with the author, Flagstaff, AZ.

Grant, Campbell. 1978. *Canyon de Chelly: Its People and Rock Art*. University of Arizona Press, Tucson.

Hawley, Florence. 1937. "Kokopelli of the Prehistoric Southwestern Pueblo Pantheon." *American Anthropologist* 39(4):644–646.

Hayes, Alden C. 1981. "A Survey of Chaco Canyon Archeology." In *Archeological Surveys of Chaco Canyon*, by Alden C. Hayes, David M. Brugge, and W. James Judge, 1–68. Publications in Archeology 18A. Chaco Canyon Studies. National Park Service, US Department of the Interior, Washington, DC.

Hays-Gilpin, Kelley Ann. 1996. "Anasazi Iconography: Medium and Motif." In *Interpreting Southwestern Diversity: Underlying Principles and Overarching Patterns*, edited by Paul R. Fish and J. Jefferson Reid, 55–67. Anthropological Research Papers No. 48. Arizona State University, Tempe.

Hays-Gilpin, Kelley A., and Jane H. Hill. 2000. "The Flower World in Prehistoric Southwest Material Culture." In *The Archaeology of Regional Interaction: Religion, Warfare, and Exchange across the American Southwest and Beyond*, edited by Michele Hegmon, 411–428. University Press of Colorado, Boulder.

Hays-Gilpin, Kelley, and Emory Sekaquaptewa. 2006. "Sìitàlpuva: Through the Land Brightened with Flowers." *Plateau: The Land and People of the Colorado Plateau* 3(1):13–25. Museum of Northern Arizona, Flagstaff.

Holmes, William Henry. 1878. "Report on the Ancient Ruins of Southwestern Colorado, Examined during the Summers of 1875 and 1876." In *Tenth Annual Report of the United States Geological and Geographical Survey of the Territories, Embracing Colorado and Parts of Adjacent States; Being a Report of Progress of the Exploration for the Year 1876*, by Ferdinand V. Hayden, 381–408. US Government Printing Office, Washington, DC.

Hopkins, Maren P., and T. J. Ferguson, eds. 2014. *Anshe Ky'an'a: Zuni Traditional Properties on the Fort Wingate Depot Activity*. ZCRE Report No. 1167. Zuni Cultural Resources Enterprise, Pueblo of Zuni, NM.

Hurst, Winston, and Jonathan Till. 2006. "Mesa Verdean Sacred Landscapes." In *The Mesa Verde World: Explorations in Ancestral Pueblo Archaeology*, edited by David Grant Noble, 74–83. School of American Research Press, Santa Fe, NM.

Joyce, D. J. 1981. "Rock Art Sites Near Red Rock State Park." Field notes and site records on file, Museum of New Mexico, Laboratory of Anthropology, Santa Fe.

Judd, Neil M. 1954. *The Material Culture of Pueblo Bonito*. Smithsonian Miscellaneous Collections 124. Smithsonian Institution, Washington, DC.

Judd, Neil M. 1964. *The Architecture of Pueblo Bonito*. Smithsonian Miscellaneous Collections 147(1). Smithsonian Institution, Washington, DC.

Kidder, Alfred Vincent, and Samuel J. Guernsey. 1919. *Archeological Explorations in Northeastern Arizona*. Smithsonian Institution, Bureau of American Ethnology, Bulletin 65. Government Printing Office, Washington, DC.

Kolber, Jane. 2003. "A Quarter Century Later in Chaco Canyon: A Reassessment Recording Project." In *Climbing the Rocks: Papers in Honor of Helen and Jay Crotty*, edited by Regge N. Wiseman, Thomas C. O'Laughlin, and Cordelia T. Snow, 99–109. Papers of the Archaeological Society of New Mexico No. 29. Albuquerque.

Kolber, Jane, and Donna Yoder. 2002. "The Great Anasazi Rock Art of Chaco Canyon: Possible and Probable Implications." In *American Indian Rock Art, Vol. 28*, edited by Alanah Woody, 169–179. American Rock Art Research Association, Tucson.

Kolber, Jane, and Donna Yoder. 2008. "The Spirals of Chaco Canyon." In *Chasing Chaco and the Southwest: Papers in Honor of Frances Joan Mathien*, edited by Regge N. Wiseman, Thomas C. O'Laughlin, Cordelia T. Snow, and Cathy Travis, 107–115. Papers of the Archaeological Society of New Mexico No. 34. Albuquerque.

McCreery, Patricia, and Ekkehart Malotki. 1994. *Tapamveni: The Rock Art Galleries of Petrified Forest and Beyond*. Petrified Forest Museum Association, Petrified Forest, AZ.

Michaelis, Helen. 1981. "Willowsprings: A Hopi Petroglyph Site." *Journal of New World Archaeology* 4(2):3–23.

Miksa, Elizabeth. 1987. *Site AZ-J-58–62*. Report No. 87-328. Navajo Nation Archaeology Department, Window Rock, AZ.

Mills, Barbara J., Jeffery J. Clark, Matthew A. Peeples, W. R. Haas Jr., John M. Roberts Jr., J. Brett Hill, Deborah L. Huntley, Lewis Borck, Ronald L. Breiger, Aaron Clauset, and M. Steven Shackley. 2013. "Social Networks in the Distant Past." *Archaeology Southwest* 27(2):3–6.

Mulloy, William. 1941. "Report on Bc 52 Excavations, Chaco Canyon, New Mexico." Chaco Archive No. C85941, National Park Service, Chaco Culture National Historical Park Museum Archive, University of New Mexico, Albuquerque.

Nabahe, Rolf J. 1993. *An Archaeological Survey of Church Rock North, McKinley County, New Mexico*. Navajo Nation Archaeology Department Report No. 90-473. Navajo Nation Archaeology Department, Window Rock, AZ [NNHPD-93–515].

Nelson, Reid. 1989. *An Archaeological Survey for a Proposed Septic Tank and Drain Field Installation at the Gordon Toadlena Homesite near Ya-Tah-Hey, McKinley County, New Mexico*. Report No. 88-158, Addendum 3. Navajo Nation Archaeology Department, Window Rock, AZ [NNHPD 88–229, Addendum 3.

Nials, Fred L., John R. Stein, and John R. Roney. 1987. *Chaco Roads in the Southern Periphery: Results of Phase II of the BLM Chaco Roads Project*. Cultural Resources Series 1. Bureau of Land Management, Albuquerque.

Roberts, Frank H. H., Jr. 1932. *The Village of the Great Kivas on the Zuñi Reservation, New Mexico*. Smithsonian Institution, Bureau of American Ethnology, Bulletin 111. US Government Printing Office, Washington, DC.

Robins, Michael R., and Kelley A. Hays-Gilpin. 2000. "The Bird in the Basket: Gender and Social Change in Basketmaker Iconography." In *Foundations of Anasazi Culture: The Basketmaker-Pueblo Transition*, edited by Paul F. Reed, 231–247. University of Utah Press, Salt Lake City.

Schaafsma, Polly. 1963. *Rock Art in the Navajo Reservoir District*. Museum of New Mexico Papers in Anthropology No. 7. Museum of New Mexico Press, Santa Fe.

Schaafsma, Polly. 1972. *Rock Art in New Mexico*. State Planning Office, Santa Fe.

Schaafsma, Polly. 1980. *Indian Rock Art of the Southwest*. School of American Research Press, Santa Fe, and University of New Mexico Press, Albuquerque.

Schaafsma, Polly. 1992. *Rock Art in New Mexico*. Rev. ed. University of New Mexico Press, Albuquerque.

Schaafsma, Polly. 2006. "Emblems of Power: Visual Symbols as a Means of Social Identity and the Role of Rock Art in the Chaco System." In *Southwestern Interludes: Papers in Honor of Charlotte J. and Theodore R. Frisbie*, edited by Regge N. Wiseman, Thomas C. O'Laughlin, and Cordelia T. Snow, 147–165. Papers of the Archaeological Society of New Mexico No. 32. Albuquerque.

Schaafsma, Polly, and M. Jane Young. 2007. "Rock Art of the Zuni Region: Cultural-Historical Implications." In *Zuni Origins: Toward a New Synthesis of Southwestern Archaeology*, edited by David A. Gregory and David R. Wilcox, 247–269. University of Arizona Press, Tucson.

Seyfarth, Jill. 1983. *Rock Art on the San Juan Mine Coal Lease*. Contributions to Anthropology Series No. 782. Division of Conservation Archaeology, San Juan County Museum Association, Farmington, NM.

Smith, Howard Norman, Jr. 1974. A Survey and Stylistic Analysis of Rock Art in the San Juan Basin, Northwestern New Mexico. MA thesis, Department of Anthropology, Eastern New Mexico University, Portales.

Sofaer, Anna, Volker Zinser, and Rolf M. Sinclair. 1978. "A Unique Solar Marking Construct of the Ancient Pueblo Indians." *American Indian Rock Art* 5 (May):115–125. American Indian Rock Art Research Association, El Toro, CA.

Sofaer, Anna, Volker Zinser, and Rolf M. Sinclair. 1979. "A Unique Solar Marking Construct." *Science* 206 (4416):283–291.

Sowers, Ted C. 1942. "Petroglyphs of the Chaco Canyon Area." *Southwestern Lore* 8(2):24–26.

Steed, Paul P., Jr. 1980. "Rock Art in Chaco Canyon." *Artifact* 18(3). El Paso Archaeological Society, El Paso, TX.

Turner, Christy G., II. 1963. *Petrographs of the Glen Canyon Region*. MNA Bulletin 38. Flagstaff, AZ.

Ware, John A. 2014. *A Pueblo Social History: Kinship, Sodality, and Community in the Northern Southwest*. School for Advanced Research Press, Santa Fe, NM.

Whitten, Penelope. 1982. *Excavations at Four Pueblo II Sites on the San Juan Coal Lease, Northwestern New Mexico: For San Juan Coal Company*. Contributions in Anthropology No. 515. San Juan County Archaeological Research Center and Library, Farmington, NM.

Wilshusen, Richard H., Scott G. Ortman, and Ann Phillips. 2012. "Processions, Leaders, and Gathering Places: Changes in Early Pueblo Community Organization as Seen in Architecture, Rock Art, and Language." In *Crucible of Pueblos: The Early Pueblo Period in the Northern Southwest*, edited by Richard H. Wilshusen, Gregson Schachner, and James R. Allison, 198–218. Monograph 71. Cotsen Institute of Archaeology Press, University of California, Los Angeles.

Wilshusen, Richard H., and Elizabeth M. Perry. 2012. "Women's Central Role in Early Pueblo Change: Ground Stone, Archaeobotanical, Ceramic, Architectural, and Skeletal Evidence." In *Crucible of Pueblos: The Early Pueblo Period in the Northern Southwest*, edited by Richard H. Wilshusen, Gregson Schachner, and James R. Allison, 185–197. Monograph 71. Cotsen Institute of Archaeology Press, University of California, Los Angeles.

Yoder, Donna, and Jane Kolber. 2002. "The Anasazi Rock Art of Chaco Canyon: A Preliminary Report of the Findings." In *American Indian Rock Art, Vol. 28*, edited by Alanah Woody, 161–168. American Indian Rock Art Research Association, Tucson.

Young, Bob, and James M. Copeland. 2018. *Images of Dinétah: Reflections of Past Life in the San Juan Basin of New Mexico*. Printed by author, Farmington, NM.
Young, Jane. 1988. *Signs from the Ancestors: Zuni Cultural Symbolism and Perceptions of Rock Art*. University of New Mexico Press, Albuquerque.
Young, Lisa C., and Dennis Gilpin. 2012. "Before Chaco: Pithouse Communities on the Southern Colorado Plateau, AD 200–850." In *Southwestern Pithouse Communities, AD 200–900*, edited by Lisa C. Young and Sarah A. Herr, University of Arizona Press, Tucson.
Zeilik, Michael. 1985. "A Reassessment of the Fajada Butte Solar Marker." *Archaeoastronomy Supplement of the Journal of the History of Astronomy* 16(9):70–85.

6

Enigmatic Rock Features

Shrines, Herraduras, Stone Circles, and Cairns on the Greater Chaco Landscape

Ruth M. Van Dyke

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 15, 2017.

https://doi.org/10.5876/9781646421701.c006.v000

Across the Chaco landscape, enigmatic rock features mark mesa tops, trails, and topographic breaks. Some are adjacent to Chaco roads, and others huddle under junipers. Some stand starkly against the sky, and others blend seamlessly into sandstone or lava. Scholars have used a wide range of labels for these features, describing them as *shrines*, *cairns*, *stone circles*, *herraduras*, *crescents*, *atalayas*, *avanzadas*, and *zambullidas*. The features frequently lack associated artifacts. They are difficult to date, and some may be in active use by Indigenous peoples. To further complicate matters, archaeologists have assigned a wide range of labels to these features, often conflating shapes, locations, and assumed feature functions. My 2017 attempt to summarize our knowledge regarding these features garnered a great deal of constructive feedback, particularly from Indigenous colleagues. The chapter you are reading is an updated version of the discussion. In the pages that follow, I attempt to sort out the nomenclature and the interpretations, with the goal of providing a more coherent framework for the study of enigmatic rock features in the Chaco world. Along the way, I try to clarify and unpack the word *shrine* in southwest archaeological parlance.

Colorado Plateau archaeologists often have used the word *shrine* for enigmatic rock features because they

DOI: 10.5876/9781646421701.c006

are aware that Indigenous peoples sometimes mark meaningful places with similar stacked stone features (Anschuetz 2005; Duwe 2011, 2016; F. Ellis 1969; Fowles 2009; Jeançon 1923:70–73; Ortiz 1969, 1972; Ortman 2008; Parsons 1939; Snead 2008). For Indigenous peoples, shrines may denote meaningful directions, ancestral routes, storied or mythic events, and cosmographies. They are not always marked by stacked stones; they might involve rock art, water sources, trees, cupules, and oddly shaped boulders. Often these are places that merit (or require) repeated visits, prayer, and contemplation.

The archaeological use of the word *shrine*, however, becomes problematic on at least three fronts. First, it suggests that activities that take place in and around these features are categorically religious—a connotation that is overly simplistic and in some cases probably wrong. Inspired by Bruno Latour (1993), Severin Fowles (2013) points out that categorical divisions grounded in Western philosophy lead us to classify Indigenous practices as "religious," "political," or "economic." By contrast, within a traditional Indigenous worldview, these elements of life are inseparable and better understood as "doings."

Second, *shrine* can be a catchall term for a diverse array of features, with the implication that they must have had a common function. For example, on the Chaco Additions survey, Robert Powers defined shrines as "ceremonial or other apparently esoteric sites including Anasazi [*sic*] C or fishhook shaped enclosures formed by a masonry wall, stone circles, and possible signaling sites at locations of high topographic prominence or visibility" (Powers and Van Dyke 2015:31, table 1.1). The common thread among Powers's "shrines" seems to be the lack of an obvious functional interpretation, such as "hearth," or "habitation." While some features archaeologists have called "shrines" are situated in places of high visibility atop prominent peaks, others are associated with Chacoan road segments, topographic breaks, or trails. Alden Hayes and Thomas Windes (1975) describe J or box-shaped "communication shrines," conflating form and function, and suggesting that shrines primarily functioned to facilitate signaling. Intervisibility does seem to be a prominent feature of some shrines, but "seeing" is not synonymous with "being seen." High-visibility features could have been marking points from which to observe others on the landscape, or distant peaks, or solar and lunar events. *To see* and *to be seen*, while coterminous and complementary concepts, connote practices that might range from surveillance and navigation to boundary marking, commemoration, and identity (Van Dyke et al. 2016).

Third and most important, Indigenous colleagues can be understandably distressed to hear that their ancestors' "shrines" are a focus of (predominately Euro-American) archaeological study. This can sound like archaeologists are flagrantly trespassing upon sensitive areas of Indigenous knowledge or practices. Of course, it would be inappropriate and disrespectful for archaeologists to study active elements of Indigenous religious practices without Indigenous permission, assistance, and collaboration. However, it can be difficult today for archaeologists to recognize when we are dealing with active or sensitive shrines. In the pre-NAGPRA era, our colleagues lamentably rarely thought about this issue at all. If features are not clearly in active use, the issue may *seem* more straightforward, but the only sure way to avoid inadvertent trespass or offense is to undertake research in close collaboration with Indigenous colleagues. Even then, archaeologists may need to navigate among a host of diverse and possibly contradictory Indigenous views.

In sum, not all features labeled *shrines* are, or were, sacred places, and not all sacred places are, or were, marked with unusual configurations of stones. Furthermore, the very term *sacred* is itself problematic, often functioning as a black box for a range of practices and ideas. Nonetheless, as archaeologists, we recognize that enigmatic rock features are worthy of our consideration, and we recognize the need to attempt to engage with them clearly and systematically. We cannot simply avoid all enigmatic rock features on the assumption that they *might* be shrines or sacred places in active use. Hundreds are already documented. If archaeologists do not record visible features within newly surveyed areas, the features effectively do not exist within site databases and thus will not be factored into management considerations. The features have bearing on important questions about Chaco, such as the role of visibility and travel across the Chacoan world. Perhaps most significant, simply avoiding all enigmatic rock features will not help Indigenous peoples toward a goal that many of them share with archaeologists—creating respect for the landscape in all its dimensions, including its less tangible, more sensory, and experiential aspects.

Archaeologists need a way forward that is systematic, coherent, and respectful, allowing us to consider the wide range of possible shapes, sizes, meanings, and functions of these features whenever it is appropriate to do so. Therefore, despite my general distaste for adding more acronyms to archaeological parlance, in this chapter, I introduce the acronym ERF (enigmatic rock feature) for this broad class of features. Under the broad and nonspecific classification of ERF, archaeologists can fit a wide range of specific features. Use of this term can help all of us avoid a priori assumptions about these compelling collections of stones. In the first part of this chapter, I review the features and the nomenclature subsumed into the ERF designation. In the second part I describe a range of possible functions and meanings for ERFs across the Chaco landscape.

ERFS: PREVIOUS CLASSIFICATIONS AND INTERPRETATIONS

The ERF (enigmatic rock feature) designation includes features that previous scholars have labeled J or box-shaped masonry-walled Windes' shrines, stone crescents, stone circles, stone basins, herraduras, zambullidas, atalayas, gateway shrines, cairns, and slab boxes. I include a comparison of the shapes, sizes, and settings of stone enclosures in table 6.1. My review and discussion owe primary debts to many scholars, particularly the pioneering work of Tom Windes (e.g., Hayes and Windes 1975; Windes 1978), the Bureau of Land Management Chaco Roads Project (Kincaid 1983; Nials et al. 1987; Roney 1992; Vivian 1997a, 1997b), and the Solstice Project (Marshall and Sofaer 1988). My descriptions below provide examples of each classification. For a catalog of all known ERFs in the greater Chaco landscape as well as counts of each previously recorded type, I refer the reader to Leja (2019:app. A).

J-Shaped or Windes' Shrines

The first feature designated as a "shrine" by the Chaco Project was a Classic Bonito phase J-shaped feature erected atop 29SJ 423, the Basketmaker III village above Peñasco Blanco (Hayes and Windes 1975; Windes 2018:95–100, 692). In 1973, Tom Windes excavated the J-shaped wall in the course of excavating the underlying Basketmaker III site (figure 6.1). Built on trash deposits partially overlying a Basketmaker III pitstructure, the wall appeared to have been constructed of slabs robbed from the earlier, slab-lined pitstructures. Beneath the curve of the J, excavated into earlier trash, Windes found a pecked stone bowl capped with a flat slab. The modified sandstone cover contained a smaller, removable sandstone door or aperture. Inside the bowl excavators found 146 turquoise beads and 3 turquoise chips, and in the surrounding matrix they found more exotic items, including additional beads of turquoise, shale, and shell; pieces of azurite and malachite; a glycymeris shell bracelet; and a McElmo Black-on-white bowl. The excavators recognized the feature as the site of ritual activity, and they noticed the spectacular view this spot affords toward the west down the Chaco River toward the Chuska Mountains (figure 6.2). When Windes and Al Hayes observed two similar (unexcavated) features along the south rim of Chaco Canyon, they surmised that these features were positioned to facilitate intervisibility—in particular, links between the J-shaped features meant "visual communication was possible between . . . all of the major pueblos in the area" (Hayes and Windes 1975:143).

Table 6.1. Previous ERF classifications.

	Construction Material	*Dimensions*	*Shape*	*Setting*	*Additional Information*	*Primary References*
Windes' Shrine	Massive compound or core and veneer masonry	3.5+ m long, ≤1 m high	L, J, arc, or comet-shaped	High places, views of great houses	Associated with turquoise, malachite . . .	Hayes and Windes (1975); Windes (2018)
Crescent	Upright slabs, simple, compound, or core-and-veneer masonry	3.5–18 m across, up to 1 m high	Crescent, opening to E or SE	High places	Associated with roads, lunar standstills?	Marshall and Sofaer (1988)
Stone Circle	Upright slabs, simple or compound coursed masonry	7–20 m diameter, up to 1 m high	Circle or oval	Slickrock, canyon rims, views of great kivas	Associated with pecked stone basins, ground stone	Windes (1978)
Herradura	Upright slabs, simple or compound coursed masonry	5–7 m long axis × 3.5–6 m short axis, up to 1 m high	C, D, horseshoe	Adjacent to roads at topographic breaks	Has visibility in 2 directions	Kincaid et al. (1983)
Avanzada	Simple coursed masonry	2 × 2 m	Square or rectangular	Adjacent to roads, higher than road	From 1–4 rooms	Kincaid et al. (1983)
Zambullida	Massive compound or core-and-veneer masonry	3.5–9 m across, up to 1.5 m high	Highly variable—defined by not fitting other categories	Adjacent to roads	An "odd duck," or cross between a small great house and a herradura	Kincaid et al. (1983)
Atalaya	Simple or compound masonry	Variable, usually unroofed	Irregular, usually follows pinnacle edge	Pinnacle top		Marshall and Sofaer (1988)
Gateway Shrine	Massive, Bonito-style compound masonry	5–7 m diameter	Circular, opens to south or east	Highly visible escarpment edges along Chaco Wash	2 known, no road associations	Kincaid et al. (1983)

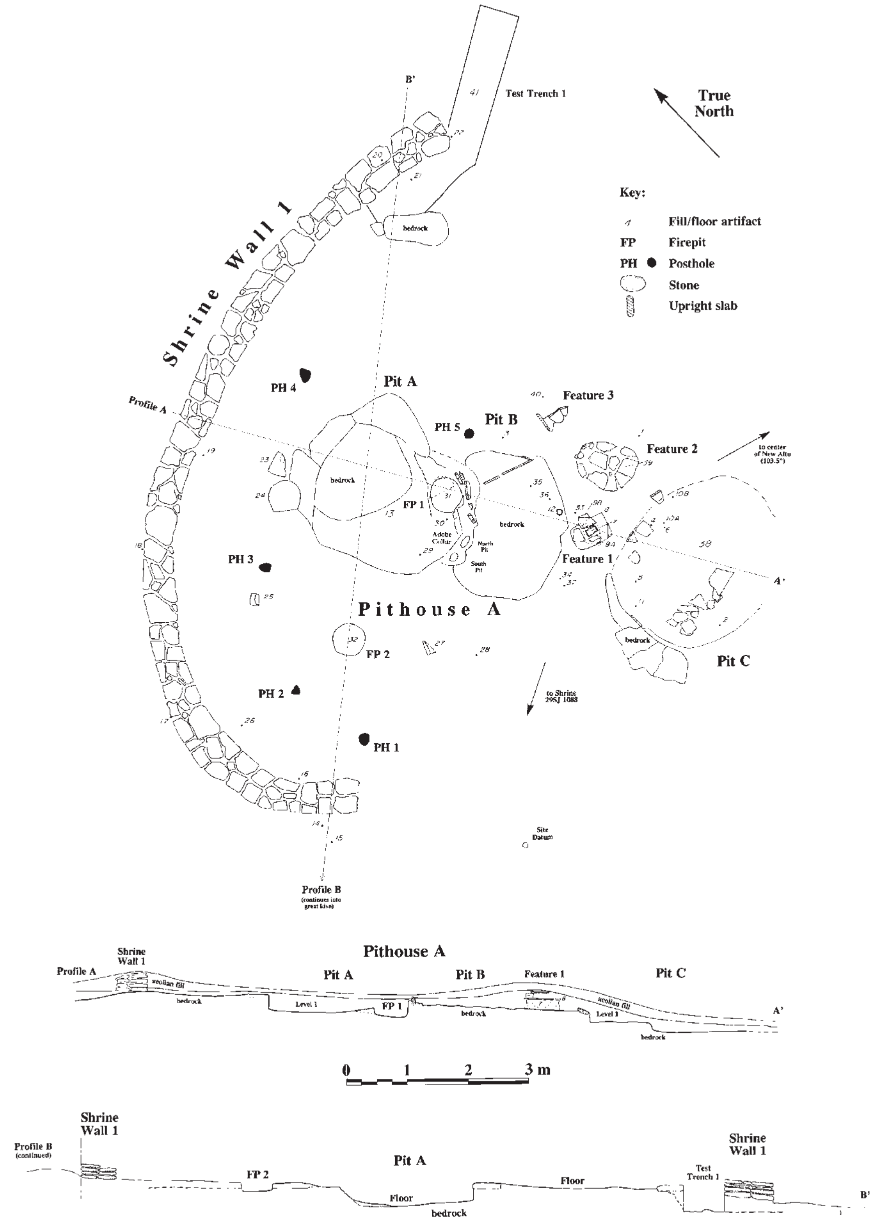


Figure 6.1. *"Windes' shrine" atop the Basketmaker III site of 29SJ 423. CCNHP Catalog #CHCU 55511, first published in Windes 2018:96, fig I.3.11, courtesy of Chaco Culture National Historical Park and the Arizona State Museum.*

Figure 6.2. *"Windes' shrine" atop 29SJ 423, looking west down the Chaco Wash. Photograph by Ruth Van Dyke, October 2017.*

Hayes and Windes's J-shaped shrines are all low, masonry-walled, curved enclosures (figure 6.3). Chris Kincaid et al. (1983:9/20) includes *Windes' shrines* in their discussion of features associated with roads. The Bureau of Land Management (BLM) Roads Report glossary defines a Windes' shrine as a "low L, J, arc, or comet-shaped masonry enclosure exhibiting massive compound or rubble-core construction and located on a topographic high point which maximizes visibility, especially line-of-sight to great houses" (Roney 1983). Kincaid et al. point out that some Windes' shrines are associated with exotic materials such as turquoise beads or chips, azurite, malachite, and shell. Windes (1991:118) discusses several finds of animal figurines that may have functioned as markers or have been associated with shrines along roads in the vicinity of Pueblo Alto. Although these features are always in elevated locations, they contain no evidence for signal fires. To date, Windes and colleagues have documented over forty similar features designed as "shrines" on high places across the greater Chacoan world (see, e.g., Windes 1978, 1991:118; 2015:692; Windes et al. 2000:43).

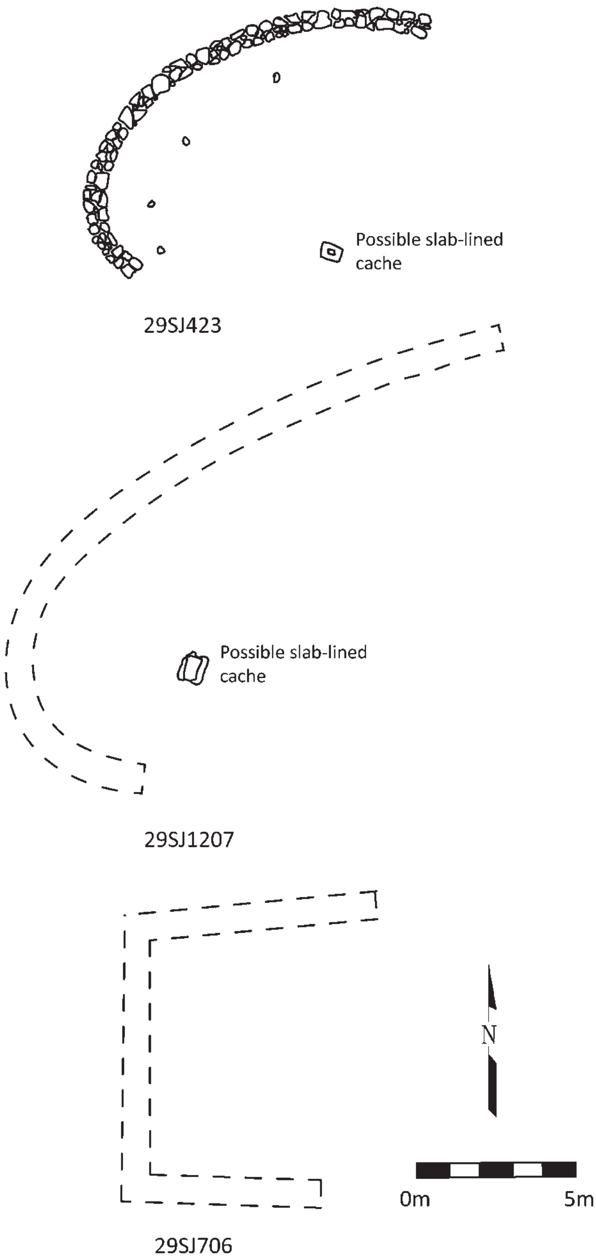


Figure 6.3. *Plans of "Windes' shrines." By Dan Leja, based on Hayes and Windes 1975:51, fig. 22.*

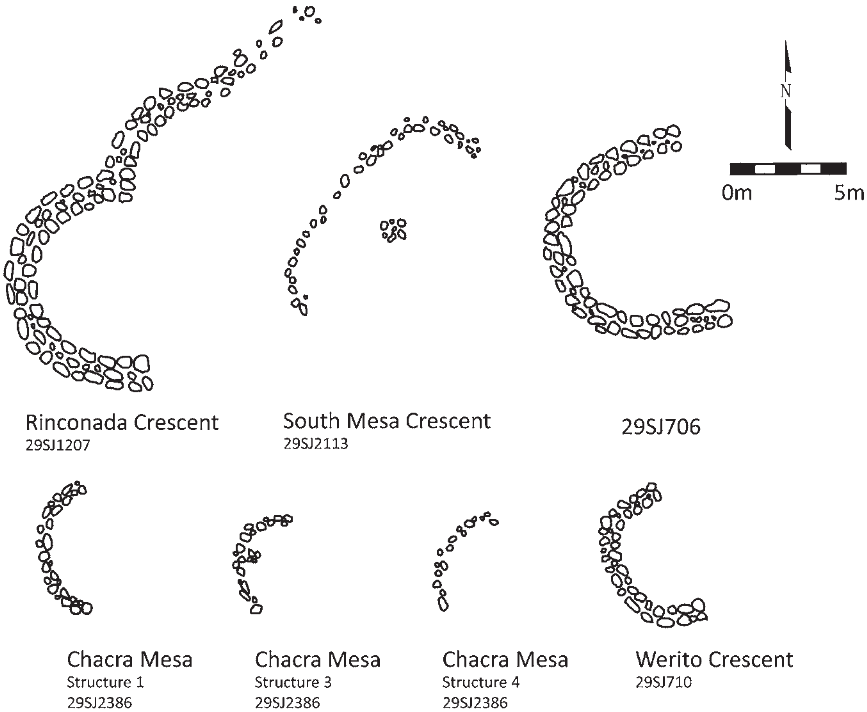


Figure 6.4. *Seven "Chacoan crescentic structures." By Dan Leja, based on an unnumbered figure from Marshall and Sofaer's (1988) draft report.*

Crescents

In 1984 and 1985 Mike Marshall and Anna Sofaer visited and recorded many outliers and other Chacoan landscape features that were not included or were underdocumented by the large-scale outlier surveys of Marshall et al. (1979) and Powers et al. (1983). In 1988 Marshall and Sofaer completed a draft report on this material (Marshall and Sofaer 1988). The "Solstice Project" draft report has never been published, but it is accessible at the Laboratory of Anthropology in Santa Fe. It contains a wealth of data both in its body and in figures, tables, and appendices. The draft report is very difficult to cite with any specificity, because there are no page numbers. However, researchers can scan the document and create a searchable pdf file to ameliorate the process of tracking down particular facts and data within the report.

In the Solstice Project report, Marshall and Sofaer (1988) introduced the term *crescent*. They recorded forty-two features they labeled stone crescents (figure 6.4). Crescents are low-walled stone features; walls may consist of simple masonry, compound masonry, or upright slabs and may be up to 1 m high. Crescents are always open to the east or southeast; long axes may range between 3.5 and 18 m. Marshall and Sofaer consider these features to be a form of "ceremonial architecture." They identified crescents on elevated landforms near Chaco Canyon, adjacent to Chaco roads, and in association with some outliers. They found no crescents along the Chuskan slopes. Marshall and Sofaer occasionally observed turquoise fragments and ceramic artifacts in association with the crescents, and they ceramically dated the crescents to AD 950–1150.

It is not immediately clear how Marshall and Sofaer's "crescents" differ from Hayes and Windes' (1975) "J-shaped shrines." For example, 29SJ 710 appears in Marshall and Sofaer as "Weritos Crescent" (see figure 6.4). Windes (1978) calls this same feature a "shrine," and in 2017, Sofaer et al. further muddy the waters by labeling 29SJ 710 a "crescentic shrine." Both Windes (1978) and Sofaer et al. (2017) consider 29SJ 710 to be part of a larger assemblage of intervisible features, but for Windes these features are for signaling, whereas for Sofaer et al. they mark a lunar standstill alignment (see further discussions about these interpretations below).

Stone Circles

Tom Windes introduced the term *stone circle* in a dedicated Chaco Center report in 1978. During the Chaco Project, Windes identified sixteen stone circles on the north rim and four on the south mesas of Chaco Canyon. Windes and other researchers subsequently have located additional stone circles at outliers across the San Juan Basin, including Andrews, Kin Bineola, and Twin Angels (Kincaid et al. 1983; Marshall and Sofaer 1988; Van Dyke 2001; Windes 1978).

By contrast with J-shaped shrines and crescents, Chacoan stone circles are completely enclosed stone rings (figure 6.5). Like crescents, they consist of compound, core-and-veneer, or upright slab masonry. Stone circles range in size from 9 to 32 m (long axis) to 7 to 20 m (short axis). Most stone circles contain one or more circular or rectangular basins pecked or ground into the interior slickrock. Although associated ceramics are scarce, sandstone abraders are common. Windes speculates that these abraders might have been used to smooth wood, hides, or the sandstone surfaces of the circles themselves. On the basis of sparsely associated ceramics, the stone circles are dated AD 1100–1150. Stone circles are almost always constructed on slickrock, on high points or benches above canyons, providing excellent vantage points.

Figure 6.5. *Plan of stone circle 29SJ 1976. By Dan Leja, based on Windes 1978:101, fig. 45.*

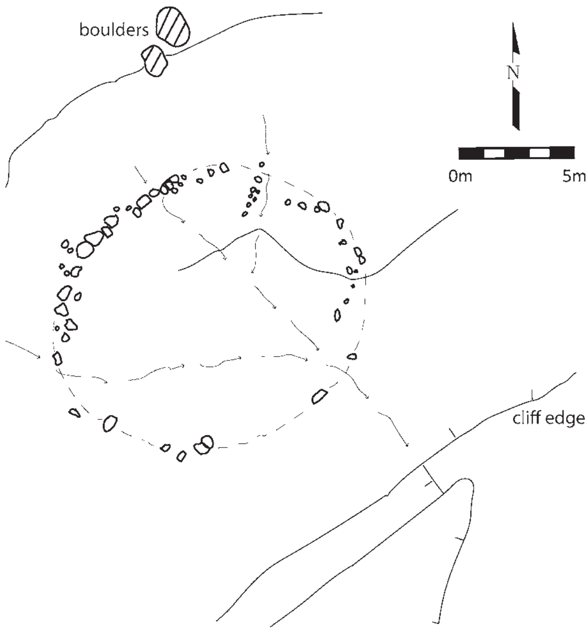


Figure 6.6. *View from 29SJ 1976 through South Gap to Hosta Butte. Photo by Ruth Van Dyke.*

As with J-shaped shrines and crescents, researchers have interpreted stone circles' functions in terms of visibility. Van Dyke (2007:fig. 6.6) noted that a stone circle on the north rim of Chaco Canyon (29SJ 1572) frames Hosta Butte in the center of South Gap (figure 6.6). In fact, from this point a viewer sees

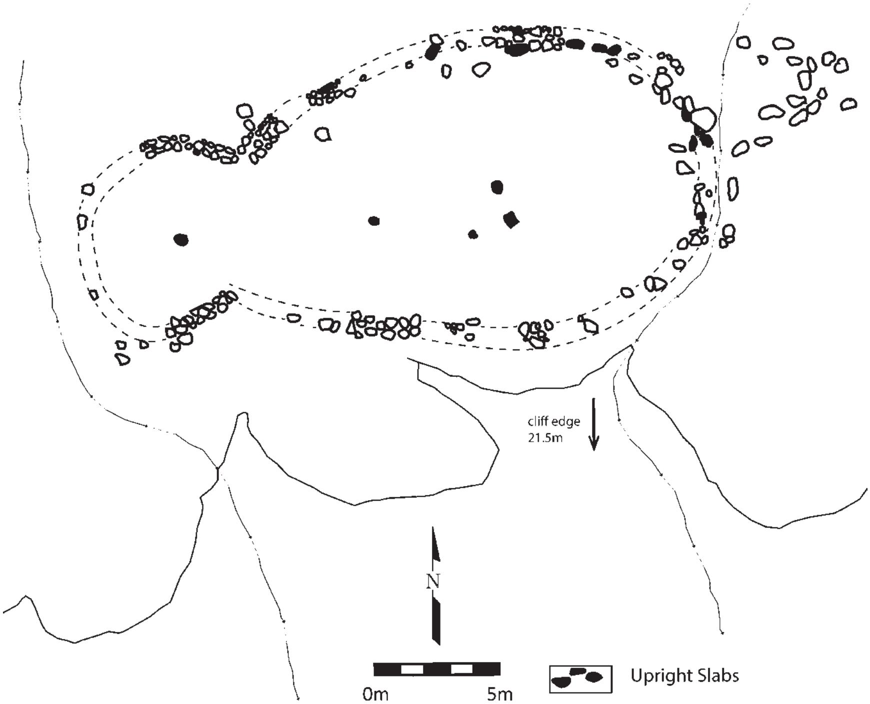


Figure 6.7. *Plan of 29SJ 1565. By Dan Leja, based on Windes 1978:90, fig. 40.*

Pueblo del Arroyo, South Gap, and Hosta Butte in perfect alignment along the trajectory of the South Road. Windes (1978) noted that viewsheds from stone circles always include one or more great kivas, but the closest great houses are usually hidden beneath the canyon rim. If the circles were moved only a few meters, these dual attributes of visibility and invisibility would be lost. Windes (1978:68–69) suggests the dual visible/invisible quality of circles might have made them ideal places for the manufacture of ritual items or preparation for ceremonies. During filming with members of the Zuni Cultural Resources Advisory Council as part of this project, we revisited 29SJ 1572 (see chapter 10, Part 2, this volume). Zuni cultural expert Octavius Seowtewa attached great significance to this stone circle on Chaco's north rim. He indicated that when Zuni people come back from a pilgrimage, "they come to an area like this, and get themselves ready to greet the people and bless the people as they are coming in" (Seowtewa 2020, this volume).

Although termed *circles*, these features often tend to be ellipses, and they are not always closed (figure 6.7). As one example, in 2000 I recorded a stone

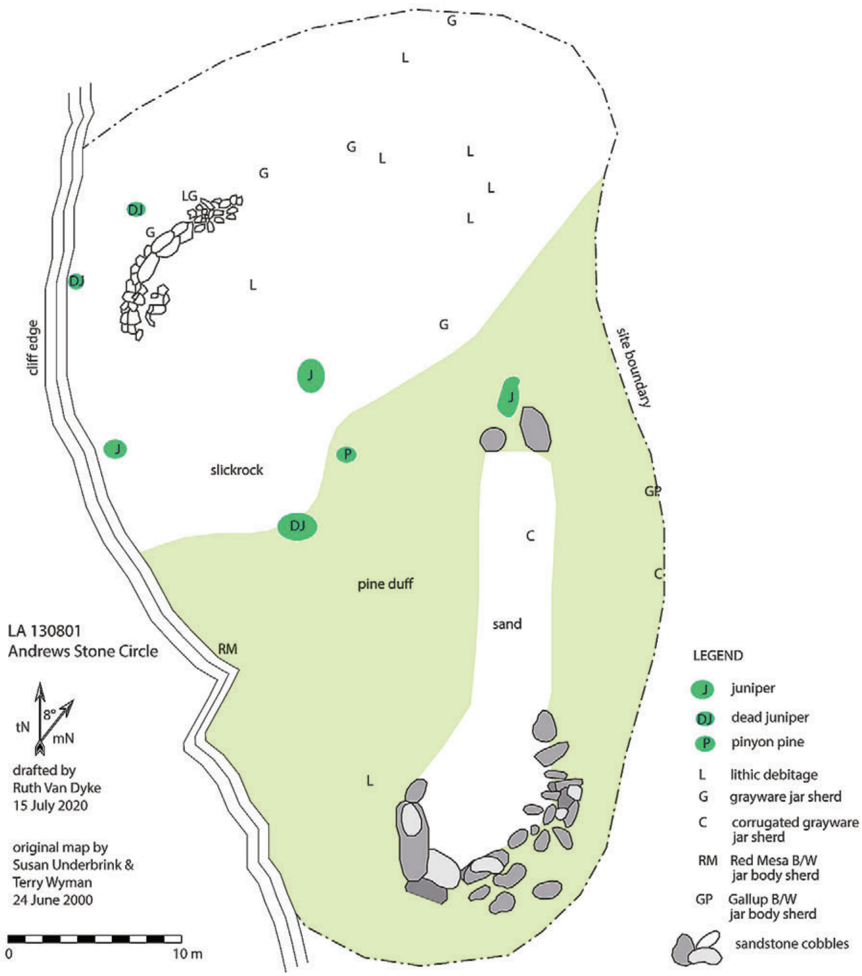


Figure 6.8. *Andrews stone circle, LA 130801.*

circle in the Andrews community near Thoreau, New Mexico. LA 130801 consisted of two facing arcs of compound sandstone masonry (figure 6.8). The arcs contained 1–6 courses of unshaped sandstone cobbles, situated on slickrock at the edge of a cliff overlooking the Andrews community. The remnant walls were 50 cm–1 m high and enclosed an area 26 m N/S × 15 m E/W. Although the area within the arcs was partially obscured by a juniper tree and associated duff, we tallied 9 associated sherds and 10 associated lithics (one Gallup Black-on-white jar body sherd dated the feature to the Pueblo II period). We saw no pecked basins, but we did note that an individual standing within the circle could see two great kivas in the Andrews community as well as a road alignment between Andrews and Casamero documented by Kincaid (1983).

Pecked and Ground Basins

During the course of Windes's stone circle investigations on high places overlooking Chaco Canyon, he observed the frequent presence of associated pecked and/or ground stone basins (Windes 1978:11, 16–34) (figure 6.9a). Windes recorded a total of 59 of these basins—46 in association with stone circles and 17 "isolated" basins. People had carved the basins into the sandstone bedrock using pecking, grinding, or a combination of the two. Bottoms are usually curving rather than flat, although Windes did note a few flat-bottomed examples. Most basins are round, or roundish, though Windes describes three rectangular cases. The basins range in size from 18 to 48.5 cm in diameter and from 2.5 to 15 cm deep. Windes statistically investigated this group of 46 features and realized that they fall neatly into two size classes: a set of large basins with diameters 37.8–48.5 cm; and a set of small basins with diameters between 18–31 cm. Windes was unable to associate his two size classes with any other variable, but he did find a relationship between numbers of basins and the sizes of stone circles. Most stone circles are associated with 1 or 2 basins, though a few have as many as 7, and 1 outlier stone circle has 14 associated basins. Windes used Spearman's rank-order coefficient and Fisher's exact test to determine a statistically significant association between stone circle size and number of basins. Stone circles covering areas < 200 sq m usually have one associated stone basin, whereas those stone circles covering areas > 200 sq m usually have multiple stone basins. And the larger the circle, the higher the number of associated basins.

In addition to the basins associated with circles, Windes recorded seventeen "isolated" stone basins in Chaco Canyon. Many are partially filled with aeolian sand, so Windes speculated that more basins likely exist in sand-covered, bedrock areas. Windes's isolated basins are small, with a mean diameter of 23.3 cm and a mean depth of 7 cm, and they lack associated artifacts. Some are situated in bedrock water runoff channels, leading Windes to speculate about possible associations with water control. A group of four basins are located above and southeast of Shabikeshchee Village within view of a great kiva, leading Windes to surmise that these basins were important in terms of visibility. Inspired by others' archaoeastronomical work, Windes explored the possibility of alignments among the seventeen isolated basins, but this

Figure 6.9. *(a) Stone basin on the north rim of Chaco Canyon. (b). Stone basin near the great kiva at Chimney Rock, 5AA 88. Photos by Ruth Van Dyke.*

investigation "revealed only a mass of lines running in every direction, with no discernible meaning" (Windes 1978:34).

Pecked or ground stone basins are not limited to the immediate environs of Chaco Canyon. Like the other ERFs described here, they are known from outlier contexts. For example, there is a well-known example in the Chimney Rock community within the Parking Lot Site, 5AA 88 (figure 6.9b). J. McKim Malville (2004:133–135) notes that from this spot, the north wall of the Chimney Rock great house is illuminated by the first light of summer solstice sunrise. During stabilization work in Room 5 of the Chimney Rock great house, Brenda Todd (2011:49) encountered a similar basin pecked into the underlying bedrock; she surmises it may have originally been an extramural feature related to astronomical alignments. It is likely that many similar basins exist across the greater Chaco landscape, but these subtle, often partially buried features may frequently go unnoticed on survey.

Herraduras and Other Road-Related Features

In the early 1980s, in advance of several major energy extraction projects, the Albuquerque office of the BLM undertook a major study focused on Chaco roads in the San Juan Basin. The Chaco Roads Project (Kincaid 1983; Nials et al. 1987) was directed specifically toward the management needs of the BLM. The BLM recognized that Chaco roads and associated features were widespread but poorly understood and difficult to study. In Phase I of the Chaco Roads Project (Kincaid 1983), archaeologists sought to collate and evaluate existing research, to streamline classification of roads and road-related features, and to detail methods for studying roads that included aerial imagery, surface survey, and excavation. Phase I was a geographically restrictive, "intensive" study focused on areas where roads were known to exist. In Phase II (Nials et al. 1987), archaeologists applied the methods from Phase I to locate and evaluate new road segments across the San Juan Basin. In the context of these projects, researchers created a classificatory scheme for road-associated ERFs of variable shapes and sizes. In the Phase I report, John Roney (1983) provided a glossary of terms, but this gray literature report advanced some labels that never entered common usage. Gwinn Vivian, who participated in the BLM roads projects, later condensed and refined Kincaid's classifications in a set of *Kiva* articles describing road function and morphology (Vivian 1997a, 1997b). Most notably, the Chaco Roads Projects coined the term *herradura* (horseshoe) to denote a stone circlelike feature associated with roads. Another term—*atalaya*—has gained some currency, while other terms—*avanzada* and *zambullida*—have been little used by subsequent researchers.

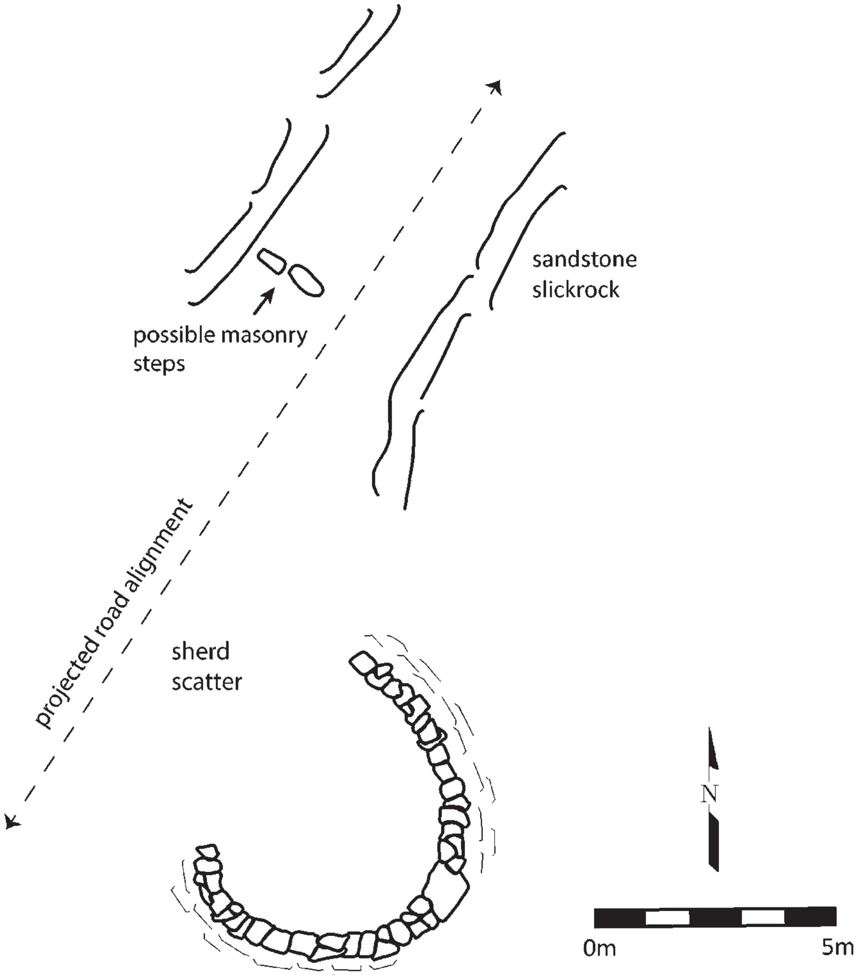


Figure 6.10. *Yellow Point Herradura, LA 35417. By Dan Leja, based on Kincaid et al. 1983:fig. C-5.*

HERRADURAS

Herraduras (Spanish for "horseshoes") are horseshoe-shaped structures defined by their association with Chacoan roads (Kincaid et al. 1983:9/14–9/16, glossary; Lekson 1999:117–118; Marshall and Sofaer 1988; Nials et al. 1987:11–14; Vivian 1997a, 1997b). These features are found near Chacoan roads on major topographic breaks with good visibility in both directions (figure 6.10). These

C-, U-, or D-shaped structures are constructed of simple or compound masonry walls up to 1 m high. Researchers have recorded at least twenty-eight herraduras across the greater Chaco landscape (Nials et al. 1987). About half of all known herraduras open to the east. Most herraduras range from 5 to 7 m in diameter, although some are as small as 3.5 m or as large as 12 m in diameter. In some locations, road segments are deeply inscribed near herraduras. Light surface ceramic scatters are sometimes present. Researchers have dated herraduras between AD 800 and AD 1300 based on associated features and associated ceramics.

Herraduras are associated with Chaco road alignments, as they are frequently situated on high places or topographic breaks where road segments change direction. They "often mark the location of a subtle bearing change of a roadway . . . usually discernible from the ground perspective only by using a compass" (Nials et al.1987:13). Recognizing the patterned associations between herraduras and Chacoan roads, Fred Nials et al. (1987) "connected the dots" between visible herraduras to find less visible road segments. Nials et al. also successfully predicted the presence of herraduras on two ridgetops along the Coyote Canyon Road.

AVANZADAS

Avanzada (Spanish for "outpost") is a term created by the BLM Chaco Roads Projects (Kincaid et al. 1983:9/19–20; Nials et al. 1987:14) to describe architectural features located near roads that (unlike herraduras and zambullidas) do not articulate with the road surface. Roney (1983:1) defines the avanzada as "a squared rectangular building which includes one to four rooms made of simple coursed masonry and/or jacal, situated on an elevated low butte or badland pinnacle adjacent to and elevated somewhat above the road alignment." An example is the feature at Gallegos Crossing (LA 34303), which also has an associated crescent (figure 6.11). Features described as avanzadas exhibit variable configurations and orientations, in keeping with Nials et al.'s (1987:14) description of avanzadas as a "catchall category for minor architectural perturbations in the vicinity of prehistoric roads." Nials et al. (1987:14) go on to state, "There is a strong possibility that these are variations of the herradura type." Given all of this variability, the term *avanzada* seems unlikely to correspond to any coherent set of Chacoan ideas or practices.

ZAMBULLIDAS

Zambullidas (Spanish for "ducks," presumably as in "odd ducks") are described as structures that are something more than a herradura but something

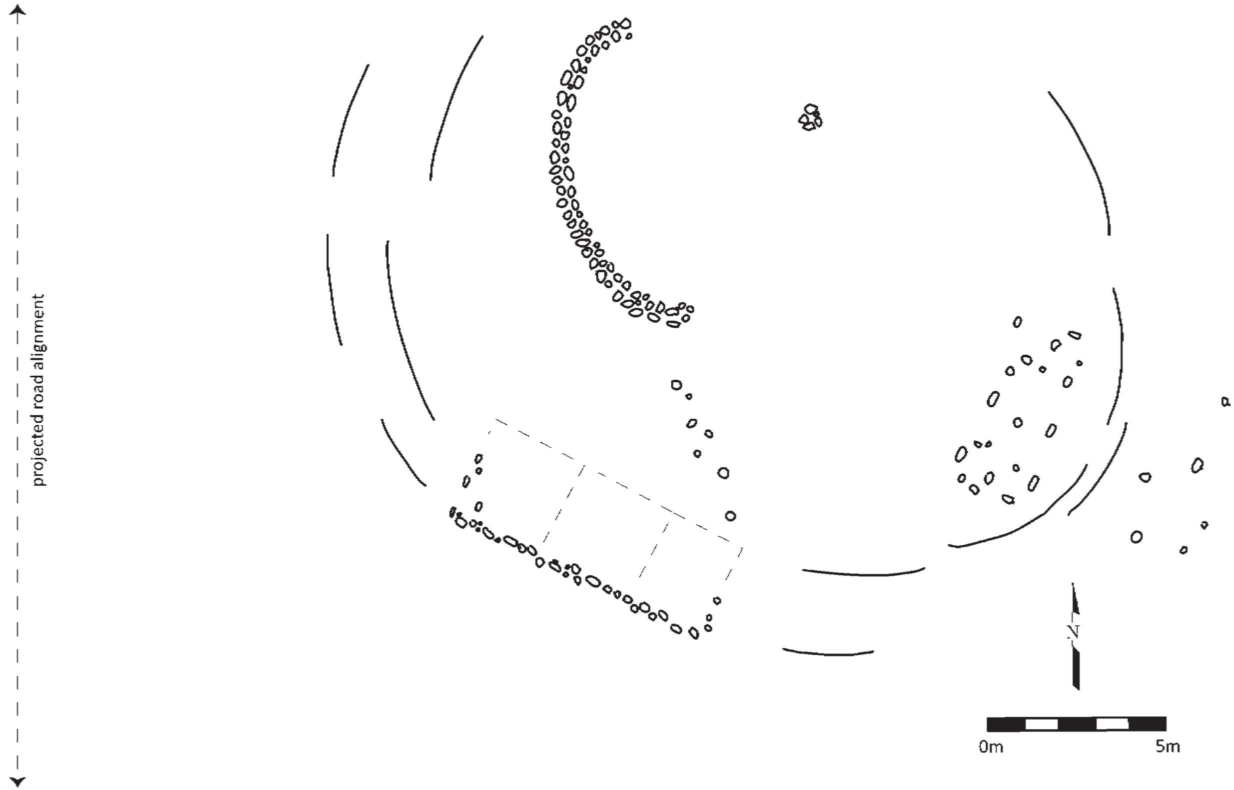


Figure 6.11. *Avanzada at Gallegos Crossing, LA 34303. By Dan Leja, based on unnumbered figure from Marshall and Sofaer's (1988) draft report.*

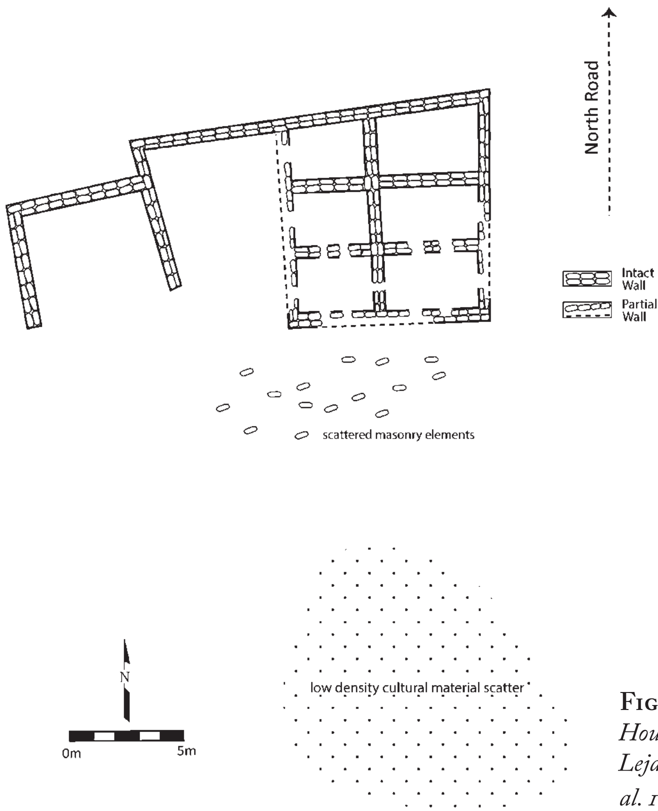


Figure 6.12. *Halfway House, LA 15191. By Dan Leja, based on Kincaid et al. 1983:fig. C-4.*

less than a great house (Kincaid et al. 1983:9–14, glossary; Vivian 1997b:22). Zambullidas have massive compound or core-and-veneer sandstone masonry walls and multiple rooms, but they have variable shapes. Some may have been roofed, though none seem to exceed 1.5 m in height; all lack enclosed kivas. Kincaid et al. describe a zambullida as "a low masonry enclosure up to 1.5 in primary height, rectangular to circular in shape, 3.5 to 9.0 m in interior diameter, and exhibiting massive compound or core-and-veneer masonry . . . less complex than the great house . . . but . . . more architecturally complex than herraduras." Nials et al. suggest that these road-related features are "fancy herraduras" (Nials et al. 1987:14) because, like herraduras, they are located in elevations of high visibility near roads. Kincaid et al. (1983:9/12) considers Halfway House (LA 15191) along the North Road to be a good example (figure 6.12), though beginning with John Kantner and Nancy Mahoney (2000:2), researchers have usually included Halfway House in tallies of outlier great houses.

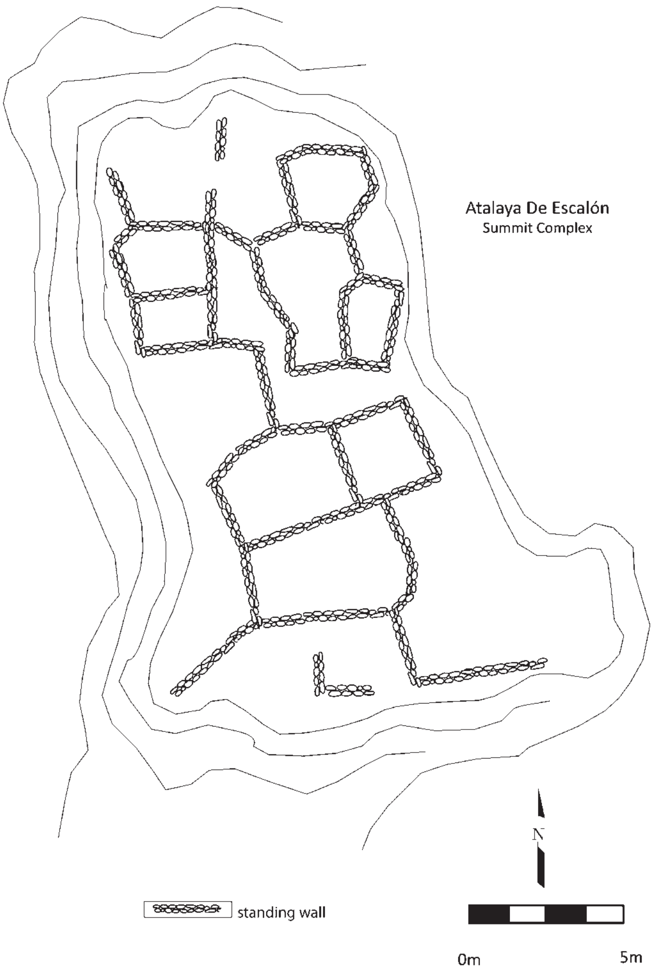


Figure 6.13. *Escalon Atalaya. By Dan Leja, based on unnumbered figure from Marshall and Sofaer's (1988) draft report.*

ATALAYAS

Marshall and Sofaer (1988) introduced the term *atalaya* (Spanish for watchtower) to describe a low-walled structure atop a pinnacle, sometimes associated with a platform, staircase, or ramp. Like avanzadas and zambullidas, atalayas can have extremely variable architectural configurations, and they are usually unroofed. The primary distinguishing characteristic of the atalaya seems to be its topographic position atop a spire. Roads may or may not be in the vicinity. The Escalon atalaya sits atop a pinnacle accessible via a large, constructed ramp (figure 6.13).

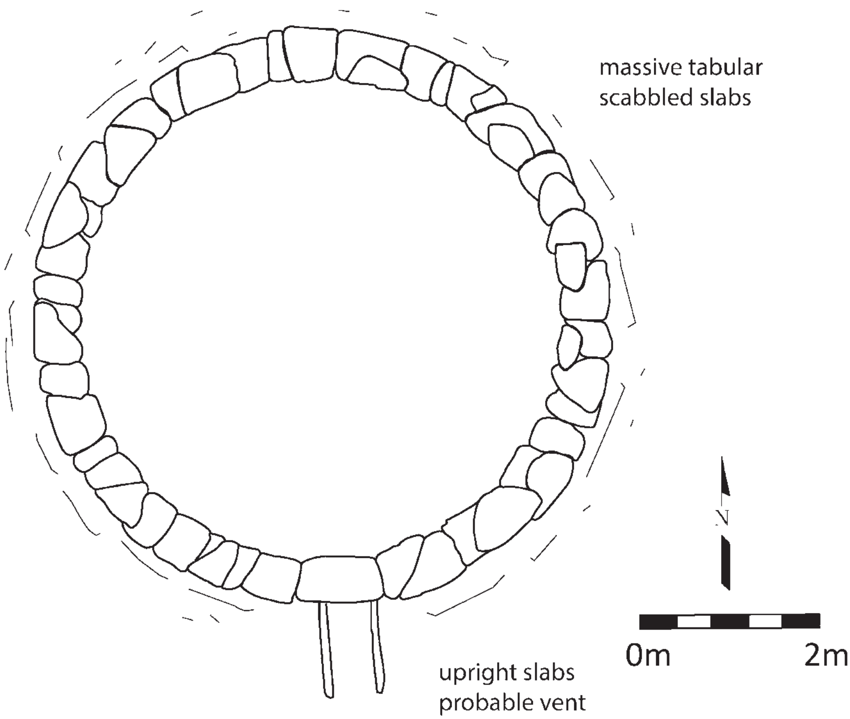


Figure 6.14. *Tse Nizhoni, "Pretty Rock," LA 37676. By Dan Leja, based on Kincaid et al. 1983:fig. C-23.*

Gateway Shrines

Two massive, circular ERF structures at the west end of Chaco Canyon have earned special designation as "gateway shrines," according to Kincaid et al. (1983:9/21–22, C/63–64). Both are in prominent, difficult-to-access locations with spectacular views westward along the Chaco River. Both consist of circular structures 5–7 m in diameter with vents or doorways to the east and south.

"Tse Nizhoni" (LA 37676) sits atop Pretty Rock, a dramatic, isolated sandstone butte elevated 20 m above the north side of the Chaco River. In 1981 Richard Loose and John Stein recorded a coursed sandstone masonry stone circle approximately 5 m in diameter, with a standing wall height of 0.4 m (figure 6.14). On the south side of the circle, there is a small ventlike feature consisting of upright slabs. The Solstice Project revisited the site in 1985 (Marshall and Sofaer 1988:224–226). Both groups considered the masonry to be Chacoan in style; neither observed any associated artifacts.

Figure 6.15. *"Medicine Hogan," LA 41088. Aerial view to the southwest. Photo by E. Beckert, 1994, 20/1-1088, courtesy of Chaco Culture National Historical Park.*

Approximately 8.5 km to the southeast, the west face of West Mesa looms 150 m above the south side of the Chaco River. At the extreme western edge of this landform, a similar structure dubbed the "Medicine Hogan" (LA 41088) straddles a crack in the caprock (Kincaid et al. 1983:9/21, C/63–64; Marshall and Sofaer 1988:241–242). Here, the sandstone caprock is crazed with deep cracks. Across one of these, there is a low-walled, circular enclosure of tabular brown sandstone with an opening to the southeast. This massive circular structure appears to have had an original diameter of approximately 7 m, though it has been split in half by the shifting caprock (figure 6.15). Unbanded, sandstone slab-masonry walls up to 1.25 m high are four slabs wide, reaching a thickness of nearly 1 m. The feature does not appear to have been roofed, but there is a 1-m-wide doorway opening to the east-southeast. Builders erected the structure atop sandstone slickrock, but Chaco Center archaeologists observed shallow fill consisting of aeolian sand 8–10 cm deep. Peter McKenna and Tom Windes (1975) conducted test excavations in this fill—they found no evidence of a prepared floor, no floor features, no evidence of roof fall, and a scant assemblage of lithic artifacts. Despite the feature's superficial similarity to a Navajo hogan, McKenna and Windes, Kincaid et al. (1983), and

Figure 6.16. *Cairn on sandstone spire on west side of Chacra Mesa, looking east toward Fajada Butte. Photo by Ruth Van Dyke.*

Sofaer and Marshall (1988) all consider the feature to be Chacoan. They base this interpretation on several lines of evidence, including the massive, Chaco-looking sandstone walls and the lack of historic artifacts; they also note that local Navajo families deny any knowledge, use of, or association with the feature (Marshall and Sofaer 1988:243). The "Medicine Hogan" feature is part of a site known as the Chaco West Cairn Complex, 29SJ 1088, which I discuss in more detail in the "cairns" section below.

Cairns

Cairns, "the ubiquitous piles of stones of the Navajo country" (Hayes et al. 1981:17), are a particularly troublesome, yet potentially important, class of ERF. These features are found atop many high places across the San Juan Basin (figure 6.16). Features recorded as cairns range from a subtle stack of three rocks near Kin Klizhin (figure 6.17) to the set of twelve formally constructed pillars in association with the "Medicine Hogan" at 29SJ 1088 (figure 6.15). Cairns frequently lack associated artifacts, making them difficult to date. Archaeologists have assumed that many cairns in association with Chacoan construction date from Chacoan periods; however, scholars also know that Navajo inhabitants of the San Juan Basin construct cairns for a wide range of reasons and that they have done so for centuries. A pile of rock marks a place, but the reasons and the timing of that marking are often difficult, if not impossible, to

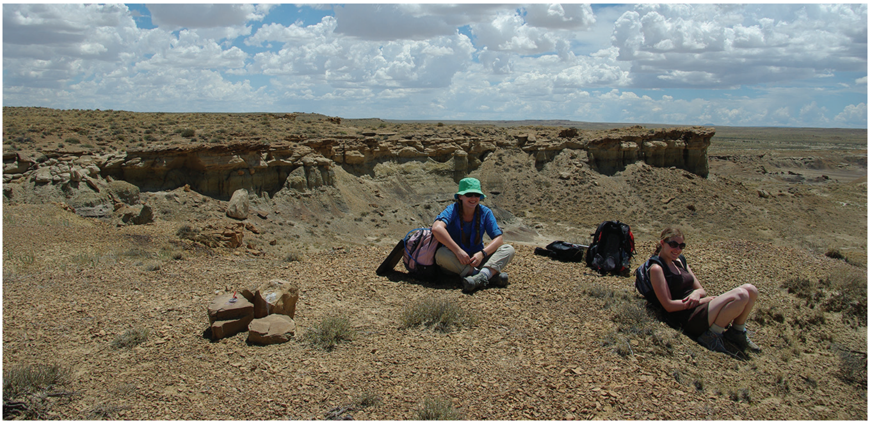


Figure 6.17. *Cairn 29SJ 2429, in the Kin Klizhin community. Photo by Ruth Van Dyke.*

determine. To further complicate matters, once a cairn is erected, it may well be used across centuries for a wide range of purposes. In Hayes's survey of Chaco Canyon National Monument (as Chaco Culture National Historic Park was known prior to 1980), he recorded cairns that "ranged from low piles of carelessly piled stones to carefully constructed, truncated, cone-like pylons up to 1.8 m high" (Hayes et al. 1981:34). Hayes et al. (1981:34) recorded 68 cairns in close association with Navajo dwellings, plus 82 more that they considered to be Navajo in origins. Furthermore, Hayes et al. recorded 14 cairns in close association with Ancient Pueblo sites and 51 sites consisting of isolated cairns or sets of cairns, with a grand total of 297 cairns at 165 sites within the 1971 park boundaries (1981:40). Hayes et al. noted that this collection included recent survey monuments, stockpiles of building material near quarries, trail markers at the heads of cliff access routes, cairns associated with stone circles, and cairns associated with petroglyphs.

Clearly not all cairns are relevant for Chacoan archaeology, but frequently there is not enough material or ethnographic information available to reliably and correctly assign cairns to a specific time period or function. Archaeologists usually must base temporal and cultural affiliation on masonry style, the presence of fill, or associations with nearby features. Where possible, archaeologists should consult with local populations for additional information about cairns that seem to be associated with Chacoan archaeology. In the Whirlwind House area, for example, highly visible cairns and upright slabs are found atop many high places and rock formations. Through ethnohistoric research, it became clear that most if not all of the Whirlwind area markers were set up over the past century by Navajo shepherds (Tim Kearns, personal communication, August 2013).

The most clearly Chacoan set of cairns within the CCNHP is found at 29SJ 1088 in association with the "Medicine Hogan" described above. The west end of West Mesa is demarcated by thirteen large, barrel-shaped cairns up to 1.5 m in diameter and 1.8 m high that sit atop the mesa edge to the north and south of the circular structure. From below, the cairns are silhouetted against the sky and, depending on the viewer's imagination, they give the mesa edge a "crenellated appearance" (Kincaid 1983:C-64), appearing as a set of jagged teeth, or distant human figures (see the cover of this volume). The Navajo name for the west end of West Mesa is *Na'nishzhin* (black spotted), which references this effect (Fransted and Werner 1974:77–78). The cairns were first noted in about 1901 by Wetherill and the Tozzer Expedition (Windes 2018:692). The site subsequently has been recorded by Hayes et al. (1981:42–43), Kincaid et al. 1983 (9/21–23), and the Solstice Project (Marshall and Sofaer 1988:238–244). Two cairns are located north and eleven are to the south of the "Medicine Hogan," spaced fairly evenly along the mesa edge approximately 10 m apart. In 1983 Kincaid et al. noted thirteen cairns ranging from 0.4 m in diameter and 0.5 m high to 1.0 m in diameter and 1.8 m high, while in 1988, Marshall and Sofaer recorded twelve cairns ranging in diameter 0.8–1.5 m and 0.75–1.5 m in height. The best-constructed of these cairns are made of the same massive stacked sandstone masonry as the "Medicine Hogan," with interiors filled with stacked rubble. However, not all of the cairns are in the best of shape. At a site visit in 2003, I noted that most of the cairns were collapsed piles of stone. At the westernmost extremity of the mesa point, south of the "Medicine Hogan," I observed five standing barrel-shaped cairns that can be clearly seen from the Chaco Wash, 150 m below. The westernmost of these was one of the best preserved. In 2003 this solidly circular mass of stacked tabular brown sandstone was approximately 1.3 m in diameter and 1.2 m high, though limited rubble attested to a slightly taller original height. Very few artifacts are associated with any of these features, but Chaco Center as well as Solstice Project scholars are convinced that they represent Bonito-style masonry (Hayes et al. 1981:43; Marshall and Sofaer 1988:240).

Slab Boxes

Pueblo people traditionally may construct small boxes of upright sandstone slabs to contain offerings such as prayer sticks (Stevenson 1904). Hayes et al. (1981:17) recorded ten of these within Chaco Canyon National Monument.

These were approximately 1 × 1 m in size; two were in high places, and one was near a spring. Kincaid et al. (1983:9/23) report two slab boxes in association with the Great North Road and the Ah-Shi-Sle-Pah-Road, respectively.

Modified Stones

Like contemporary Pueblo peoples, the Chacoans may have marked important places with subtle material indicators that could be difficult for archaeologists to recognize, such as boulders with ground cupules or slick areas, elongated upright rocks, and large depressions (Duwe 2016; F. Ellis 1974:105; Fowles 2009:457, table 1; Ortiz 1969:18–25; Parsons 1939:218, 243). While investigating 12 ancestral Tewa sites in the Rio Chama watershed, Samuel Duwe (2016) identified 70 kayé, or pounded cupule shrines, comprising 675 pecked stone cupules. Historically, Tewa created kayé as they pounded on boulders to communicate with other worlds. People visited and tended these important nodes in Tewa sacred geography (Duwe 2016). Archaeologists interested in thinking about possible markers of past pilgrimage, community boundaries, or religious activity thus might be mindful not only of ERFs but also of modified rocks possibly recorded as cupules or petroglyphs (see also Gilpin, chapter 5 in this volume). Some stones that were significant places for Chacoans are likely not marked by anything readily recognizable by an archaeologist today.

POSSIBLE FUNCTIONS AND MEANINGS

Above, I have attempted to systematically review the kinds of enigmatic rock features archaeologists encounter across the San Juan Basin in association with Chacoan sites. Chacoans created stone rings, stone piles, and other kinds of stone configurations to mark places . . . but to what ends? There are many possibilities, and they are not mutually exclusive. In this section of the chapter, I offer a brief review and discussion of some of the most frequently discussed explanations for ERFs: marking community boundaries, cosmographies, and prayer spots; denoting roads, waypoints, and alignments; establishing locations where people could see people or places or be seen by one another; and activities such as trapping eagles. Although many ERFs are in elevated, highly visible locations, this is not true of all of them. In the discussion that follows, I attempt to sequester and organize discussions of visibility, though it is not strictly possible to do so. Clearly, for Indigenous people living at altitude on a horizontal landscape with clear, bright skies, long-distance visibility was and continues to be important. I shall begin with functions and meanings that are less entangled with visibility, and proceed outward from there.

Cosmographies and Community Boundaries

Some Chacoan ERFs may indeed be shrines, in the Pueblo sense of marking cosmographies, community boundaries, or cardinal directions. At specific times Pueblo people visit these special, marked locations as part of ritual practices or "doings"—once there, they might need to pray, sing, or take or leave particular objects.

Alfonso Ortiz (1969:18–25) described the nested, hierarchical shrine system that surrounds a Tewa village. An upright slab in the plaza represents the center of the world. Moving outward from the Tewa village in four cardinal directions, there are two additional sets of shrines: (1) keyhole-shaped directional shrines on hillslopes face downward toward the village; and (2) world-quarter shrines open to the east, which sit atop highly visible high places in four directions within a km or two of the village. Scott Ortman (2012:312–319) identifies these complex shrine configurations at thirteenth-century Tewa sites in the Rio Grande area (Anschuetz 1998; Curtis 1926; Douglass 1915; Hewett 1938:55; Jeançon 1923:70–73; Marshall and Walt 2007:C-2; Nelson 1914:70–471; Wendorf 1953:53), and he contends that this nested, hierarchical shrine system represents place-making practices specific to Tewa speakers.

The Tewa directional and world-quarter shrine system is part of Ortman's (2008, 2012) argument for migration of Tewa speakers from the Mesa Verde region to the Rio Grande in the thirteenth century. Enigmatic rock features are common in the Mesa Verde region (e.g., Bernhart and Ortman 2013; Ferguson and Rohn 1986:129; Fetterman and Honeycutt 1987:107; Rohn 1977:113). Ian Thompson et al. (1997), in a move similar to the one I am making here, began designating miscellaneous Mesa Verde region features as Architecture With Unknown Function (AWUFs), although AWUF was a broader designation than ERF, and the term did not catch on. Ortman (2012:312–319; Bernhart and Ortman 2013) builds a case for the presence of early world-quarter shrines at several prominent Pueblo III period sites in the Mesa Verde region, and he identifies a complete Tewa-style directional shrine system at the early thirteenth-century site of Castle Rock Pueblo (Ortman 2008).

Other researchers also have used Pueblo cosmology as the basis for investigating ancient Pueblo landscapes in the northern Rio Grande. For example, Fowles (2009) located directional shrines surrounding the ancient Tiwa site of

T'aitöna (Pot Creek Pueblo). Duwe (2011, 2016) investigated Tewa landscapes in the Rio Chama. James Snead (2008:101) identified directional shrines at the Keres site of Los Aguayes.

Extending these ideas back into the ninth–twelfth centuries, we might expect that Chacoan ERFs found on high places or slopes in cardinal or intercardinal directions from a major "center place" might be marking cosmography, or the interstitial boundaries of a nested, hierarchical cosmography. Likely candidates, for example, include the two J-shaped "Windes' shrines" on Chacra Mesa and South Mesa. These features bracket Fajada Butte, iconic symbol of central Chaco, and home of the Sun Dagger petroglyph.

Such ERFs as these were probably important places to visit and pray in the past, and they may still be in active use today. These ERFs may commemorate the locations of remembered or mythic events. Some of these ERFs might be in highly visible high places, but others might not. To evaluate these possibilities on the Chacoan landscape, and to avoid inadvertent trespass, archaeologists should work closely with Indigenous collaborators.

Roads and Waypoints

Boundary markers, prayer places, and waypoints are not mutually exclusive functions for ERFs, particularly within a context of Pueblo "doings." Keresan place-making practices involve the creation of C-shaped shrines open to the east, situated along a north-south line, and associated with paths of movement (White 1942:80–94, 1960, 1962:110–115). Similarly, some ERFs—particularly herraduras—seem clearly related to Chaco roads. Kincaid et al. (1983) found that they could reliably locate Chaco roads by "connecting the dots" between herraduras. A comprehensive discussion of possible road functions, and the role of herraduras in relation to road engineering, is beyond the scope of this chapter (but see Vivian 1997b, and Friedman et al., chapter 13 this volume).

If we assume that people traveled from outlying areas to Chaco Canyon, they must have walked on roads, trails, or both. Even the best-established walking routes can require waypoints, particularly at topographic breaks or trail intersections (Darling 2009; Ingold 2011). Some cairns seem to be trail markers (figure 6.18). It can be difficult to find a good pedestrian route up or down the 100+ m escarpments of the Chaco mesas. Contemporary tourists pile stacks of rocks along the proscribed hiking trails of Chaco—some of these serve as useful markers when the hiker must navigate a sudden change in topography, but many seem primarily to illustrate the human walker's universal practice of piling stones or other small objects in passing (Darling 2009:79; Frey 1998:fig. 5).

Figure 6.18. *Cairn 29SJ 184, on the south edge of Chacra Mesa, looking south toward Mount Taylor, and marking an access trail on the south side of the mesa. Photo by Ruth Van Dyke.*

For outlier residents walking into Chaco Canyon, there are several major, obvious entry points: the North Road, the east canyon, Fajada Gap, South Gap, and the west canyon. Roads, ramps, and staircases indicate that several tributary canyons on the north side of Chaco Canyon were also entries. As pedestrian travelers moved into or out of Chaco Canyon, we might expect that boundaries would have been be crossed, and these boundaries might have been marked by ERFs. This is the reasoning behind Kincaid et al.'s discussion of LA 51167 and 29SJ 1088 as "gateway shrines." It is notable that both features are situated at the west end of Chaco Canyon, along the Chaco River—presumably the major route of travel for ancient Pueblos moving to and from Chaco Canyon and the Chuska Valley. There are many outlier communities west of Chaco. However, there are also many outlier communities north and south of Chaco, and archaeologists have not, as yet, located similar "gateway shrines" along routes of travel in those directions.

Astronomical Alignments

Thus far I have been discussing possible functions of ERFs from the perspective of a human subject moving across a rugged landscape. The sun, moon, and stars also move—across the sky—and we know that Chacoans were following these movements attentively (e.g., Malville 2004; Sofaer et al. 1979; Sofaer 2007). Sofaer and colleagues recently have pointed out that twelve of the features classified here as ERFs cluster along the ± 53.5° azimuths of the rising and setting moon at the major lunar standstill (Sofaer et al. 2017). Sofaer's study involves twelve features recorded as crescents, J-shaped "Windes' shrines," cairn clusters, and one zambullida. All twelve of the ERF features were selected for inclusion because they were situated in locations of high visibility in or near Chaco Canyon. Sofaer et al. excluded ERFs situated on lower terrain, and they excluded herraduras on the grounds that these features are "road-related." Interestingly, Chaco Canyon itself trends along the ± 53.5° azimuth, so it is not surprising that ERFs on high places (though not all of them are on rims) would adhere to this alignment. Sofaer and colleagues note that the twelve ERFs included in their study are not intervisible, nor do they consider this to have been important. Nonetheless, the study is intriguing, and it is certainly possible that ancient Chacoans constructed some ERFs to mark particular solar, lunar, or other celestial events.

Visibility: To See and Be Seen

In the Chacoan world of a millennium ago, there are clear archaeological indicators that Chacoans emphasized visibility for a range of purposes. People in the ancient as well as the contemporary Pueblo world would have been looking out across the open horizon toward prominent landforms, distant peaks, or archaeological sites. People could have been marking points from which to observe others on the landscape, or distant peaks, or solar and lunar events. At the same time, they could have been marking locations or high places that they wanted others to be able to see. It is important to think analytically about the different (if at times overlapping) ways that visibility might have been relevant for Chacoans. *To see* and *to be seen*, while coterminous and complementary concepts, nonetheless imply diverse practices that might range from surveillance and wayfaring to communication and identity construction. These practices have different kinds of implications for our understanding of Chaco.

At present, Chacoan studies of sensory landscape dimensions such as viewscapes and soundscapes are in their infancy. Energy development threatens the destruction of Chacoan viewscapes just as archaeologists are beginning to systematically explore them. In this chapter I focus on ERFs, but I direct the reader to chapter 11 (Van Dyke et al., this volume) for detailed investigations into Chacoan community viewscapes and soundscapes at the outliers of Bis sa'ani and Pierre's.

WITHIN LOCAL COMMUNITIES: SURVEILLANCE AND IDENTITY

For Western capitalist societies, *to see*—to look at another person or place—is bound up with knowledge of and power over (Thomas 1993). Jeremy Bentham's perfect prison—the panopticon—is the quintessential Foucauldian example of the power of surveillance in the modern era (Foucault 1977). In a panoptic situation, subjects who cannot see a central watcher (or each other) discipline their own behavior because they are conscious that they may be being watched. Although Bentham's 1787 panoptic gaze is generally discussed within the context of modern, capitalist states, some archaeologists have documented similar kinds of unidirectional surveillance in the ancient past (Yekutieli 2006).

Chacoan topography juxtaposes high escarpments with deep adjacent canyons and valleys, providing ample opportunities for people on high places to watch those below while remaining themselves unobserved. Windes (1978) noted that stone circles are nearly always positioned on high slickrock benches where they can see one or more great kivas. It is interesting to think about this relationship in the context of possible surveillance. From the stone circles on the rims of Chaco Canyon, people could watch others moving around great houses, or outside of great kivas, in Chaco Canyon far below. It is unlikely, however, that people inside the canyon (or inside great kivas) would be aware of the watchers.

The cairns at 29SJ 1088 are an interesting possible case of panoptic surveillance. From the Padilla Wash Chacoan community in the valley below and west of West Mesa, the cairns on the mesa rim appear as dark, indistinguishable figures (*Na'nishzhin*) (figure 6.19; see also book cover). It is not possible to make out the human figure beyond distances of approximately 400 m or so (Hamilton and Whitehouse 2006:47). Thus, from the Padilla Wash community, it is very difficult to tell whether the dark figures are cairns, juniper trees, or human watchers. It is conceivable that for the Chacoan residents of Padilla Wash community, the cairns of 1088 would invoke self-discipline, a sense of potentially being watched by Chaco.

And the converse of *to see* is *to be seen*. If there is no evidence to indicate watchers were hidden or ambiguous (as in the case of panoptic surveillance), intervisible connections might just as easily be fostering a sense of community among the part of the people who can all see a landmark, topographic feature, or building that symbolizes shared identity. Investigations into visibility within Chacoan outlier communities have yielded contradictory and complicated results. Some outlier great houses have visual connections with their communities, but others seem specifically situated not to have such connections. For example, John Kantner and Ronald Hobgood (2003) conducted a Geographic Information System (GIS) analysis at Kin Ya'a and

Figure 6.19. *The cairns of 29SJ 1088, as seen from the Padilla Wash Chacoan community. Photo by Ruth Van Dyke.*

demonstrated that the tower kiva's extra height increased visibility within the immediate Kin Ya'a community, suggesting that the Kin Ya'a tower kiva's likely audience was local. Similarly, in the Kin Bineola outlier community, Katherine Dungan (2009) found that the massive great house was positioned to be seen within the surrounding community. However, Katharine Ellenberger (2012) found that the Kin Klizhin tower kiva did *not* facilitate intervisibility with the surrounding community sites, which already could see one another quite well. And, at Whirlwind Lake, a great house perched on a high mesa overlooking a valley containing some twenty contemporaneous small sites is invisible from nearly all of its associated community sites. The Whirlwind great house does have line-of-sight connections to prominent landmarks such as Shiprock, White Rock, and Huerfano Mesa, and the structure is visible to approaching pedestrians at the edge of the valley 2–3 km away, suggesting its visible audience was nonlocal (Robinson et al. 2007). Most recently, Dungan et al. (2018) harnessed the power of GIS visibility modeling to conduct a total viewshed analysis for 430 great houses and great kivas. They found that builders consistently used topography to position great houses where the structures would be highly visible from a distance, concluding that "great houses were intended to be seen by individuals across the wider landscape, rather than only by viewers in the immediate vicinity of the building" (Dungan et al. 2018:916).

LOOKING AT LANDFORMS OVER LONG DISTANCES

To stand atop West Mesa, South Mesa, or Chacra Mesa is to look out at a world punctuated and surrounded by iconic volcanic and sedimentary landforms such as Hosta Butte, Shiprock, Huerfano Mesa, Mount Taylor, and the Chuska and San Juan Mountains. In the ethnographic past and present, buttes and mountain peaks are storied places for Pueblo and Navajo peoples, integrated into nested, layered cosmologies, bounding the world (e.g., Duwe 2011; Fowles 2009; Kelley and Francis 1994; Linford 2000; Malotki 1993; McPherson 1992, 2001; Ortman 2012:312–319; Ortiz 1969, 1972). To be a Navajo person is to live within the area defined by four sacred mountain peaks. I have argued that in the tenth century, many early Chacoan communities were positioned to see Sleeping Ute Mountain—perhaps a reminder of a ninth-century homeland (Van Dyke 2011). Wesley Bernardini and Matthew Peeples (2015) have demonstrated how prominent mountain peaks and landmarks could have helped with wayfaring and contributed to the creation of a sense of community during post-Chacoan times.

Given the spectacular range of peaks and landforms visible in and around the circumference of the San Juan Basin, it is highly likely that Chacoans, too, felt a sense of community or identity when in sight of certain distant topographic places. It may be coincidence that some ERFs mark places on the Chaco landscape where a viewer, looking outward, could see for long distances—see, for example, Mount Taylor on the horizon behind 29SJ 184 in figure 6.18. From the west end of West Mesa, marked by 29SJ 1088, a viewer looks down the Chaco River toward the Chuska Mountains, across major landmarks such as Pretty Rock and White Rock. It is difficult to know if these visual relationships were meaningful or merely coincidental, but such an interpretation is strengthened when ERFs seem carefully aligned to create relationships with distant landforms. For example, earlier I noted that a viewer standing in the stone circle 29SJ 1572 on the north rim of Chaco Canyon looks south/southeast through South Gap directly down the South Road at Hosta Butte (Van Dyke 2007:fig. 6.6).

Kincaid et al. (1983) note that herraduras, found along road segments, are often atop major topographic breaks with good visibility. Perhaps herraduras in high places were situated in part to facilitate the construction of long, straight Chacoan roads. See Van Dyke et al. (chapter 11, this volume) for a discussion of the role of herraduras and road construction in the Pierre's Chacoan community.

As I mentioned earlier, a viewer on West Mesa at 29SJ 1088 can see most of the western half of the San Juan Basin—a region that contained nearly sixty Classic Bonito phase outlier communities. The West Mesa escarpment, 150 m above the Chaco River, is a prominent high place in the middle of the basin that can be seen from as far away as Skunk Springs on the Chuskan slopes 75 km to the west. Although the cairns on the mesa rim are not distinguishable with the naked eye beyond a distance of approximately 1 km, the ERFs may be flagging this prominent spot as a marker for Chaco Canyon. Just as someone standing at this point can see most of the Chacoan world, the inhabitants of some sixty outlier communities in the western San Juan Basin could also see West Mesa, their visual link to Chaco. As Bernardini and Peeples (2015) postulated for northern Arizona, *to see* 29SJ 1088 could have been important for wayfaring as well as for a sense of shared Chacoan identity.

Signaling (Communication)

Windes and his associates have argued that J-shaped shrines on high places constituted a line-of-sight signaling system within Chaco Canyon (Hayes and Windes 1975; Windes et al. 2000). Hayes and Windes's (1975) investigations indicated that line-of-sight connections were critical factors in the locations of features such as 29SJ 1207 and 29SJ 706 along South Mesa. Across the greater San Juan Basin, researchers have anecdotally observed that ERFs associated with outlier great houses often create line-of-sight connections with Chaco Canyon. For example, the "giant head" of Cabezon Peak near the outlier of Guadalupe is topped by an ERF; although Cabezon Peak is not visible from Chaco Canyon, it is within sight of ERFs adjacent to and east of Fajada Butte. An ERF atop Huerfano Mesa links Pueblo Alto to the outlier great house of Chimney Rock, 140 km to the northeast (Freeman et al. 1996, 1997). A person atop Huerfano Mesa can see an ERF location atop the Knickerbocker Peaks east of Aztec Ruins, thereby connecting Chaco Canyon with the Aztec outlier. Intervisibility between the Kin Ya'a tower kiva and shrine 29SJ 706 on South Mesa is contingent on the tower kiva's precise alignment with a notch in an intervening ridge; this "impressive bit of engineering" seems good evidence for intentional line-of-sight communication between the two areas (Hayes and Windes 1975:154–155).

Chacoans certainly possessed the technology to signal over many kilometers. The Chaco Project used flares at night to demonstrate that signaling among shrines and great houses in high places is possible (Van Dyke et al. 2016:supplemental materials). Archaeologists have identified the presence of large hearths or fire pits associated with the canyon great houses of Pueblo Bonito / Chetro Ketl, Tsin Kletsin, and Pueblo Alto, and with the outlier great houses of Chimney Rock, Pierre's, Bis sa'ani, the Poco Site, and Guadalupe (Breternitz et al. 1982; Chaco Research Archive 2018; Drager and Lyons 1979; Eddy 1977; Harper et al. 1988; Pippin 1987; Powers et al. 1983). The translucent mineral selenite, widespread in the local Menefee Formation, is another possibility for flashing over long distances. Selenite is found in abundance in the rock formations below 29SJ 1088 at the west end of West Mesa, and it has been recorded in association with some Chaco outlier great houses (Mathien and Windes 1989:27). Florence Ellis was shown a selenite mirror purportedly for signaling among Rio Grande pueblos; she and Andrea Ellis successfully used selenite to signal between Gallina towers (A. Ellis 1991). Windes noted a "mirror"—now unfortunately lost—listed in a Bc 59 excavation field catalog (Chaco Research Archive 2018). In lieu of selenite, Gwinn Vivian and Doug Palmer used modern mirrors to establish line-of-sight connections between the outlier of Pierre's and the great houses of Pueblo Alto and Tsin Kletsin.

Chacoans had both means and motives to create a communication network that drew together the greater Chacoan world. This network may have involved both architecture and ERFs, and it probably changed over time. Recently, colleagues and I conducted a GIS analysis evaluating intervisibility (cumulative viewsheds and viewscapes) among 258 great houses and 87 ERFs (features recorded as shrines, stone circles, crescents, and herraduras) across the greater San Juan Basin and beyond (Van Dyke et al. 2016). We wished to know whether the canyon signaling network documented by Hayes and Windes (1975) extended outward into the San Juan Basin and, if so, when, and for how far. We found that great houses on high places are frequently intervisible in the absence of ERFs. The addition of ERFs to the landscape greatly enhanced intervisible connections, particularly across the central San Juan basin, north toward the Upper San Juan area, west to the Chuskan slopes, and south to the eastern Cibola area. This was particularly apparent in the Classic Chaco period, post AD 1050. We concluded that the Chaco phenomenon was held together, in part, by a network of intervisibility that could have facilitated communication across the Chacoan world. Because we did not want to prejudice our findings by using only ERFs in high (and therefore highly visible) places, we included all the Chaco-era ERFs we could find, of every shape and size (n = 83). Studies segregating ERFs into smaller subgroups (such as herraduras or stone circles) did not produce statistically significant results due to the small numbers of cases. There are undoubtedly many more ERFs out there to be recorded, which may well change our results in future.

Eagle Traps

There are other reasons to be in high places, along cliff edges, that have little to do with visibility. Pueblo and Navajo peoples have special dispensation from

Figure 6.20. *Working with the Navajo Nation Heritage and Historic Preservation Department, Pat Alfred examines an ERF that his team identified as an eagle trap, situated atop an escarpment on the north side of the Chaco River. Photo by Ruth Van Dyke.*

the US Department of Game and Fish to trap and to use and exchange feathers from protected raptors, such as golden and bald eagles, for religious and ceremonial reasons. These practices stretch back at least into historic times. I was with a team of Navajo Nation Heritage and Historic Preservation Department archaeologists in the western San Juan Basin when the team encountered a large stone cairn high on an escarpment overlooking the Chaco River. One of the team members identified the feature as an eagle trap, similar to ones he had used as a child with his grandfather (figure 6.20). According to the team member, a rabbit or other small game would be tied atop the cairn, and the eagle hunter would crouch down inside the cairn's empty center. When an eagle or other raptor approached the game, the hunter would spring up and grab the eagle by its talons. There were no visible artifacts, though there were scattered historic and contemporary Navajo homesteads in the vicinity. Without benefit of this Indigenous knowledge, a Euro-American Chaco scholar might have easily considered this feature to be a marker for Chacoan signaling or visibility. And, indeed, the feature might well be an ancient signaling station repurposed in historic times as an eagle trap. This encounter illustrates well the problems with attempting to monolithically ascribe function to an ERF, and it underscores the imperative for working in collaboration with Indigenous peoples.

DISCUSSION AND CONCLUSION

In this chapter I have offered a review of the many configurations of enigmatic stone features found across the greater Chaco landscape, followed by a systematic discussion of these features' possible functions within past and present Indigenous society. I have attempted to bring some clarity to the thicket of existing terminology. However, it is impossible to be exhaustive here, just as it is impossible to completely disentangle form from function or, indeed, to separate multiple overlapping meanings and purposes from one another. My primary goal here has been to demonstrate that ERFs are ubiquitous, yet poorly documented and even more poorly understood. I advocate for the ERF tag to be applied to all such features in existing databases, and on newly recorded future sites, so that researchers can more easily locate and evaluate these features in all their diversity.

My attempt here to replace the term *shrine* with the acronym ERF may strike some readers as whitewashing or as a scientific appropriation of something Indigenous and sacred. Given that archaeological investigations focused on *shrines* might understandably create Native American discomfort, is this something archaeologists should be studying at all? An emotional discussion of this issue took place at our August 2017 conference. With the benefit of some time for reflection, I would answer the question this way:

Euro-American archaeologists always should tread sensitively and lightly; we are guests walking in a past landscape that is not our own. This approach is especially true for ERFs, where it is likely that these features mark special beliefs, events, memories, or practices. If prayer sticks, sage bundles, turquoise chips, or other signs of recent visitation are on view, archaeologists should assume an ERF is a shrine in active use, and they should avoid interacting with it unless accompanied by an Indigenous person who gives them explicit permission to do so. If these kinds of signs are not obviously present, it may be impossible for Euro-American archaeologists to know for certain whether recording the feature would violate a sacred place. But ancestral shrines, like all Indigenous archaeological sites, do not come with expiration dates for their importance to descendant communities. For this author, the solution is to record with respect. As a Euro-American archaeologist, I have no wish to violate or interfere with Indigenous "doings" on the greater Chaco landscape. I do contend, however, that it is responsible archaeological practice to record ERFs (just as we record all archaeological sites), in the absence of signs of active use, and unless explicitly instructed not to do so by members of the descendant communities. It is also responsible practice for land managers to conduct substantive ethnographic research well in advance of any planned or potential impacts. When energy development advocates fail to see any intrinsic value to the landscape beyond its potential for mineral extraction, it is in our shared best interests to demonstrate to the best of our abilities that even small piles of rocks can potentially signal big ideas on the Chaco landscape.

ACKNOWLEDGMENTS

This chapter is, at its core, a summary and reinterpretation of the work of many venerable Chaco scholars, including Al Hayes, Chris Kincaid, Mike Marshall, Fred Nials, Bob Powers, John Roney, Anna Sofaer, John Stein, Gwinn Vivian, and Tom Windes. I am deeply grateful for their scholarship and inspiration. I thank Tom Windes, in particular, for sharing unpublished data and many enthusiastic conversations with me about the enigmatic rock features found in and around greater Chaco. I developed parts of this chapter in the context of a 2016 *American Antiquity* article on "shrines" and intervisibility, and I am grateful for the contributions of GIS wizard and thoughtful scholar Kyle Bocinsky on that undertaking. Early drafts of this chapter benefited from close reads and helpful comments offered by Carrie Heitman and three anonymous reviewers. Binghamton University MA student Daniel Leja helped assemble an ERF database for the Chacoan world. I alone, however, assume responsibility for any errors or oversights contained in this chapter.

REFERENCES

Anschuetz, Kurt F. 1998. "Not Waiting for the Rain: Integrated Systems of Water Management by Pre-Columbian Pueblo Farmers in North-Central New Mexico."

PhD dissertation, Department of Anthropology, University of Michigan, Ann Arbor.

Anschuetz, Kurt F. 2005. "Landscapes as Memory: Archaeological History to Learn from and to Live by." In *Engaged Anthropology: Essays in Honor of Richard I. Ford*, edited by Michele Hegmon and B. Sunday Eiselt, 52–72. Anthropological Papers 94, Museum of Anthropology, University of Michigan, Ann Arbor.

Bernardini, Wesley, and Matthew A. Peeples. 2015. "Sight Communities: The Social Significance of Shared Visual Landmarks." *American Antiquity* 80(2):215–236.

Bernhart, Robert, and Scott G. Ortman. 2013. "New Evidence of Tewa-Style Moiety Organization in the Mesa Verde Region, Colorado." In *Astronomy and Ceremony in the Prehistoric Southwest Revisited: Collaborations in Cultural Astronomy*, edited by G. E. Munson, Todd W. Bostwick, and T. Hull, 87–99. Maxwell Museum of Anthropology, Albuquerque.

Breternitz, Cory D., David E. Doyel, and Michael P. Marshall. 1982. *Bis sa'ani: A Late Bonito Phase Community on Escavada Wash, Northwest New Mexico*. Navajo Nation Papers in Anthropology 14. Navajo Nation Cultural Resource Management Program, Window Rock, AZ.

Curtis, Edward. 1926. "The Tewa." *The North American Indian*, vol. 17. Library of Congress, Washington, DC.

Darling, J. Andrew. 2009. "O'odham Trails and the Archaeology of Space." In *Landscapes of Movement: Trails, Paths, and Roads in Anthropological Perspective*, edited by J. A. Snead, C. L. Erickson, and J. A. Darling, 61–83. University of Pennsylvania Press, Philadelphia.

Douglass, William B. 1915. "Notes on the Shrines of the Tewa and Other Pueblo Indians of New Mexico." In *Proceedings of the 19th International Congress of Americanists*, 344–378. Washington, DC.

Drager, Dwight L., and Thomas R. Lyons. 1979. "Preliminary Report—Site 29SJ 1010, the Poco Site." Manuscript on file, Division of Remote Sensing, National Park Service, Santa Fe, and Accession 57, National Park Service, Chaco Culture National Historical Park Museum Archive, University of New Mexico, Albuquerque.

Dungan, Katherine. 2009. "Visibility, Monumentality, and Community in the Chacoan Community at Kin Bineola, New Mexico." MA thesis, Department of Anthropology, University of Arizona, Tucson.

Dungan, Katherine A., Devin White, Sylvaine Déderix, Barbara J. Mills, and Kristin Safi. 2018. "A Total Viewshed Approach to Local Visibility in the Chaco World." *Antiquity* 92(364):905–921.

Duwe, Samuel G. 2011. "The Prehispanic Tewa World: Space, Time, and Becoming in the Pueblo Southwest." PhD dissertation, University of Arizona, Tucson.

Duwe, Samuel G. 2016. “Cupules and the Creation of the Tewa Pueblo World.” *Journal of Lithic Studies* 3(3):147–168.

Eddy, Frank W. 1977. *Archaeological Investigations at Chimney Rock Mesa, 1970–72*. Memoirs of the Colorado Archaeological Society 1. Boulder, CO.

Ellenberger, Katharine. 2012. “Scales of Visibility at a Chacoan Outlier: The Visual World of People at Kin Klizhin.” MA thesis, Department of Anthropology, Binghamton University, NY.

Ellis, Andrea. 1991. “Towers of the Gallina and Greater Southwest.” In *Puebloan Past and Present: Papers in Honor of Stewart Peckham*, edited by Meliha S. Duran and David T. Kirkpatrick, 57–70. Archaeological Society of New Mexico Annual Volume No. 17. Archaeological Society of New Mexico, Albuquerque.

Ellis, Florence. 1969. “Differential Pueblo Specialization in Fetishes and Shrines.” *Anales, 1967–1968*. Sobretiro. Anales del Instituto Nacional de Antropología e Historia. Epoca 7a, tomo 1, numero 49, 1967–1968:159–180. Secretaria de Educacion Publica, Mexico City.

Ellis, Florence. 1974. *Navajo Indians 1: An Anthropological Study of the Navajo Indians*. Garland, NY.

Ferguson, William M., and Arthur H. Rohn. 1986. *Anasazi Ruins of the Southwest in Color*. University of New Mexico Press, Albuquerque.

Fetterman, Jerry, and Linda Honeycutt. 1987. “The Mockingbird Mesa Survey, Southwestern Colorado.” Bureau of Land Management, Denver.

Foucault, Michel. 1977. *Discipline and Punish: The Birth of the Prison*. Pantheon, New York.

Fowles, Severin. 2009. “The Enshrined Pueblo: Villagescape and Cosmos in the Northern Rio Grande.” *American Antiquity* 74(3):448–466.

Fowles, Severin. 2013. *An Archaeology of Doings: Secularism and the Study of Pueblo Religion*. 1st ed. School for Advanced Research Press, Santa Fe.

Fransted, Dennis, and Oswald Werner. 1974. “The Ethnogeography of the Chaco Canyon Area Navajo.” Manuscript on file, Chaco Archives, University of New Mexico, Albuquerque.

Freeman, Katherine, Robert Bliss, James R. Freeman, and Jennifer Thompson. 1997. “The Study of Visual Communication between Chimney Rock and Chaco Canyon.” Farmington High School Science Fair Project. Project presented at the Intel International (High School) Science and Engineering Fair, Louisville, KY. Copies in possession of K. Freeman and T. Windes.

Freeman, Katherine, Robert Bliss, and Jennifer Thompson. 1996. Visual Communications between Chimney Rock and Chaco Canyon. Paper presented at the Oxford V Conference on Archaeoastronomy, Santa Fe, NM.

Frey, Nancy. 1998. *Pilgrim Stories: On and Off the Road to Santiago*. University of California Press, Berkeley.

Hamilton, Sue, and Ruth Whitehouse. 2006. "Phenomenology in Practice: Towards a Methodology for a 'Subjective' Approach." *European Journal of Archaeology* 9(1):31–71.

Harper, Randy, Marilyn K. Swift, Barbara J. Mills, James Brandi, and Joseph C. Winter. 1988. *The Casamero and Pierre's Outliers Survey: An Archaeological Class III Inventory of the BLM Lands Surrounding the Outliers*. Office of Contract Archeology, University of New Mexico, Albuquerque.

Hayes, Alden C., David M. Brugge, and James W. Judge. 1981. *Archaeological Surveys of Chaco Canyon, New Mexico*. Publications in Archaeology 18A. National Park Service, Washington, DC.

Hayes, Alden C., and Thomas C. Windes. 1975. "An Anasazi Shrine in Chaco Canyon." In *Papers in Honor of Florence Hawley Ellis*, edited by Theodore R. Frisbie, 143–156. Papers of the Archaeological Society of New Mexico No. 2. Archaeological Society of New Mexico, Santa Fe.

Hewett, Edgar Lee. 1938. *Pajarito Plateau and Its Ancient People*. University of New Mexico Press and School of American Research Press, Albuquerque and Santa Fe.

Ingold, Tim. 2011. *Being Alive: Essays on Movement, Knowledge and Description*. Routledge, London.

Jeançon, Jean A. 1923. *Excavations in the Chama Valley, New Mexico*. Bureau of American Ethnology Bulletin 81. Government Printing Office, Washington, DC.

Kantner, John, and Ronald Hobgood. 2003. "Digital Technologies and Prehistoric Landscapes in the American Southwest." In *The Reconstruction of Archaeological Landscapes through Digital Technologies*, edited by Maurizio Forte, P. Ryan Williams, and James Wiseman, 117–123. Archaeopress, Oxford.

Kantner, John, and Nancy Mahoney, eds. 2000. *Great House Communities across the Chacoan Landscape*. Anthropological Papers of the University of Arizona No. 66. University of Arizona Press, Tucson.

Kelley, Klara B., and Harris Francis. 1994. *Navajo Sacred Places*. Indiana University Press, Bloomington.

Kincaid, Chris, ed. 1983. *Chaco Roads Project Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin 1983*. Bureau of Land Management, New Mexico State Office, Albuquerque District, Albuquerque.

Kincaid, Chris, John R. Stein, and Daisy F. Levine. 1983. "Road Verification Summary." In *Chaco Roads Project Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin 1983*, edited by Chris Kincaid, 9.1–9.78. Bureau of Land Management, New Mexico State Office, Albuquerque District, Albuquerque.

Latour, Bruno. 1993. *We Have Never Been Modern*. Translated by C. Porter. Harvard University Press, Cambridge, MA.

Leja, Daniel. 2019. "Gathered Stones: Applying a Relational Database to the Study of Enigmatic Rock Features." MA thesis, Department of Anthropology, Binghamton University–State University of New York.

Lekson, Stephen H. 1999. *The Chaco Meridian: Centers of Political Power in the Ancient Southwest*. Altamira Press, Walnut Creek, CA.

Linford, Laurance D. 2000. *Navajo Places: History, Legend, Landscape*. University of Utah Press, Salt Lake City.

Malotki, Ekkehart. 1993. *Hopi Ruin Legends: Kiqötutuwutsi*. Narrated by M. Lomatuway'ma, L. Lomatuway'ma, and S. Namingha Jr. University of Nebraska Press, Lincoln.

Malville, J. McKim. 2004. *Chimney Rock: The Ultimate Outlier*. Lanham, MD, Lexington Books.

Marshall, Michael P., and Anna Sofaer. 1988. "Solstice Project Investigations in the Chaco District 1984 and 1985: The Technical Report." Manuscript on file, Laboratory of Anthropology, Santa Fe, NM.

Marshall, Michael P., John R. Stein, Richard W. Loose, and J. E. Novotny. 1979. *Anasazi Communities of the San Juan Basin*. Public Service Company of New Mexico, Albuquerque.

Marshall, Michael P., and Henry Walt. 2007. "The Eastern Homeland of San Juan Pueblo: Tewa Land and Water Use in the Santa Cruz and Truchas Watersheds: An Archaeological and Ethnogeographic Study." Prepared for Ohkay Owingeh (San Juan) Pueblo. Report No. 432. Cibola Research Consultants, Corrales, NM.

Mathien, Frances Joan, and Thomas C. Windes. 1989. "Greathouse Revisited: Kin Nahasbas, Chaco Culture National Historical Park." In *From Chaco to Chaco: Papers in Honor of Robert H. Lister and Florence C. Lister*, edited by Meliha S. Duran and David T. Kirkpatrick, 11–34. The Archaeological Society of New Mexico No. 15. Albuquerque.

McKenna, Peter J., and Thomas C. Windes. 1975. "Test Excavations and Site Notes for 29SJ 1088." Unpublished manuscript on file, Chaco Project Records 0002/032.003-001 (CHCU 51405), Chaco Culture National Historical Park Archives, University of New Mexico, Albuquerque.

McPherson, Robert S. 1992. *Sacred Land, Sacred View: Navajo Perceptions of the Four Corners Region*. Charles Redd Center for Western Studies, Brigham Young University, Salt Lake City, UT.

McPherson, Robert S. 2001. *Navajo Land, Navajo Culture: The Utah Experience in the Twentieth Century*. University of Oklahoma Press, Norman.

Nelson, Nels C. 1914. *Pueblo Ruins of the Galisteo Basin, New Mexico*. Anthropological Papers of the American Museum of Natural History. Vol. 15, pt. 1. New York.

Nials, Fred, John Stein, and John Roney. 1987. *Chacoan Roads in the Southern Periphery: Results of Phase II of the BLM Chaco Roads Project*. Cultural Resources Series—Published Monographs, No. 1. Bureau of Land Management, Albuquerque District, Albuquerque.

Ortman, Scott G. 2008. "Action, Place and Space in the Castle Rock Community." In *The Social Construction of Communities: Studies of Agency, Structure and Identity in the Southwestern U.S.*, edited by Mark D. Varien and James M. Potter, 125–154. Altamira Press, Lanham, MD.

Ortman, Scott G. 2012. *Winds from the North: Tewa Origins and Historical Anthropology*. University of Utah Press, Salt Lake City.

Ortiz, Alfonso. 1969. *The Tewa World: Space, Time, Being and Becoming in a Pueblo Society*. University of Chicago Press, Chicago.

Ortiz, Alfonso. 1972. Ritual Drama and the Pueblo Worldview. In *New Perspectives on the Pueblos*, edited by Alfonso Ortiz, 135–161. University of New Mexico Press, Albuquerque.

Parsons, Elsie Clewes. 1939. *Pueblo Indian Religion*. University of Chicago Press, Chicago.

Pippin, Lonnie C. 1987. *Prehistory and Paleoecology of Guadalupe Ruin, New Mexico*. Anthropological Papers 112. University of Utah, Salt Lake City.

Powers, Robert P., William B. Gillespie, and Stephen H. Lekson. 1983. *The Outlier Survey: A Regional View of Settlement in the San Juan Basin*. Reports of the Chaco Center, No. 3. US Department of the Interior, National Park Service, Albuquerque.

Powers, Robert, and Ruth M. Van Dyke, eds. 2015. *An Archaeological Survey of the Additions to Chaco Culture National Historic Park*. Reports of the Chaco Center, No. 14. National Park Service, Santa Fe. Chaco Research Archive. Published by the Institute for Advanced Technology in the Humanities, University of Virginia. http://www.chacoarchive.org/ChacoAdditionsSurvey/toc.

Robinson, Tucker G., Ruth M. Van Dyke, and Thomas C. Windes. 2007. "Shrines and Great House Intervisibility across the Chacoan Landscape." Poster presented at the 72nd Annual Meeting of the Society for American Archaeology, Austin, TX. April 27.

Rohn, Arthur H. 1977. *Cultural Change and Continuity on Chapin Mesa*. Regents Press of Kansas, Lawrence.

Roney, John R. 1983. "Glossary." In *Chaco Roads Project, Phase 1: A Reappraisal of Prehistoric Roads in the San Juan Basin, 1983*, edited by Chris Kincaid, 1–12. Bureau of Land Management, Albuquerque.

Roney, John R. 1992. "Prehistoric Roads and Regional Integration in the Chacoan System." In *Anasazi Regional Organization and the Chaco System*, edited by D. E. Doyel, 123–131. Maxwell Museum of Anthropology Anthropological Papers 5. University of New Mexico, Albuquerque.

Snead, James. E. 2008. *Ancestral Landscapes of the Pueblo World*. University of Arizona Press, Tucson.

Sofaer, Anna. 2007. *Chaco Astronomy: An Ancient American Cosmology*. Ocean Tree Books, Santa Fe.

Sofaer, Anna, Volker Zinser, and Rolf M. Sinclair. 1979. "A Unique Solar Marking Construct." *Science* 206(4416):283–291.

Sofaer, Anna, Robert Weiner, and William Stone. 2017. "Inter-site Alignments of Prehistoric Shrines in Chaco Canyon to the Major Lunar Standstill." In *The Science of Time 2016*, edited by E. Arias, L. Combrinck, P. Gabor, C. Hohenkerk, and P. Seidelmann, 79–101. Astrophysics and Space Science Proceedings 50, Springer International Publishing, New York.

Stevenson, Matilda C. 1904. *The Zuni Indians, Their Mythology, Esoteric Fraternities, and Ceremonies*. 23rd Annual Report of the Bureau of American Ethnology. Washington, DC.

Thomas, Julian. 1993. "The Politics of Vision and the Archaeologies of Landscape." In *Landscape: Politics and Perspectives*, edited by B. Bender, 19–48. Berg, Oxford.

Thompson, Ian, Mark D. Varien, Susan Kenzle, and Rina Swentzell. 1997. "Prehistoric Architecture with Unknown Function." In *Anasazi Architecture and American Design*, edited by Baker H. Morrow and V. B. Price, 149–158. University of New Mexico Press, Albuquerque.

Todd, Brenda K. 2011. "Chimney Rock Stabilization Project, Chimney Rock Great House (5AA83), Archuleta County, Colorado." Unpublished report prepared for the USDA San Juan National Forest, Pagosa District, Chimney Rock Interpretive Association, and the University of Colorado–Boulder.

Van Dyke, Ruth M. 2001. "Andrews Community Archaeological Research Project, 1999–2000." Report prepared for the Bureau of Land Management, Albuquerque, and the State of New Mexico, Santa Fe. Manuscript on file, NMCRIS Project No. 65869, Laboratory of Anthropology, Santa Fe, NM.

Van Dyke, Ruth M. 2007. *The Chaco Experience: Landscape and Ideology at the Center Place*. School of Advanced Research Press, Santa Fe.

Van Dyke, Ruth M. 2011. "Anchoring Identities: Iconic Landforms across San Juan Time and Space." In *Changing Histories, Landscapes, and Perspectives: The Twentieth Anniversary Southwest Symposium*, edited by Margaret C. Nelson and Colleen A. Strawhacker, 403–422. University Press of Colorado, Boulder.

Van Dyke, Ruth M., R. Kyle Bocinsky, Thomas C. Windes, and Tucker J. Robinson. 2016. "Great Houses, Shrines, and High Places: A GIS Viewshed Analysis of the Chacoan World." *American Antiquity* 81(2):205–230.

Vivian, R. Gwinn. 1997a. "Chacoan Roads: Morphology." *Kiva* 63(1):7–34.

Vivian, R. Gwinn. 1997b. "Chacoan Roads: Function." *Kiva* 63(1):35–67.

Wendorf, Fred. 1953. "Excavations at Te'ewi." In *Salvage Archaeology in the Chama Valley, New Mexico*, edited by Fred Wendorf, 34–93. Monographs No. 17. School of American Research, Santa Fe, NM.

White, Leslie A. 1942. *The Pueblo of Santa Ana*. Memoirs No. 60. American Anthropological Association, Washington, DC.

White, Leslie A. 1960. "The World of the Keresan Pueblo Indians." In *Culture in History: Essays in Honor of Paul Radin*, edited by S. Diamond, 53–64. Columbia University Press, NY.

White, Leslie A. 1962. *The Pueblo of Sia, New Mexico*. Smithsonian Institution, Washington, DC.

Windes, Thomas C. 1978. *Stone Circles of Chaco Canyon, Northwestern New Mexico*. Reports of the Chaco Center No. 5. National Park Service, Department of the Interior, Albuquerque.

Windes, Thomas C. 1991. "The Prehistoric Road Network at Pueblo Alto, Chaco Canyon, New Mexico." In *Ancient Road Networks and Settlements in the New World*, edited by Charles D. Trombold, 111–131. Cambridge University Press, Cambridge.

Windes, Thomas C. 2018. *Early Puebloan Occupations in the Chaco Region, Parts 1–2: Excavations and Survey of Basketmaker III and Pueblo I Sites, Chaco Canyon, New Mexico*. Rev. ed. Arizona State Museum Archaeological Series 214, University of Arizona, Tucson.

Windes, Thomas C., Rachel Anderson, Brian Johnson, and Cheryl Ford. 2000. "Sunrise, Sunset: Sedentism and Mobility in the Chaco East Community." In *Great House Communities across the Chacoan Landscape*, edited by John Kantner and Nancy M. Mahoney, 39–59. Anthropological Papers of the University of Arizona, No. 64. Tucson.

Yekutieli, Yuval. 2006. "Is Somebody Watching You? Ancient Surveillance Systems in the Southern Judean Desert." *Journal of Mediterranean Archaeology* 19(1):65–89.

III

Indigenous Perspectives

Figure 7.1. *Ernest Vallo at Pueblo Bonito. Photo by Cloudy Ridge Productions.*

Figure 7.2. *Ernest Vallo and William B. Tsosie Jr. at Pueblo Bonito. Photo by Cloudy Ridge Productions.*

7

Acoma (Haaku) Perspectives

Ernest M. Vallo Jr.

Watch the videos, recorded at Chaco Culture National Historical Park, October 21–22, 2017.

https://doi.org/10.5876/9781646421701.c007.v001
https://doi.org/10.5876/9781646421701.c007.v002

Speaking in English and in Keresan, Acoma tribal elder Ernest Vallo describes the importance of Chaco Canyon to his people. Standing in Pueblo Bonito and at Casa Rinconada, Mr. Vallo relates how Acoma ancestors were part of the gathering of peoples at Chaco before they continued on their migrations. Mr. Vallo describes the clans that make up the Acoma people today. He emphasizes the importance of water for the Acoma, and he voices the particular concern that oil and gas drilling in the Chaco area may contaminate the water—a critical resource that needs to be protected. Mr. Vallo encourages young people to learn about Chaco and participate in consultation with the park service. He issues a plea for the public and for government agencies to respect, preserve, and protect the archaeology of greater Chaco.

Mr. Vallo was filmed speaking in Chaco Canyon in October 2017, together with Mr. William B. Tsosie Jr., a Diné archaeologist (see chapter 8). Mr. Vallo and Mr. Tsosie come together in mutual respect and cooperation to emphasize how important it is for Native peoples to put aside their differences. Both men emphasize that cooperation is needed to help protect the water, the air, and the earth from oil and gas development.

DOI: 10.5876/9781646421701.c007

8

Diné (Navajo) Perspectives

William B. Tsosie Jr., with Denise Yazzie, Eurick Yazzie, and Tristan Joe

Watch the videos, recorded in Chaco Culture National Historical Park, October 21, 2017.

https://doi.org/10.5876/9781646421701.c008.v001
https://doi.org/10.5876/9781646421701.c008.v002
https://doi.org/10.5876/9781646421701.c008.v003
https://doi.org/10.5876/9781646421701.c008.v004
https://doi.org/10.5876/9781646421701.c008.v005

In this series of seven short videos, filmed in Chaco Canyon in October 2017, Diné (Navajo) archaeologist William B. Tsosie Jr. shares some of his traditional knowledge about Chaco. Mr. Tsosie engages in conversation with Ms. Denise Yazzie, a teacher at Navajo Preparatory School in Shiprock, and two of her students. Speaking in the Diné language, Mr. Tsosie introduces himself and discusses the importance of Chaco to the Diné (Navajo) people. This is a holy place, known from stories such as that of Nááhwiilbiihi (the Great Gambler). Navajo Preparatory students Eurick Yazzie and Tristan Joe share their impressions of their first visit to Chaco Canyon. Mr. Tsosie shares his knowledge with them regarding the origins of the Diné people, and relationship of the Diné people to Chaco Canyon and the Ana'asazi. Their teacher Ms. Yazzie is gratified to learn more about the history of Chaco, and she emphasizes the importance of passing traditional knowledge to the next generation. Mr. Tsosie and Ms. Yazzie express concern over drilling for oil and gas near this place, because it will harm Mother

DOI: 10.5876/9781646421701.c008

Figure 8.1. *Denise Yazzie, Tristan Joe, Eurick Yazzie, and Will Tsosie in Chaco Canyon. Photo by Cloudy Ridge Productions.*

Earth. They discuss the difficulties in balancing revenue from mineral extraction with protecting irreplaceable and fragile cultural landscapes. Ms. Yazzie encourages Diné youth to use their voices as young leaders of the future. It is important to be reverent and to remember that your life is a prayer, watched over by Mother Earth and Father Sky. In the final segment, in Pueblo Bonito, Mr. Tsosie offers a Blessingway Song.

9

Hopi Perspectives

Terrance Outah,
Georgiana Pongyesva,
and Ronald Wadsworth

Watch the video, recorded in Chaco Culture National Historical Park on August 22, 2019.

https://doi.org/10.5876/9781646421701.c009.v000

Two members of the Hopi Cultural Resources Advisory Task Team (Terrance Outah and Ronald Wadsworth) and a staff member from the Hopi Cultural Preservation Office (Georgiana Pongyesva) once again visited Yupköyvi (Chaco Culture National Historical Park) to speak about its importance, Hopi peoples connections to this place, and the grave concerns they have for its future. Chaco was built by the children of *Màasaw*, the guardian of the fourth world. These ancestors, Màasaw's children, are still there. Chaco is a place of power and regeneration for Hopi people and a reminder of their enduring spirituality and strength. The buildings still stand today because they were built with purpose and substance all the way down to their foundations. Like the human nervous system, spirit lines of energy and vibration connect Chaco within a broader web of energy and blessings. Oil, gas, and uranium extraction threaten to sever those connections and create imbalance. Hopi teachings warn that what is below does not belong to anyone, and they implore fossil fuel developers to respect their people, to respect their ancestors. A culture of greed and extraction threatens Hopi religious commitments to reciprocity. For everything taken,

DOI: 10.5876/9781646421701.c009

Figure 9.1. *Hopi Cultural Resources Advisory Task Team members Terrance Outah, Sue Kuyvaya, Georgiana Pongyesva, and Ronald Wadsworth in Pueblo Bonito. Photo by Cloudy Ridge Productions.*

something must be given. Disturbing the land causes imbalance in the ecosystem and rainfall. We must protect Chaco and the areas surrounding it not just for Hopi, but for all humanity.

10

A:shiwi (Zuni) Perspectives

Octavius Seowtewa,
Curtis Quam,
and Presley Haskie

Watch the videos of this conversation, recorded in Chaco Culture National Historical park, August 23–24, 2019.

https://doi.org/10.5876/9781646421701.c010.v001
https://doi.org/10.5876/9781646421701.c010.v002
https://doi.org/10.5876/9781646421701.c010.v003

The three members of the Zuni Cultural Resources Advisory Team gathered early in the morning at a rock art panel located just behind Wijiji. Here, they explained that Pueblo ancestors stopped in Chaco before traveling on to Zuni in their quest for the Middle Place. The ancestors left behind these petroglyphs and pictographs—which include the migration route symbol—as a record of their journey. Ancestors of all the Pueblos—not just Zuni—were here in Chaco before continuing on their migrations. There is a special energy or presence in Chaco that attracted them. Today, Zuni see the traces left by the ancestors as their library, their encyclopedia of knowledge. It is good to come to such a place, to reconnect with their history, to learn. The Zuni are very concerned about mineral development near Chaco Canyon, because this is a violent disturbance of Mother Earth. They are asking the public for help to protect and care for Chaco. The only way forward for all of us is mutual respect for the land and for each other.

In the evening we gathered on the north rim of Chaco Canyon, overlooking Pueblo Bonito. On the trail we encountered stone circles and pecked basins. The Zuni pointed out that these little things have big

DOI: 10.5876/9781646421701.c010

Figure 10.1. *Zuni Cultural Resources Advisory Team members Curtis Quam, Octavius Seowtewa, and Presley Haskie above Pueblo Bonito. Photo by Cloudy Ridge Productions.*

significance for them and are used in ceremonies today. Looking beyond the great houses, they pointed out that in Chaco, these small features, the wind, the views, the sunrises, and the roads, are just as significant for the Zuni. The Zuni selected this spot for filming because of the vantage point it gives for reflecting on the rock fall that crushed the eastern portion of Pueblo Bonito. Zuni ancestors were master builders. In Chaco Canyon, they raised families, held ceremonies, and kept the earth in balance. They built places like Pueblo Bonito to speak to future generations. The rock fall is a reminder that it is our responsibility to care for these places. This is what can happen if we do not honor our responsibility to protect Chaco. Our individual voices may not be heard, but our unified voices will be strong.

Members of the Zuni Cultural Resources Advisory Team gathered on the second morning in Chaco at the great kiva Casa Rinconada. Here, walking in the footsteps of their ancestors, the Zuni felt a very strong connection to their Chacoan forbears. Today, a kiva is a gathering place, a place for ceremonies, the driving force of the Zuni community. All important events start and finish in kivas such as this one. They explained that the small round houses such as those within Pueblo Bonito are not kivas—they are medicine curing houses. A great kiva such as Casa Rinconada is a sacred place. The elders are here, and it is appropriate to make offerings. The Zuni reminded us that they pray for all of us, asking for help in protecting this place from the damage caused by resource extraction of all kinds, now, and into the future.

IV

Experiencing the Landscape

11

Viewscapes and Soundscapes

Ruth M. Van Dyke,
Timothy De Smet,
and R. Kyle Bocinsky

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 15, 2017.

https://doi.org/10.5876/9781646421701.c011.v000

In Keith Basso's (1996) famous ethnography, *Wisdom Sits in Places*, he and his Apache interlocutors eloquently demonstrated the importance of a sensory, human experience of the landscape for Native inhabitants of the American Southwest. Yet, despite the presence of vibrant descendant communities and awe-inspiring topography, there has been relatively little archaeological work on the Chacoan landscape focused specifically on the senses. There are good reasons for this. The study of sensory experience is difficult and problematic on many levels (see, e.g., Day 2013; Hamilakis 2012). Phenomenological research is often (and perhaps justifiably) viewed with a healthy dose of skepticism by Southwest archaeologists trained in processual traditions. But Chacoan ceremonialism, like Pueblo and Navajo ceremonialism today, must have had vibrant sensory dimensions. We will never understand Chaco without explorations into the sensory human experience on the Chaco landscape.

In this chapter we forge a productive path forward combining systematic data collection, ArcGIS modeling, and video footage. We focus on viewscapes and soundscapes. We use the term view*scape* rather than the more familiar view*shed* to underscore that—although our techniques incorporate Geographic Information

DOI: 10.5876/9781646421701.c011

System (GIS) modeling—we move beyond the model to encompass lived, experiential dimensions of sight on the landscape. In the first part of the chapter, we provide background for our work, describing previous research on viewscapes and soundscapes in the Chaco world. We then turn to two case studies on the greater Chacoan landscape: the outliers of Bis sa'ani, and Pierre's (figure 11.1). We use the two case studies to illustrate our methods and to demonstrate the impact of oil and gas extraction on sensory experience within outlier communities. Bis sa'ani is in a relatively pristine environment with little energy extraction infrastructure. Pierre's, by contrast, is in the center of the Mancos Shale oil and gas development area. The chapter concludes with our recommendations for archaeologists and land managers to better record, study, understand, and protect the visual and auditory dimensions of the greater Chaco landscape.

CHACOAN VIEWSCAPES

Viewscapes are an important part of the Chacoan experience, past and present. The human eye can see for great distances on the Colorado Plateau, where many high places are intervisible due to the elevated topography and the clear, open skies. Although the name Chaco Canyon suggests depth, Fajada Butte and the mesas that form the canyon walls are some of the highest points in the surrounding San Juan Basin, affording spectacular visibility for over 100 km in nearly all directions. From these high places, Huerfano Mesa, the San Juan Mountains, the Nascimiento Mountains, Mount Taylor, the Dutton Plateau, Hosta Butte, the Chuska Mountains, and Shiprock punctuate Chaco's horizons. Archaeoastronomers, GIS-based scholars, and phenomenologists are among those interested in the study of visibility—who can see whom, and what can be seen—across the Chaco landscape. We know that viewscapes are critical for understanding Chaco, because (1) descendant communities incorporate dramatic topography into their cosmographies and ideologies, (2) descendant communities value the dualistic opposition between highly visible and hidden elements of the landscape and the material world, (3) Chacoans frequently positioned great houses and other features on highly visible terrain, and (4) Chacoans marked solar and lunar phenomena.

In Pueblo and Diné worldviews, dramatic topographic features such as highly visible mountain peaks and hidden canyons mark mythic events, homelands, and sacred directions. The rugged Colorado Plateau topography contains landmarks by which to measure the movements of celestial bodies throughout the year (e.g., Parsons 1939). We know that Chacoans carefully

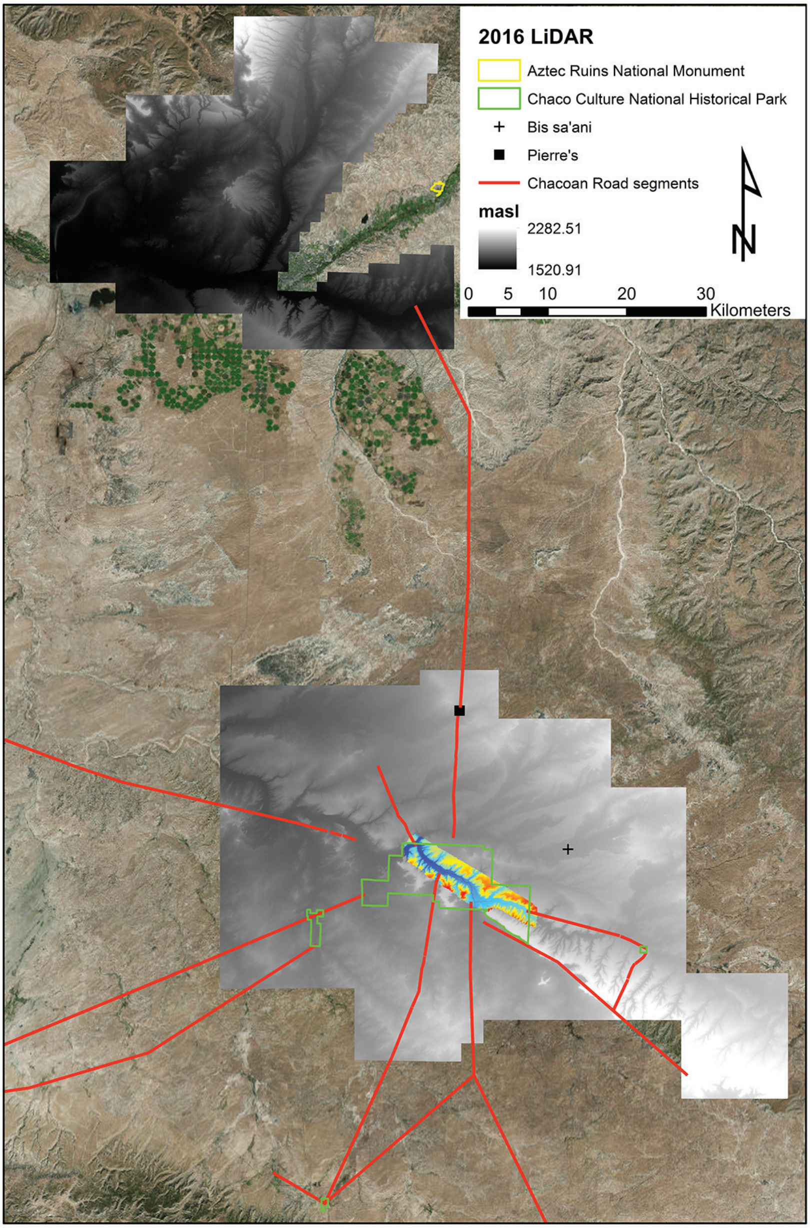


Figure 11.1. *Composite LiDAR and satellite imagery of the central Chaco Canyon area, showing locations of Bis sa'ani and Pierre's great house communities. Graphic created by Timothy De Smet.*

marked solstices, equinoxes, and lunar standstills with great house alignments and with rock art, such as the Sun Dagger petroglyph atop Fajada Butte (Sofaer 2007) and the Chimney Rock outlier great house in southwest Colorado (Malville 2004). At Chimney Rock, during a major lunar standstill year on the full moonrise nearest the winter solstice, the full moon ascends directly between the two natural rock pinnacles that tower over the great house, moving through a narrow passage from the earth into the sky.

Chacoan great houses often are situated in visually prominent locations on elevated terrain (Van Dyke 2007:169–199; Dungan et al. 2018). Enigmatic features such as shrines, stone circles, and cairns in high places further enhance intervisible connections among Chacoan sites (Van Dyke et al. 2016; Van Dyke, chapter 6 in this volume). For example, Chacoans positioned a stone circle atop the canyon's north rim to create a line-of-sight through South Gap to Hosta Butte (Van Dyke 2007:155, figure. 6.6 in this book). There could be many reasons for this Chacoan emphasis on elevated positions, and these may have involved desires both *to see* and *to be seen* (Van Dyke et al. 2016:3). At the local level, Chacoans may have wanted to surveil or keep an eye on others in the community, and /or people on high places may have wanted to be seen by others in the community. At the regional level, Chacoans may have wanted to create visual connections beyond local communities, linking neighboring communities and/or linking themselves to Chaco Canyon. These connections could have been for communication, to foster a sense of common identity, or both (see, e.g., Bernardini et al. 2013; Bernardini and Peeples 2015). It is likely that intervisibility among high places, great houses, and communities helped weave together the fabric of the Chacoan world.

Geographic Information System technology has proven to be an excellent tool for examining and modeling visible connections over large areas such as greater Chaco. GIS-based visibility studies usually focus on determining lines-of-sight, viewnets, and viewsheds (Wheatley 1995; Wheatley and Gillings 2002). Lines-of-sight involve the reciprocal ability of people at two locations to see one another. For example, GIS analysis predicts (and experiments have confirmed) that a person standing atop Pueblo Alto and a person standing atop Pierre's El Faro can signal to one another using mirrors (Chacoans probably used selenite). Viewnet analysis uses GIS modeling to identify networks of locations connected by lines-of-sight. Bocinsky (Van Dyke et al. 2016:222, fig. 7) generated viewnets to demonstrate that 74 percent of Chacoan great houses can see at least one other great house, for example. Viewshed analysis identifies the surrounding terrain and features that can be seen from a particular location. Many Chaco scholars are working with GIS line-of-sight and viewshed analyses in attempts to look at visibility within Chacoan communities, within areas of 10–25 sq km. See, for example, John Kantner and Ronald Hobgood (2003) at Kin Ya'a, Katherine Dungan (2009) at Kin Bineola, and Katharine Ellenberger (2012) at Kin Klizhin. Bocinsky (Van Dyke et al. 2016:222) used cumulative viewshed analysis to learn that 258 Chacoan great houses can see 30 percent of all the terrain within a 160,000-sq.-mi. area of the Chacoan world. Most recently, Dungan et al. (2018) conducted a total viewshed analysis for the local environs of 430 great houses and great kivas; their study demonstrated that builders across most of the Chacoan world consistently sited great houses (but not great kivas) in highly visible locations. These kinds of analyses, involving hundreds of potential viewpoints and thousands of sq. mi. in area, can only practically be carried out using GIS.

Although GIS studies and remote aerial data are undeniably useful, GIS analyses can never tell us whether visibility was meaningful (Frieman and Gillings 2007; Hacıgüzeller 2012; Llobera 2007). Top-down modeling studies are useful at reconstructing past connections and pinpointing possible relationships, but because we are ultimately interested in the experiences of human bodies, we consider it best to combine GIS analyses with phenomenological, on-the-ground, embodied field-based investigations. Again, we here employ the term *viewscape* to move the conversation beyond viewshed or line-of-sight modeling within GIS, to encompass the lived, experiential dimension of visibility on the Chacoan landscape.

In this study we examine viewscapes using GIS analyses in tandem with phenomenological methods. Early critics of phenomenology in archaeology were concerned with subjectivity and lack of replicability (Brück 2005), but good phenomenological research can be both systematic and replicable (see, e.g., Hamilton and Whitehouse 2006). Van Dyke has developed a method for documenting viewscapes that incorporates still and video photography as well as paper forms, top-down maps, and digital elevation models (DEMs). She first establishes locations that are likely to have been important viewscapes—these are usually pinnacles or high places such as great houses or unusual topographic features topped with ERFs (see chapter 6, this volume). For comparison, she also chooses locations with more restricted viewscapes, such as a small community site at the base of a pinnacle. From each point she uses digital and video cameras to record the 360 degree panorama. A video camera offers the added benefit that she can narrate what her human eye can see as the camera turns. On paper, she sketches the visible attributes of the near, intermediate, and far horizons using a modified version of Sue Hamilton and Ruth Whitehouse's (2006) circle maps. She then juxtaposes this information with top-down maps of archaeological features and digital elevation models of the terrain. The result is a comprehensive digital record of a viewscape from a particular location, such as a great house. The different kinds of information can be combined in programs such as iMovie to show how different recording techniques highlight different kinds of visible attributes and to make the results accessible to a reader or viewer (videos 11.1 and 11.2).

In the second half of this chapter, we illustrate these techniques at the Chaco outliers of Bis sa'ani and Pierre's. But first, we turn to a short review of the study of Chacoan soundscapes.

CHACOAN SOUNDSCAPES

Archaeologists have only recently begun to study soundscapes (e.g., Miller 2008; S. Mills 2014; Mlekuz 2004; Scarre and Lawson 2006; Schofield 2014; Scullin 2019; Till 2014; Villanueva-Rivera et al. 2011). A soundscape is defined as "any sonic environment, with particular emphasis on the way it is perceived and understood by an individual or by a society" (Truax 1999, cited in Elliot and Hughes 2014:306). In the Chacoan world, sounds created by human voices, animals, water, wind, thunderstorms, daily activities, and musical instruments would have been part of the fabric of life. Previous researchers have thought a lot about sound from the perspective of musical instruments. Pueblo peoples used a wide variety of percussion and wind instruments: drums, copper bells, kiva bells, tinklers, rasps, bullroarers, conch shell trumpets, flutes, and whistles (see Brown 2005 for a comprehensive discussion). Acoustic researchers at Chaco have been particularly interested in conch shell trumpets—an instrument likely employed in the context of ritual events at Chaco. By removing the pointed end and then blowing through the whorls of these exotic shells, it is possible to create a very loud blast. Trumpets made from the shells of Pacific ocean conch, particularly *Strombus* sp. and *Murex* sp., are found in very small numbers from contexts across the Southwest (Brown 2005:291–305; B. Mills and Ferguson 2008; Vokes and Gregory 2007). Out of forty-six known conch shells or fragments in the Southwest, seventeen were found in Chaco Canyon, and one was found with Chaco's most elaborate burial under a plank floor in Room 33 of Pueblo Bonito (Brown 2005:299–300; B. Mills and Ferguson 2008:347, table 1).

Richard Loose and his colleagues have used experiments to explore the resonance of conch shell trumpets in Chacoan settings. Loose (2012) re-created a shell trumpet using a *Strombus galeatus* shell, and he used digital software to measure the pitch and loudness when blown. His 20-cm-long experimental shell trumpet produced a sound at at 329.84 Hz, with harmonic overtones at 650 and 974.4 Hz; he measured the sound at 96 decibels above the noise floor of his recording system. (This is approximately the decibel level produced by a motorcycle or a handheld drill.) Loose observes that pitch and loudness would vary, however, depending on each shell's bore configuration as well as the volume of air forced through the bores. Loose deployed his experimental trumpet in acoustic research carried out with John Stein, Richard Friedman, and others in front of a toric sandstone cliff face in downtown Chaco Canyon, between the great houses of Pueblo Bonito and Chetro Ketl (Loose 2008, 2010; Stein et al. 2007). In Diné oral traditions this cliff face is called Tse' Biinaholts'a Yałti (Curved Rock That Speaks), and it is where deities taught Navajo hero twins how to produce the vocal tones used in ritual chants, accompanied by shell trumpet, eagle bone whistle, and reed flute. The investigators measured the sandstone cliff at approximately 150 m long × 25 m high and dubbed the region in front of it "the amphitheatre," due to the interesting acoustic effects they observed. Over multiple occasions the researchers played amplified music, sine waves, flutes, and conch shell trumpets in the amphitheatre, acquiring five hours of experimental recordings. Reverberations in the amphitheatre last for 2 seconds (comparable to a concert hall), and there is a secondary echo with a 3.5-second delay from across the canyon to the south. The torus curve of the cliff causes unusual effects, including virtual sound image, in which sounds seemed to be emanating from within the cliff, and acousma, in which sounds produced nearby were heard as garbled or spooky, unintelligible noises. John Stein et al. (2007) conclude that the amphitheatre was intentionally used by Chacoans during ritual performance events.

Geographic Information Systems is a useful tool for acoustic studies, just as with visibility studies. It is very challenging to study archaeo-acoustics across open-air areas such as a Chacoan outlier community, but GIS modeling can help. Working toward this end, Kristy Primeau and David Witt (2018) developed a soundshed analysis tool for ArcGIS that takes into account distances, physical barriers, air temperature, relative humidity, and ambient sound pressure. After evaluating their tool in a controlled setting, they employed it to replicate and analyze the sound of a conch shell trumpet blown at dawn from outside Pueblo Bonito in downtown Chaco Canyon. Primeau and Witt discovered that certain features such as stone circles on the canyon rims might be positioned to be able to hear this kind of event. Primeau and Witt's work offers a promising way forward to evaluate speculations regarding the performative resonances of musical instruments and chants during ceremonies and processions in Chaco Canyon (Van Dyke 2013; Weiner 2015).

Table 11.1. Sound model variables for raised voice, conch trumpet, and pump jack sources.

Model inputs	*Raised Voice*	*Conch Trumpet*	*Pump Jack*
Sound source height (m)	1.524	1.8288	1.828
Frequency (Hz)	325	330	500
Source sound level (dB)	84	96	82
Source measurement distance (m)	0.9144	0.30483	15.24
Temperature (°C)	32	32	32
Relative humidity (%)	30	30	30
Receiver measurement height (m)	1.524	1.524	1.524

In our study, De Smet followed Primeau and Witt's (2018) procedures to model soundscapes in the Bis sa'ani and the Pierre's communities. De Smet specifically focused on the reach of three kinds of sounds: a male human shout, a blast from a conch shell trumpet, and the noise produced by an active drill rig. To model the spread and attenuation of sound, he input nine model parameters: a 1 m LiDAR DEM raster, sound source location points, and seven user-determined variables. He used the frequency (Hz), source sound level (dB), source sound height (m), source measurement distance (m), temperature (°C), and relative humidity (%) variables to calculate the resulting A-weighted sound pressure levels (dBA) at a specified receiver measurement height (human ear height) of 1.524 m, or about 5 feet (table 11.1). These input variables allow the model to calculate for attenuation of the sound source signal, namely, spherical spreading loss (distance), atmospheric absorption loss (temperature, humidity, elevation), and terrain effects (ground and barrier loss). These models assume no wind speed or direction. The results of De Smet's modeling exercises are striking, and we present them within the context of our two case studies below.

CASE STUDIES: BIS SA'ANI AND PIERRE'S

The Chaco outliers of Bis sa'ani and Pierre's are ideal cases upon which to demonstrate our viewscape and soundscape study methods. Both communities are well studied, with accurate and detailed community site information. Both are relatively close to Chaco, on terrain with dramatic topographic features, and both were most intensively occupied during the early AD 1100s. However, there is one important difference between the two communities. The terrain surrounding Bis sa'ani has not been subjected to intensive oil and gas infrastructure development, while the terrain surrounding Pierre's is at the

Figure 11.2. *Bis sa'ani great house, looking north. Photo by Ruth Van Dyke.*

center of Mancos Shale energy development. Thus, the two communities form an ideal pair within which to contrast the impacts of energy development on viewscapes and soundscapes.

Bis sa'ani

The Bis sa'ani outlier is situated approximately 12 km northeast of Chaco Canyon. East Great House and West Great House structures perch atop a prominent shale ridge on the south side of Escavada Wash (figure 11.2). Sixteen small habitations and field houses form an associated community in the aeolian dunes to the south (figure 11.3). Robert Powers et al. (1983:21–54) intensively surveyed a 3.2-km (2 mi.) diameter area around the great houses and mapped the great houses and community. Cory Breternitz et al. (1982) conducted extensive excavations at the great houses and some of the small sites. No known road segments connect Bis sa'ani to Chaco Canyon, although to reach Chaco Canyon, one can merely follow Escavada Wash.

The two south-facing great houses are "rather precariously situated" atop an isolated 750-m-long shale ridge; the narrow ridge measures at least 20 m high but only 20–50 m wide (Powers et al. 1983:21). The West House contains twelve rooms and a kiva. A little over 100 m to the east, the East House contains at least twenty-five rooms and four kivas with a total floor area of at least 1040 sq. m. Breternitz et al. organized the East House into four substructures: Rabbit House (to the east), Casa Quemada (in the center), South House (to the south), and Casa Hormiga (to the west) (figure 11.4). Builders erected Casa Hormiga, South House, and Rabbit House using sandstone core-and-veneer,

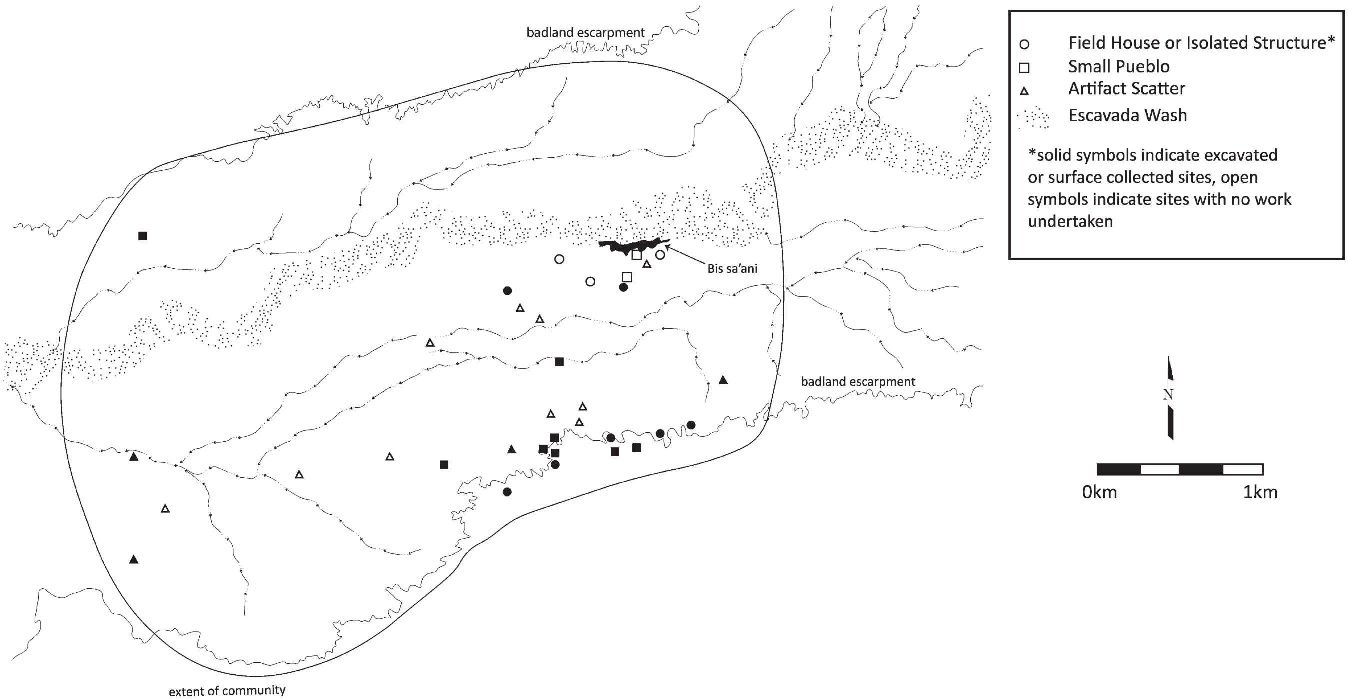


Figure 11.3. *Map of the Bis sa'ani Community. From Breternitz et al. (1982).*

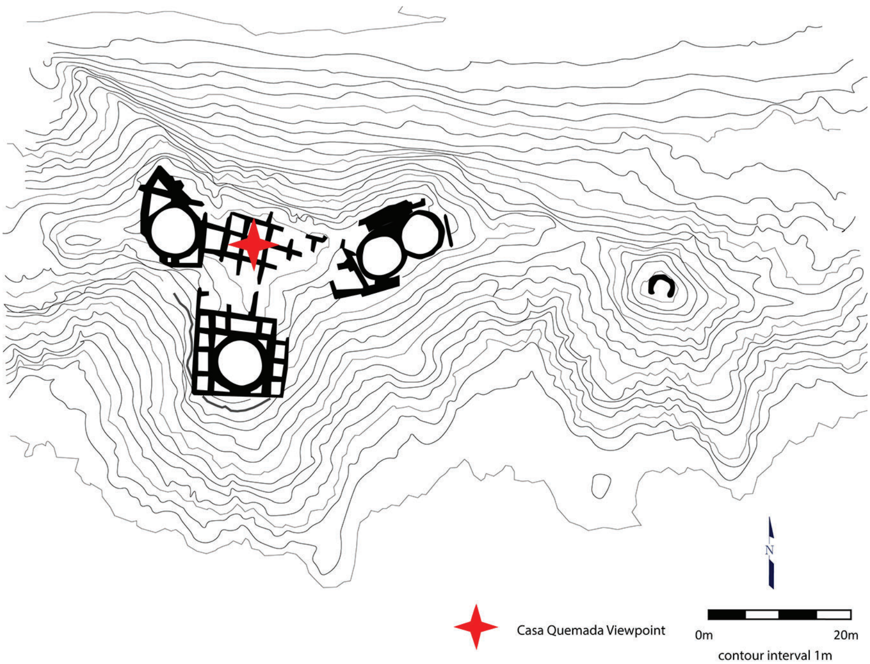


Figure 11.4. *Eastern component of Bis sa'ani great house, with Casa Quemada denoted by red star. Modified from Breternitz et al. (1982).*

but they used adobe—a highly unusual Chacoan construction technique—to construct the aptly named Casa Quemada, or "burned house."

Van Dyke visited Bis sa'ani on a clear summer morning in June 2017. She chose Casa Quemada—the highest and most central area—as the representative viewpoint for the East House at Bis sa'ani. Van Dyke recorded the 360° panoramic viewscape from Casa Quemada atop the East House at Bis sa'ani using three techniques: circle drawings, still photography, and digital video. She confirmed the coordinates of her location using a handheld GPS, and she established cardinal directions using a Silva Ranger compass calibrated to true north. First, she used a graphic method of field recording developed by Hamilton and Whitehouse (2006) to create 360° circular drawings of the prominent visible elements from each location (figure 11.5).

These drawings include three sight horizons (near distance, middle distance, and final horizon). Within each horizon, and using the compass for accuracy, she noted major topographic and architectural features. Second, from the same location, she used a Pentax K200D 10.2 mega-pixel digital

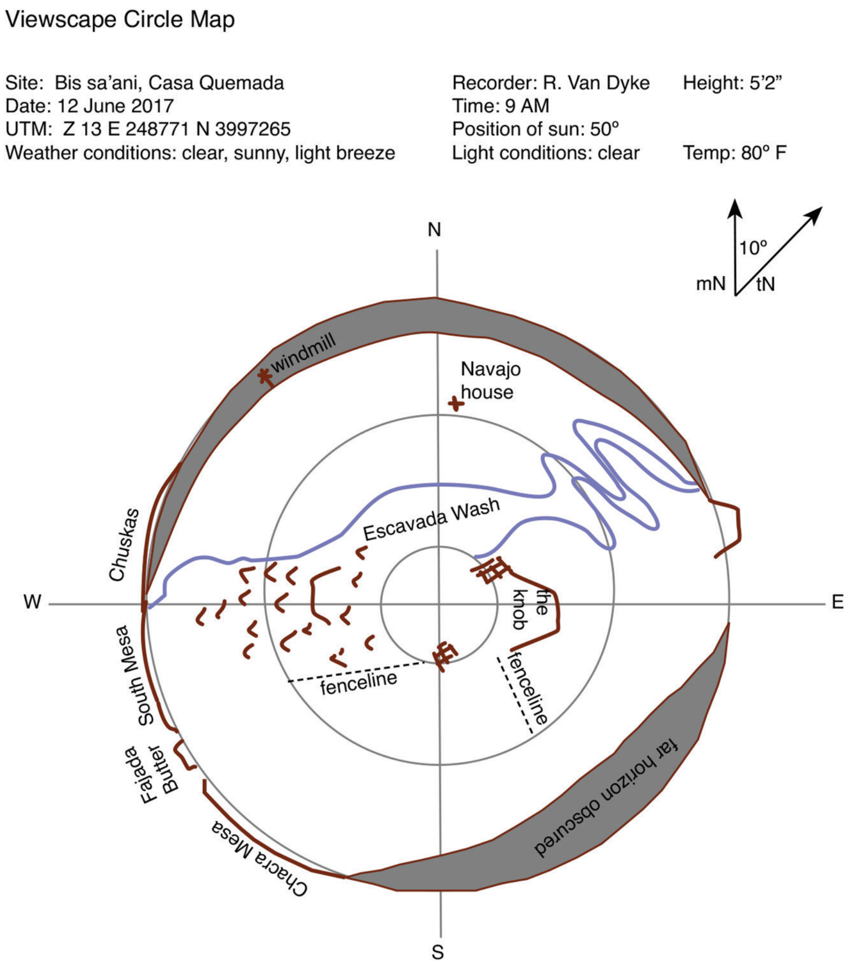


Figure 11.5. *Example of a circle map: viewscape from Casa Quemada, Bis sa'ani. Graphic by Ruth Van Dyke.*

SLR camera to capture a series of still photographs in 360° circumference. Third, she used an iPhone 6 with a 29-mm lens and 8-megapixel resolution to shoot high-definition (1080-pixel) video in 360° at 60 frames/second. She mounted the iPhone on a tripod for stability and rotated it by hand, while narrating a description of the views. The background narration provides notes useful in pulling together the final viewscape. Back from the field, Van Dyke used iMovie to create a short video illustrating the Casa Quemada

Video 11.1. *Bis sa'ani viewscape (https://doi.org/10.5876/9781646421701.c011.v001).*

viewscape. The video (video 11.1: https://doi.org/10.5876/9781646421701.c011.v001) combines Van Dyke's field data with Breternitz et al.'s (1982) top-down maps and Bocinsky's GIS-modeled viewsheds and line-of-sight analyses to present a short, seamless illustration of what a human observer standing atop Casa Quemada can see.

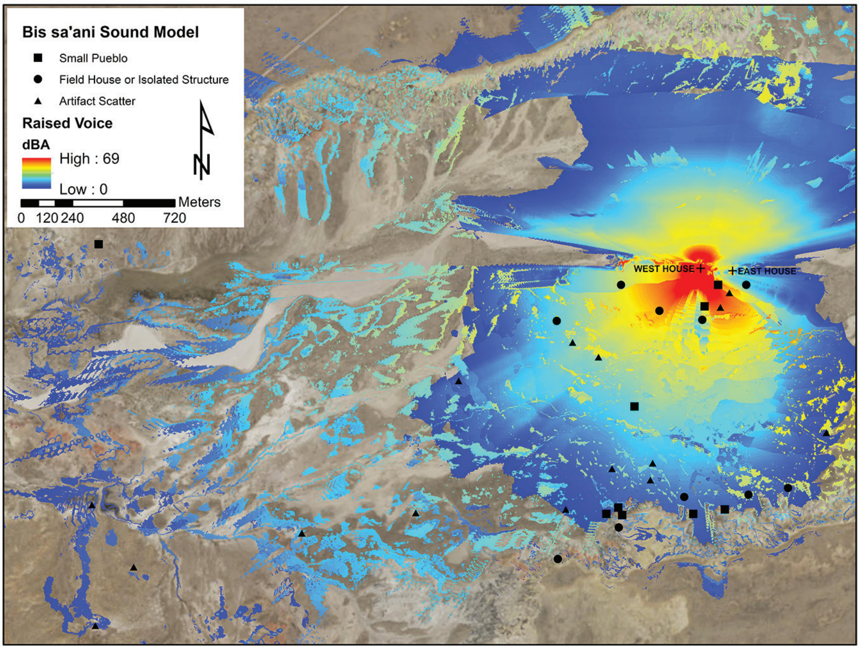
The viewscape at Bis sa'ani links the community with the greater Chacoan landscape. Upon initial entry, Bis sa'ani seems its own self-enclosed world on the banks of the Escavada. From the valley floor within Bis sa'ani, the shale ridge with the great houses is a prominent location, but a viewer can see neither Chaco Canyon nor any of its familiar landmarks (e.g., Fajada Butte, Huerfano Mesa). Furthermore, not all of the community sites are intervisible with the great houses. However, the viewscape afforded by the great houses on the ridge tells a different story. From this vantage point, someone walking to Bis sa'ani from Chaco along the Escavada Wash would see the great house silhouetted against the sky long before they arrived in the community. And someone standing atop any of the Bis sa'ani great houses could see Fajada Butte, central Chaco Canyon, and ERF locations atop Chacra Mesa and South Mesa. The viewscape also links Bis sa'ani to communities far beyond Chaco Canyon. Not only could a viewer standing atop Casa Quemada see 90 km west to the Chuska Mountains, but (perhaps more important) this viewer could see White Rock, a landform 40 km to the west. Van Dyke et al. (2016) identified White Rock as a major node in the Chacoan great house viewnet—in other words, the great houses at Bis sa'ani were linked to scores of Chacoan outliers in the western San Juan Basin and beyond, through intervisibility with White Rock. So, although early twelfth-century Bis sa'ani residents may have moved east up the Escavada Wash and out of Chaco Canyon's direct purview, they were not by any means visually separated from doings in Chaco Canyon or more distant outliers. The builders of Bis sa'ani appear to have intentionally situated their great houses atop the "precarious" shale ridge, not for intervisibility with the immediate community of small sites, but to maintain connections with the greater Chacoan world.

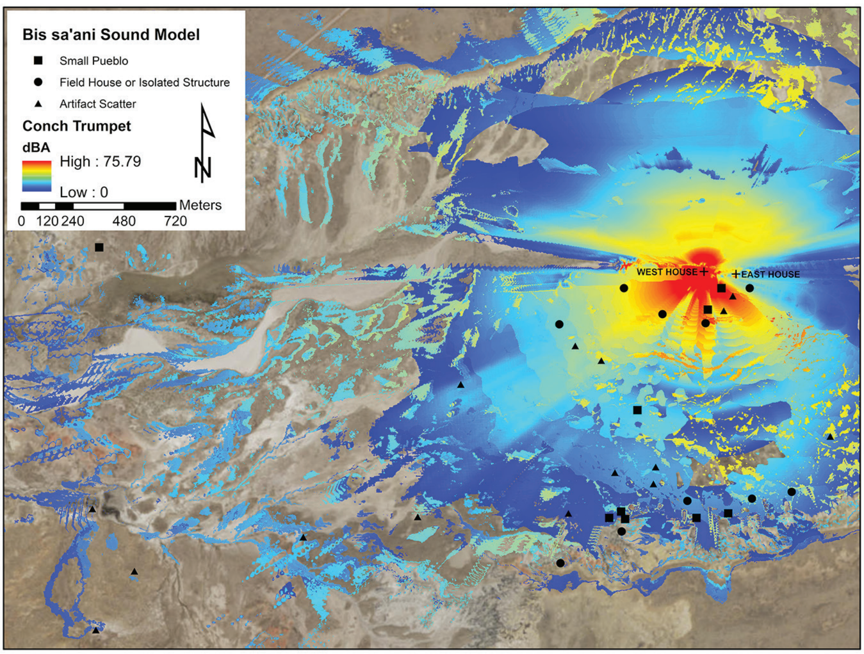
The soundscape at Bis sa'ani tells a different, but equally compelling story. As with the viewscape, we were interested in exploring how the position of the great houses atop the shale ridge might, or might not, affect acoustics across the community. Using the procedures outlined previously in this chapter and the variables presented in table 11.1, De Smet created a GIS model for the reach of a human shout (figure 11.6) and the blast of a conch shell trumpet (figure 11.7) emanating from atop the West Great House. We found that both sounds traveled outward for distances up to 3 km. The shout extended across most of the community, but it failed to reach two small pueblos, two field houses, and an artifact scatter situated on the outskirts. The conch shell trumpet blast, however, reached every one of the thirty-four sites in the community. In fact, the extent of the conch shell trumpet blast mapped surprisingly well onto the boundaries of the Bis sa'ani community as previously defined by archaeological survey.

To date, most Chaco researchers interested in the sensory dimensions of outlier communities have focused exclusively on the intervisibility of great houses with community sites. Our experimental soundscape results suggest that the acoustic reach of a conch shell blast may be even more important. If leaders atop great houses needed to quickly communicate with all community residents, a conch shell blast would have been a much more effective method than relying upon community residents to look in the right direction at the right time. It is possible that community boundaries map onto the extent of the conch shell blast because community members did not wish to live, or were not permitted to live, where they could not be reached.

Figure 11.6 (facing page, top). *Reach of a human shout emanating from the West Great House at Bis sa'ani. Model and graphic by Tim De Smet.*

Figure 11.7 (facing page, bottom). *Reach of a conch shell blast emanating from the West Great House at Bis sa'ani. Model and graphic by Tim De Smet.*


Bis sa'ani Sound Model
Small Pueblo
Field House or Isolated Structure
Artifact Scatter
Raised Voice
dBA
High : 69
Low : 0
Meters
0 120 240 480 720
WEST HOUSE
EAST HOUSE


Bis sa'ani Sound Model
Small Pueblo
Field House or Isolated Structure
Artifact Scatter
Conch Trumpet
dBA
High : 75.79
Low : 0
Meters
0 120 240 480 720
WEST HOUSE
EAST HOUSE

We were able to examine viewscapes and soundscapes at Bis sa'ani with little interference from modern landscape intrusions. The Bis sa'ani area is remote and sparsely populated, and there has been little to no impact from energy development in the area. Although we are aware that the ancient visual and acoustic landscapes would have differed from the contemporary landscape, there was no need for us to attempt to remove or counterbalance modern intrusions such as those created by gas wells. For counterpoint, we turn now to the Pierre's community, situated in the midst of Mancos Shale energy development.

Pierre's

The Chacoan outlier of Pierre's is situated 19 km north of Chaco Culture National Historical Park, on the southern edge of the break between the Chaco Slope and the mesas and badlands of the Denazin and Ah-shi-sle-pah Washes, on the USGS 7.5' Pueblo Bonito NW quadrangle. The outlier is clearly articulated with the Great North Road, which leaves the vicinity of Pueblo Alto and, in a series of stages, heads north to Kutz Canyon, 50.5 km distant (figure 11.8). Powers et al. (1983:94–122) and Randy Harper et al. (1988) both conducted intensive survey and recording in the Pierre's community during the 1980s. The community was also investigated by the Chaco Roads Project (Stein 1983) and the Solstice Project (Marshall and Sofaer 1988). The Pierre's community is spatially distributed over an area of approximately 1.6 sq. km. Powers et al. documented seventeen Ancient Pueblo sites in the surrounding community, and Harper et al. added an additional nine. All but one small Basketmaker III–Pueblo I artifact scatter date from the Late Pueblo II or Early Pueblo III period.

There are several Bonito-style structures in the community (figure 11.9). The "Acropolis" cluster consists of two core-and-veneer structures (LA 16509, House A and LA 16508, House B) atop a large butte near the center of the community. House A contains an estimated fifteen ground-floor rooms and three enclosed kivas over an area of 255 sq m. House B is located 30 m to the north/northeast of LA 16509. House B contains an estimated thirteen ground-floor rooms and a single enclosed kiva and covers 315 sq m. An additional structure, House C (LA 35423), is an isolated room located approximately 5 m northwest of LA 16509; although the room was given a separate site number by the Chaco Roads Project, Harper et al. (1988:119) contend that House C should be considered part of LA 16508.

"El Faro," or "The Lighthouse," consists of a pinnacle on the valley floor that is topped by a small, three-room structure including an exposed hearth (LA 16514, Powers et al.'s 1983 P-5). At the base of this pinnacle, there is another

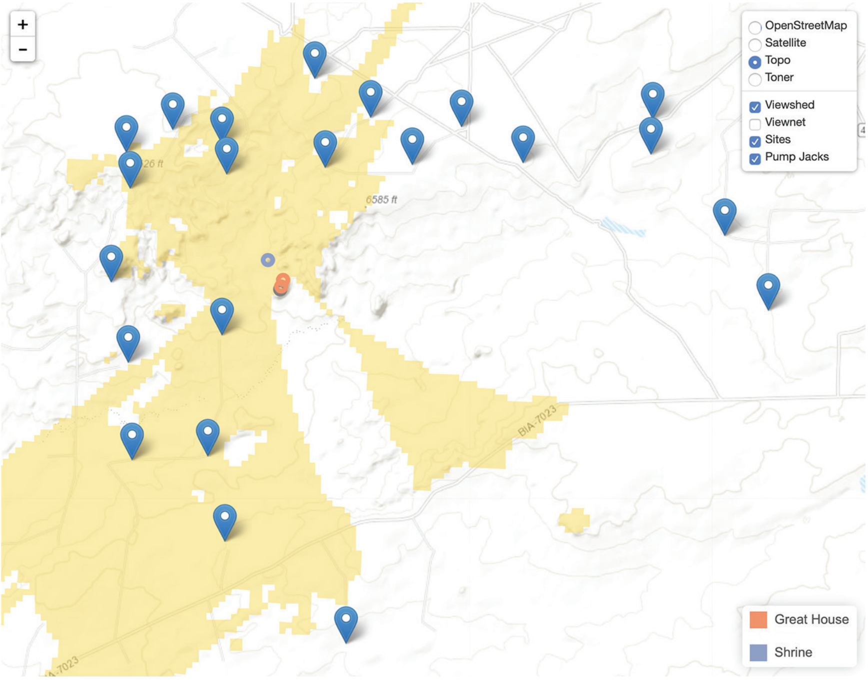


FIGURE 11.8. *The Pierre's landscape, with numbered viewpoints and drill rigs corresponding to Van Dyke's viewscape videos. Model and graphic by R. Kyle Bocinsky.*

massive core-and-veneer building covering 505 sq m, estimated to contain eighteen rooms and one enclosed kiva (LA 16515, Powers et al.'s 1983 P-6). A neighboring pinnacle 80 m ESE of El Faro hosts at least two small room blocks, LA 16518 (P-9) and LA 16519 (P-10). LA 16519 is situated directly on top of this second pinnacle and might be considered to represent an *atalaya*, or watchtower, following Marshall and Sofaer (1988).

There is little doubt that Chacoans located Pierre's in this place because of the Great North Road and because of specific visible attributes of the local topography. The Great North Road originates at Pueblo Alto. Ancient engineers could have used a simple gnomon device to derive the road's northern bearing (Lekson 2015), but as road surveyors moved north, they likely engineered road segments using backsights. Road construction would have required a clear line-of-sight, and Pierre's is located on the first major topographic break in the landscape moving north from Chaco Canyon. The pinnacles and butte of Pierre's are visible from Pueblo Alto, and vice versa. Gwinn Vivian and Doug Palmer have conducted experiments with mirrors flashed

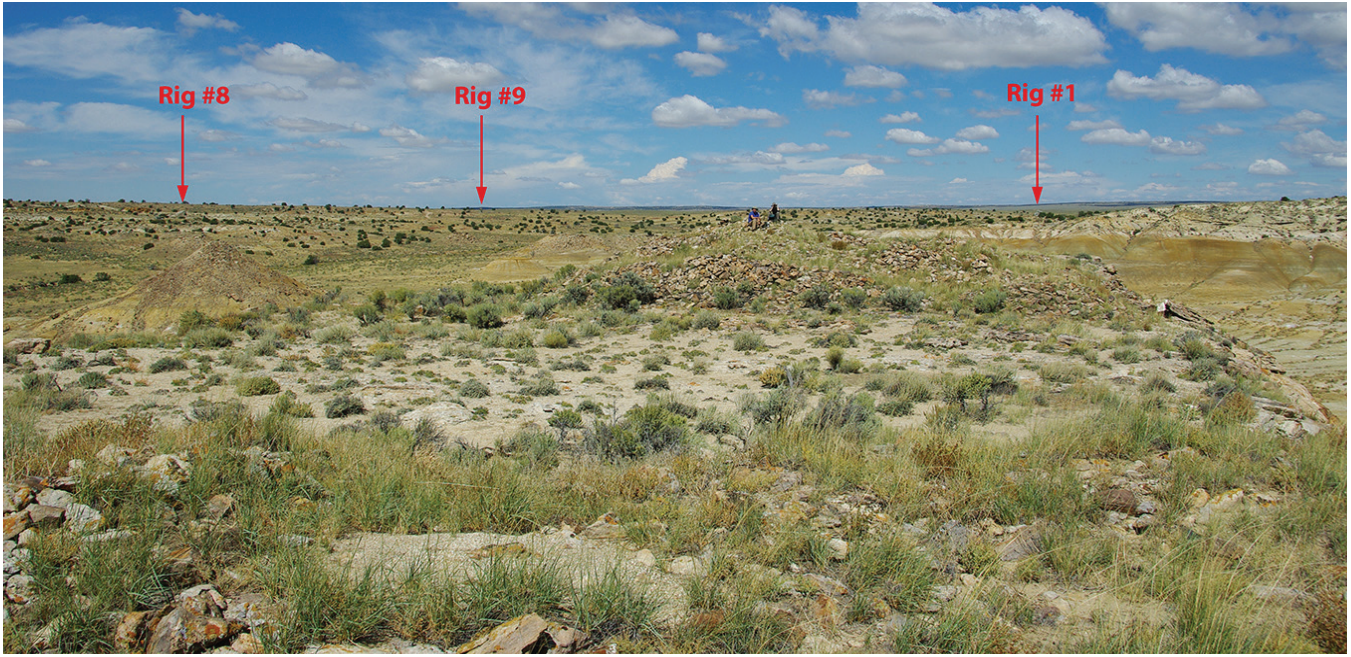


Figure 11.9. *Carrie Heitman and Julian Thomas sit atop Pierre's Great House B (LA 16508) as seen from Great House A (LA 16509) in September 2015, looking north, with drill rig #s 8, 9, and 1 on the horizon. Photo by Ruth Van Dyke.*

in the sunlight to establish line-of-sight connections between Pierre's and Pueblo Alto; Van Dyke participated in one of these experiments in September 2015. Hearths atop high places at Pierre's (El Faro, LA 16514, and LA 16519) suggest that the Chacoans were, indeed, interested in signaling between these locations. Looking north along the Great North Road past Pierre's, the next topographic break is Carson Divide (Marshall and Sofaer 1988), also topped by a potential signaling feature. Thus, visibility between Pierre's and Pueblo Alto in Chaco Canyon was a key part of the construction of the Great North Road and likely continued to be important for signaling between the two areas.

For extended discussions of the possible functions of Chacoan roads and associated features, see chapters 3, 5, and 10 (this volume). It seems likely that ritual processions or other movements of people took place along Chacoan road segments, particularly when those segments are in the vicinity of outlier great houses. Michael Marshall (1997) suggests that Chacoans processed north along the Great North Road to deposit vessels (and perhaps, symbolically, the dead) in Kutz Canyon. Such possibilities are understudied and could benefit from experimental reconstruction.

The Pierre's community, with its clear and strong relationship to the Great North Road, is protected as part of the Chaco Protection Sites group and was included as part of Chaco's entry on UNESCO's World Heritage List. However, despite the obvious importance of viewscapes at Pierre's, the sensory aspects of this landscape have been little studied. And, although the Pierre's Chacoan outlier is itself protected from development as part of the Chaco Protection Sites federal legislation, existing laws do little to counter the indirect cumulative adverse sensory impacts of ongoing oil and gas production in the surrounding area.

On a cold, sunny autumn day in November 2016, Van Dyke visited Pierre's to assess these sensory impacts. Following the same procedures as at Bis sa'ani, Van Dyke used digital still photography and video, as well as a variation of Hamilton and Whitehouse's (2006) circle maps, to record 360° panoramas from five Chacoan structures in the community. She observed that twelve pumpjacks and five drilling containers are visible from the high places in the community. The nearest pumpjack, Dugan Production Corp Hoss Com #95, is located just outside the Pierre's community only 650 m southwest of the great house butte (figure 11.10). Because the Pierre's sites—particularly LA 16509 (House A), LA 16508 (House B), LA 16514 (El Faro), and LA 16519 (the atalaya)—are significant in terms of visibility along the Chacoan road, Van Dyke chose these four locations for 360° viewscape investigation. She also included LA 16515, the large Bonito-style structure at the base of El Faro on

Figure 11.10. *Hoss Com #95 (pumpjack #6), 650 m southwest of the Pierre's community, with Great Houses A and B on butte in background. Photo by Ruth Van Dyke.*

the basin floor. As at Bis sa'ani, Van Dyke determined cardinal directions using a Silva Ranger compass oriented to magnetic north. She then recorded the 360° viewscapes at each of these locations using circle drawings, still photography, and digital video. She numbered the pumpjacks within the viewscapes from #1 to #12. Back from the field, Van Dyke used the collected data to create five short videos in iMovie 10.1.4. We include one of these here as video 11.2.

Viewscape 1 records the 360° view from the highest point on LA 16508, Pierre's Great House B, and Viewscape 2 records the 360° view from the highest point on LA 16509, Pierre's Great House A. The two viewscapes are similar. There are a total of twelve pumpjacks visible. To the north, there are two pumpjacks on the horizon (#1 and #2); the closest of these is approximately 900 m away. There are also three drilling tanks. To the northwest, pumpjack #9, which is painted camouflage colors, is visible on the horizon next to a drill tank. Pumpjack #7, which is dark red, stands out against yellow caprock and is visibly moving—it is also accompanied by a tank on the horizon. To the southwest a viewer can see the knob on the other side of the Pierre's community with the Chuska Mountains on the far horizon, and White Rock visible in the foreground. There are two pumpjacks labeled #10 and #12 visible on the valley floor just south of the knob. On the valley floor 650 m to the southwest is pumpjack #6, or Hoss Com #95. Looking across the landscape toward Chaco Canyon, there is a string of pumpjacks in view positioned along rig roads: # 5, 12, 11, 4, and 3. Behind them, the major topographic landmarks of Chaco Canyon are visible to the south: West Mesa, Hosta Butte, South Gap, South Mesa, Fajada Butte, and Chacra Mesa. To the east on the far horizon, there are a few tanks as well as a Navajo settlement.

Viewscape 3 records the 360° panorama from LA 16515, the large masonry house on the valley floor at the base of the El Faro pinnacle. Because LA 16515 is on the valley floor, there are only three pumpjacks visible from this spot (#3, 4, and 8), but all three can be seen bobbing up and down on the horizon. Viewscapes 4 and 5 record the 360° views from the sites at the tops of two pinnacles—El Faro (LA 16514) and the atalaya (LA 16519), respectively. Nine pumpjacks are visible from these locations. To the east, the badlands topography blocks the long-distance horizon, although in the far distance buildings and a vehicle on the horizon represent a Navajo settlement. To the east-southeast is the large butte crowned by the two great houses. To the south is the landscape of Chaco Canyon, with Mount Taylor, South Mesa, South Gap, Hosta Butte, West Mesa, and Little Hosta Butte. As one looks southwest down the valley toward the Chaco River, there are three pumpjacks (#3, 4, and 5) flashing in the sun as their arms pump up and down. Pumpjack #6 is located 750 m to the southwest. This rig, labeled Hoss Com #95, was reportedly placed perpendicular to Houses A and B so that it would be less visible from the Pierre's community; however, the pumpjack is not perpendicular to either of the two pinnacle sites. To the south-southwest there is another pinnacle in the middle distance, and the Chuska Mountains and Narbona Pass on the horizon. Pumpjack #7 bobs up and down on the valley rim that blocks the far western horizon. To the north-northwest, the dark red pumpjack #8 is below the yellow sandstone caprock. Pumpjack #9 is on the horizon but less visible since it is painted in camouflage colors; both are accompanied by storage tanks.

Viewscape 5 (video 11.2) may be viewed at https://doi.org/10.5876/9781646421701.c011.v002. These viewscapes illustrate several important observations. First, the Pierre's sites on high places are situated to maximize visibility with the major topographic features of Chaco Canyon. Elsewhere, Van Dyke (2007) has argued that major landforms such as Mount Taylor and Hosta Butte were storied places for ancient Chacoans, just as they are for today's descendant communities. An individual standing atop Pierre's great houses, atalaya, or El Faro, looks south towards the striking landscape of South Mesa, South Gap, and West Mesa—downtown Chaco Canyon. And, on the horizon behind Chaco Canyon, an ancient viewer would have seen Mount Taylor, Hosta Butte, and Little Hosta Butte. If, as Marshall (1997) and Van Dyke

Video 11.2. *Pierre's Pinnacle Viewshed 5 (https://doi.org/10.5876/9781646421701.c011.v002).*

(2007:148–151) have argued, the Great North Road and the South Road are meant as a dualistic pair that counterbalance one another, then the visibility of Hosta Butte from Pierre's could have been particularly important for ancient Chacoans. As noted earlier, it is possible for viewers at Pueblo Alto and Pierre's to pinpoint one another's locations using bright light created by mirrors or flames. Van Dyke et al. (2016) and many others have argued that these connections may have been important for signaling, tying together the greater Chacoan world.

Unfortunately, the flashes seen during our November 2016 visit to Pierre's represented the sunlight glinting off a series of pumpjacks, with arms moving up and down. And, while pumpjacks do not actually impede a modern viewer's ability to see distant peaks such as Hosta Butte, they are certainly distracting. Pumpjacks silhouetted against the near horizon—numbers 1, 2, 7, and 9 in our study—make modern viewers feel as if they have stumbled into an industrial park. The National Environmental Policy Act (NEPA) states that environmental assessments must consider the "cumulative effects" of developments. While oil and gas rigs did not erase or disturb the ground at archaeological sites in or around the Pierre's community, we argue that the positioning of twelve rigs within the great house viewscape falls into the "cumulative effects" category, as these wells clearly constitute "a pattern of actions whose effects are significant," as stipulated in NEPA. The general viewscape of the Pierre's community has been irreparably damaged by failure to consider these wells' obtrusive visibility.

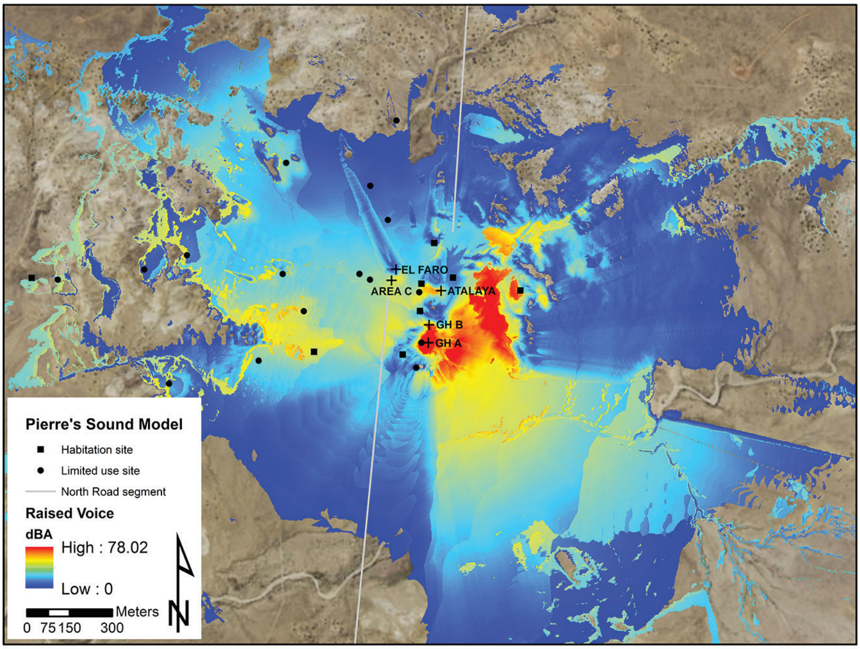
In our study we were keen to also investigate the Pierre's soundscape, particularly because noise from nearby mineral extraction is audible within the Pierre's community. During Van Dyke's site visit in November 2016, she could hear the clanking and periodic backfire of the engine driving Hoss Com #95. Van Dyke used a Roland Edirol digital recorder to capture periodic bursts of sound from Hoss Com #95 that measured up to 60 decibels higher than the ambient background. When the Bureau of Land Management (BLM) was subsequently notified of this noise disturbance, they required the drilling company to outfit the rig with a new muffler.

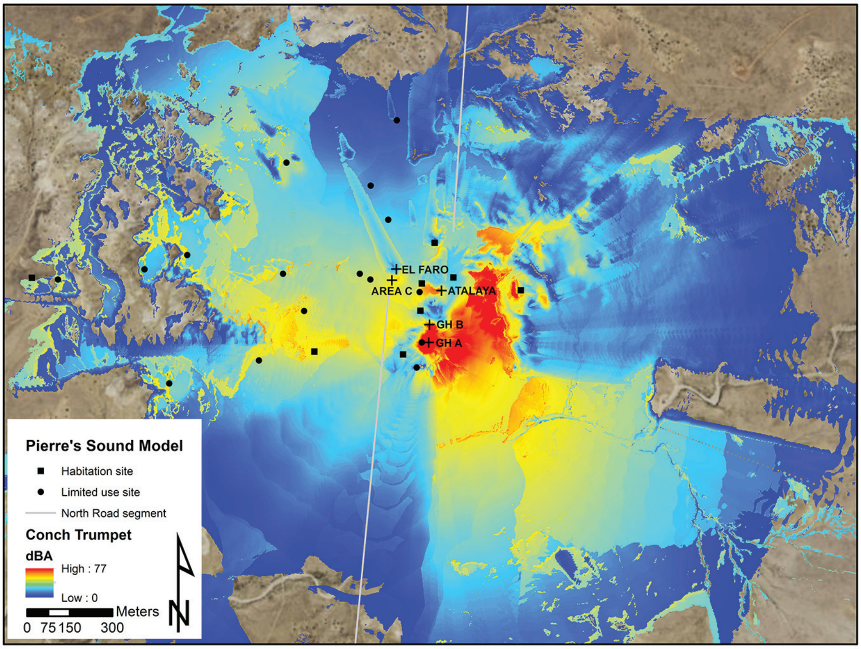
We investigated the Pierre's soundscape using the same acoustic modeling experiments that we had employed at Bis sa'ani. De Smet again followed the detailed procedures set out in the first part of this chapter. De Smet modeled a human shout and a conch shell trumpet blast emanating from Great House A (LA 16509). In both experiments the sounds reached distances nearly 2 km. As at Bis sa'ani, in our model, the conch shell trumpet was more effective than a human shout at reaching the entire Pierre's community. A human shout traveled to all but one limited use site in the Pierre's community (figure 11.11). The conch shell trumpet blast—as at Bis sa'ani—reached all twenty-eight habitations and limited use sites in the Pierre's community (figure 11.12). Both sounds would have been heard by travelers up to 1 km away along the North Road.

As at Bis sa'ani, the Pierre's community boundaries map rather neatly onto the reach of the sound of a conch shell trumpet, suggesting that it may have been important for residents to live and work within hearing distance of the Pierre's great houses. People at Pierre's could have seen Chacoan landmarks and could have signaled with Pueblo Alto, suggesting that viewscape is most important for long-distance interactions; by contrast, soundscape seems most important for local, community interactions. Although we need to replicate these experiments at additional outliers with good community data, our work suggests that soundscape modeling may prove useful to land

Figure 11.11 (overleaf, top). *Reach of a human shout emanating from Pierre's great house A (LA 16509). Model and graphic by Tim De Smet.*

Figure 11.12 (overleaf, bottom). *Reach of a conch shell blast emanating from Pierre's Great House A (LA 16509). Model and graphic by Tim De Smet.*


EL FARO
AREA C
ATALAYA
GH B
GH A
Pierre's Sound Model
Habitation site
Limited use site
North Road segment
Raised Voice
dBA
High : 78.02
Low : 0
Meters
0 75 150 300
N


EL FARO
AREA C
ATALAYA
GH B
GH A
Pierre's Sound Model
Habitation site
Limited use site
North Road segment
Conch Trumpet
dBA
High : 77
Low : 0
Meters
0 75 150 300
N

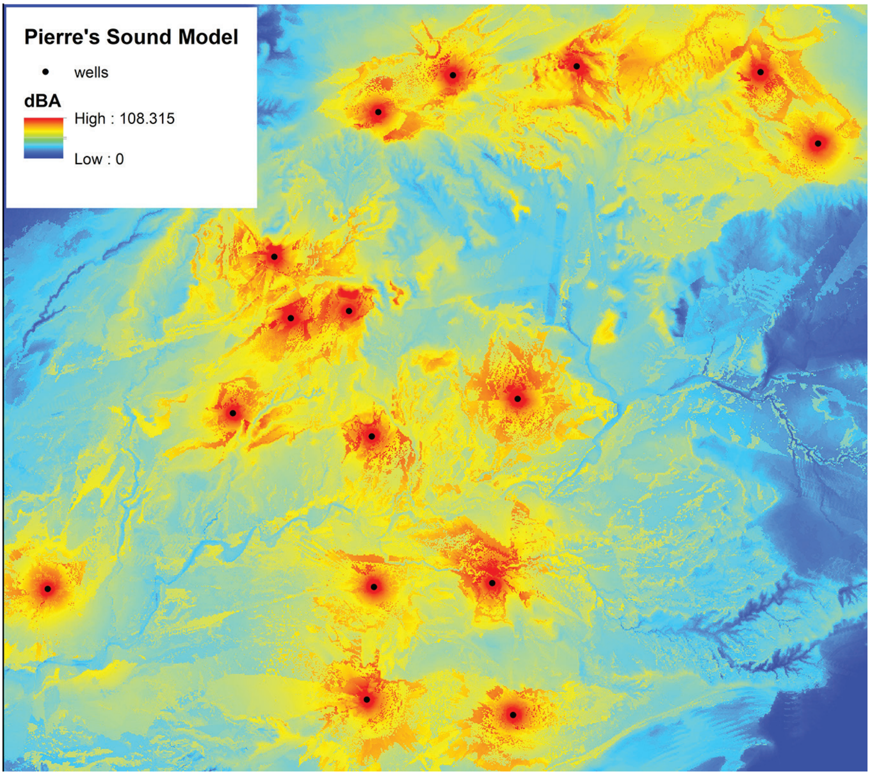


Figure 11.13. *Cumulative soundscape showing reach of noise from sixteen drill rigs in the Pierre's vicinity. Model and graphic by Tim De Smet.*

managers and archaeologists as a means with which to predict Chacoan community boundaries.

Noise from the surrounding drill rigs did not impact our ability to model the Pierre's soundscape, but it is always present at a low level, and it is affecting visitors' sensory experiences of this community. To measure this impact, De Smet obtained pumpjack sound decibel data from the BLM (2000). Following Primeau and Witt's (2018) procedures, De Smet modeled the extent of the noise emanating from sixteen pumpjacks located in the immediate area of the Pierre's community. This model demonstrates that between 40 dBA and 60 dBA reach most of the archaeological sites in the community (figure 11.13). For reference, 40 dBA is the ambient noise of a suburban area at night, and 60 dBA is normal conversational speech (Yale University 2018). By contrast, a natural area with no wind has an ambient decibel level of 20 dBA.

Clearly the pumpjacks are producing low-level background noise pollution that constitutes "cumulative effects" under NEPA and adds to visitor's sense of walking through an industrial area.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Sense of place is a difficult concept to quantify. It will be different for different people. A sense of place incorporates aspects that archaeologists cannot study easily, such as meaning and memory. But in this study we hope to have shown that sensory experiences—what can be seen and what can be heard on an archaeological landscape—*can* be approached by archaeologists. Our comparison of viewscapes and soundscapes in the Bis sa'ani and Pierre's communities has given us tantalizing ideas about interactions across the Chacoan world. Intervisibility was important for reaching beyond community boundaries and making connections to Chaco Canyon and other outliers, and the acoustic reach of a conch shell trumpet was one way that outlier communities were held together. Colleagues (e.g., B. Mills et al. 2018) are studying the "social networks" represented by moving objects, but connections also were made through sight and sound. We have the ability to study these connections, but only if we do not destroy the visual and acoustic landscapes in which they are embedded. While today's landscape is not synonymous with the Chacoan past, neither is today's potsherd synonymous with a Chacoan vessel. Like artifact analysts, phenomenological archaeologists take the fragments we can get, and we ask questions that we can answer. Phenomenological methods such as those we have demonstrated here, working in tandem with powerful GIS mapping and modeling programs, have tremendous untapped potential for Chacoan scholarship.

However, because these kinds of studies are relatively new in archaeology, we lack robust legislation to help landowners and agencies figure out how to evaluate, study, and mitigate potentially damaging effects from oil and gas drilling or other types of destructive development. The Pierre's community is a poster child for what can go wrong when land managers do not assess the potential for indirect and cumulative adverse impacts to viewscapes and soundscapes. Despite efforts made by the Bureau of Land Management and the National Park Service to minimize the effects of mineral extraction on the Pierre's community, the Pierre's community today has the feeling of an industrial park.

We offer the following recommendations that would help prevent adverse effects across other areas of the greater Chaco landscape:

1. We cannot protect archaeological sites where we do not know about them. Site data availability and recording across the greater Chaco world are piecemeal at best. Thus, land managers should require comprehensive Class III survey across areas intended for leasing, and this survey should take place at a regional, not a local or piecemeal, scale. In other words, large-scale landscape archaeology is needed as part of a Master Leasing Plan in the greater San Juan Basin. Discrete site protection is not enough.
2. Archaeological surveys should include assessment of viewscapes and soundscapes. We have laid out here some simple and effective techniques for recording viewscapes and soundscapes in the field. These methods or similar should become part of every survey archaeologist's toolkit.
3. Land managers should use the available technology to create predictive models of potential adverse impacts. They could use ArcGIS modeling to delineate the extents of great house viewscapes. Similar, they could use our methods to predict the potential impacts of drill rigs on soundscapes. Land managers could then require mining companies to locate their machinery outside the potentially impacted areas. The areas covered by a drilling moratorium thus would vary based on the local situation at each great house—a blanket protection of 1–2 km, for example, is not sufficient, because every great house's topography and community configuration are different.
4. Where avoidance is not possible, land managers should require mineral extraction companies to camouflage equipment and to provide sound-dampening equipment to mitigate the noise.

In an era of rapidly advancing economic development on the Colorado Plateau, it is imperative for archaeologists to help government personnel and legislators develop good management strategies for the fragile and understudied aspects of the ancient sensory world.

Viewscapes and soundscapes are important dimensions of the ancient Chacoan landscape. If we are ever to understand a Chacoan sense of place, archaeologists need to continue to devise creative (yet rigorous and systematic!) methods for studying sensory experiences. And, we need to ensure that the visual and acoustic dimensions of Chacoan communities are protected, not only for our current study but to ensure that future generations of scholars and visitors will be able to experience the greater Chaco landscape.

ACKNOWLEDGMENTS

Our thanks to Paul Reed and Archaeology Southwest for the inspiration and the funding to carry out the digital viewscape studies in the Bis sa'ani and Pierre's communities. We thank Cory Breternitz for a site tour and for the accurate Bis sa'ani community site locations. We appreciate Carrie Heitman's feedback on an early draft of this paper. Jo Day's work in sensory archaeology has been an inspiration. De Smet carried out the sound modeling work in the Binghamton University Geospatial Remote Sensing/Environmental Visualization laboratory.

REFERENCES

Basso, Keith H. 1996. *Wisdom Sits in Places: Landscape and Language among the Western Apache*. University of New Mexico Press, Albuquerque.

Bernardini, Wesley, Alicia Barnash, Mark Kumler, and Martin Wong. 2013. "Quantifying Visual Prominence in Social Landscapes." *Journal of Archaeological Science* 40(2013):3946–3954.

Bernardini, Wesley, and Matthew A. Peeples. 2015. "Sight Communities: The Social Significance of Shared Visual Landmarks." *American Antiquity* 80(2):215–235.

Breternitz, Cory Dale, David E. Doyel, and Michael P. Marshall, eds. 1982. *Bis sa'ani: A Late Bonito Phase Community on Escavada Wash, Northwest New Mexico*. Navajo Nation Papers in Anthropology No. 14. 3 vols. Window Rock, AZ.

Brown, Emily J. 2005. "Instruments of Power: Musical Performance in Rituals of the Ancestral Puebloans of the American Southwest." PhD dissertation, Graduate School of Arts and Sciences, Columbia University. ProQuest, Ann Arbor.

Brück, Joanna. 2005. "Experiencing the Past? The Development of a Phenomenological Archaeology in British Prehistory." *Archaeological Dialogues* 12(1):45–72.

Day, Jo, ed. 2013. *Making Senses of the Past: Toward a Sensory Archaeology*. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Dungan, Katherine. 2009. "Visibility, Monumentality, and Community in the Chacoan Community at Kin Bineola, New Mexico." Unpublished MA thesis, Department of Anthropology, University of Arizona, Tucson.

Dungan, Katherine A., Devin White, Sylvaine Déderix, Barbara J. Mills, and Kristin Safi. 2018. "A Total Viewshed Approach to Local Visibility in the Chaco World." *Antiquity* 92(364):905–921.

Ellenberger, Katharine. 2012. "Scales of Visibility at a Chacoan Outlier: The Visual World of People at Kin Klizhin." Unpublished MA thesis, Department of Anthropology, Binghamton University, Binghamton, NY.

Elliot, Ben, and Jon Hughes. 2014. "Sonic Horizons of the Mesolithic: Using Sound to Engage Wider Audiences with Early Holocene Research." *World Archaeology* 46(3):305–318.

Frieman, Catherine, and Mark Gillings. 2007. "Seeing Is Perceiving?" *World Archaeology* 39(1):4–16.

Hacıgüzeller, Piraye. 2012. "GIS: Critique, Representation, and Beyond." *Journal of Social Archaeology* 12(2):245–263.

Hamilakis, Yannis. 2012. "Archaeologies of the Senses." *The Oxford Handbook of the Archaeology of Religion and Ritual*, edited by Timothy Insoll, 208–225. Oxford, Oxford.

Hamilton, Sue, and Ruth Whitehouse. 2006. "Phenomenology in Practice: Towards a Methodology for a 'Subjective' Approach." *European Journal of Archaeology* 9(1):31–71.

Harper, Randy, and Marilyn K. Swift, Barbara J. Mills, James Brandi, and Joseph C. Winter. 1988. *The Casamero and Pierre's Outliers Survey: An Archaeological Class III Inventory of the BLM Lands Surrounding the Outliers*. Office of Contract Archeology, University of New Mexico, Albuquerque.

Kantner, John, and Ronald Hobgood. 2003. "Digital Technologies and Prehistoric Landscapes in the American Southwest." In *The Reconstruction of Archaeological Landscapes through Digital Technologies*, edited by Maurizio Forte, P. Ryan Williams, and James Wiseman, 117–123. Archaeopress, Oxford.

Lekson, Stephen H. 2015. *The Chaco Meridian: One Thousand Years of Political and Religious Power in the Ancient Southwest*. 2nd ed. Rowan and Littlefield, New York.

Llobera, Marcos. 2007. "Reconstructing Visual Landscapes." *World Archaeology* 39(1):51–69.

Loose, Richard W. 2008. "Tse' Biinaholts'a Yałti (Curved Rock That Speaks)." *Time and Mind: Journal of Archaeology, Consciousness, and Culture* 1(1):31–50.

Loose, Richard W. 2010. "Archaeoacoustics: Adding a Soundtrack to Site Descriptions." In *Threads, Tints, and Edification, Papers in Honor of Glenna Dean*, edited by E. J. Brown, K. Armstrong, D. M. Brugge and C. J. Condie, 127–136. Papers of the Archaeological Society of New Mexico 36, Albuquerque.

Loose, Richard W. 2012. "That Old Music: Reproduction of a Shell Trumpet from Pueblo Bonito." In *Glen Canyon, Legislative Struggles, and Contract Archaeology: Papers in Honor of Carol J. Condie*, edited by E. J. Brown, C. J. Condie, and H. K. Crotty, 127–133. Papers of the Archaeological Society of New Mexico 38, Albuquerque.

Malville, J. McKim, ed. 2004. *Chimney Rock: The Ultimate Outlier*. Lexington Books, Lanham, MD.

Marshall, Michael P. 1997. "The Chacoan Roads: A Cosmological Interpretation." In *Anasazi Architecture and American Design*, edited by B. H. Morrow and V. B. Price, 62–74. University of New Mexico Press, Albuquerque.

Marshall, Michael P., and Anna Sofaer. 1988. "Solstice Project Investigations in the Chaco District 1984 and 1985: The Technical Report." Manuscript on file, Laboratory of Anthropology, Santa Fe, NM.

Miller, Nicholas P. 2008. "U.S. National Parks and Management of Park Soundscapes: A Review." *Applied Acoustics* 69(2):77–92.

Mills, Barbara J., and T. J. Ferguson. 2008. "Animate Objects: Shell Trumpets and Ritual Networks in the Greater Southwest." *Journal of Archaeological Method and Theory* 15(4):338–361.

Mills, Barbara J., Matthew A. Peeples, Leslie D. Aragon, Benjamin A. Bellorado, Jeffery J. Clark, Evan Giomi, and Thomas C. Windes. 2018. "Evaluating Chacoan Migration Scenarios Using Dynamic Social Network Analysis." *Antiquity* 92(364):922–939.

Mills, Steve. 2014. *Auditory Archaeology: Understanding Sound and Hearing in the Past*. Left Coast Press, Walnut Creek, CA.

Mlekuz, Dmitrij. 2004. "Listening to Landscapes: Modelling Past Soundscapes in GIS." *Internet Archaeology* 16. http://dx.doi.org/10.11141/ia.16.6.

Parsons, Elsie Clewes. 1939. *Pueblo Indian Religion*. University of Chicago Press, Chicago.

Powers, Robert P., William B. Gillespie, and Stephen H. Lekson. 1983. *The Outlier Survey: A Regional View of Settlement in the San Juan Basin*. Reports of the Chaco Center 3. US Department of the Interior, National Park Service, Albuquerque.

Primeau, Kristy E., and David E. Witt. 2018. "Soundscapes in the Past: Investigating Sound at the Landscape Level." *Journal of Archaeological Science: Reports* 19 (October): 875–885.

Scarre, Chris, and Graeme Lawson, eds. 2006. *Archaeoacoustics*. McDonald Institute for Archaeological Research, University of Cambridge, Cambridge, UK.

Schofield, John. 2014. "The Archaeology of Sound and Music." *World Archaeology* 46(3):289–291.

Scullin, Dianne. 2019. "Mapping Sound: Creating a Static Soundscape." In *Re-Mapping Archaeology: Critical Perspectives, Alternative Mappings*, edited by Mark Gillings, Piraye Hacıgüzeller, and Gary Lock. Routledge, London and New York.

Sofaer, Anna. 2007. *Chaco Astronomy: An Ancient American Cosmology*. Ocean Tree Books, Santa Fe.

Stein, John R. 1983. "Road Corridor Descriptions." Chapter 8 in *Chaco Roads Project, Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin*, edited by Chris Kincaid, 8-1–8-15. Bureau of Land Management, Albuquerque.

Stein, John R., Richard Friedman, Taft Blackhorse, and Richard Loose. 2007. "Revisiting Downtown Chaco." In *The Architecture of Chaco Canyon, New Mexico*, edited by Stephen H. Lekson, 199–224. University of Utah Press, Salt Lake City.

Till, Rupert. 2014. "Sound Archaeology: Terminology, Paleolithic Cave Art and the Soundscape." *World Archaeology* 46(3):292–304.

Truax, Barry. 1999. *Handbook of Acoustic Ecology*. Street Publishing, Cambridge.

Van Dyke, Ruth M. 2007. *The Chaco Experience: Landscape and Ideology at the Center Place*. School of Advanced Research Press, Santa Fe, NM.

Van Dyke, Ruth M. 2013. "Ritual, Timelessness, and Experience in the Pueblo World." In *Big Histories, Human Lives: Tackling Problems of Scale in Archaeology*, edited by John Robb and Timothy Pauketat, 193–206. School of Advanced Research Press, Santa Fe, NM.

Van Dyke, Ruth M., R. Kyle Bocinsky, Thomas C. Windes, and Tucker J. Robinson. 2016. "Great Houses, Shrines, and High Places: A GIS Viewshed Analysis of the Chacoan World." *American Antiquity* 81(2):205–230.

Villanueva-Rivera, Luis J., Bryan C. Pijanowski, Jarrod Doucette, and Burak Pekin. 2011. "A Primer of Acoustic Analysis for Landscape Ecologists." *Landscape Ecology* 26(9):1233–1246.

Vokes, Arthur W., and David A. Gregory. 2007. "Exchange Networks for Exotic Goods in the Southwest and Zuni's Place in Them." In *Zuni Origins: Toward a New Synthesis of Southwestern Archaeology*, edited by David A. Gregory and David R. Wilcox, 318–357. University of Arizona Press, Tucson.

Weiner, Robert S. 2015. "A Sensory Approach to Exotica, Ritual Practice, and Cosmology at Chaco Canyon." *Kiva* 81(3–4):220–246.

Wheatley, David. 1995. "Cumulative Viewshed Analysis: A GIS-Based Method for Investigating Intervisibility, and Its Archaeological Application." In *Archaeology and Geographic Information Systems: A European Perspective*, edited by Gary R. Lock and Zoran Stančič, 171–186. Taylor and Francis, London.

Wheatley, David, and Mark Gillings. 2002. *Spatial Technology and Archaeology: The Archaeological Applications of GIS*. Taylor and Francis, London.

Yale University. 2018. "Decibel Level Comparison Chart." *Environmental Health and Safety*. https://ehs.yale.edu/sites/default/files/files/decibel-level-chart.pdf.

12

Night Skies

G. B. Cornucopia

Watch the video of this chapter, recorded at Crow Canyon Archaeological Center on August 14, 2017.

https://doi.org/10.5876/9781646421701.c012.v000

Interpretive ranger G. B. Cornucopia first came to Chaco Culture National Historical Park (NHP) as a campground host in 1988. Across three decades of interaction with the public, he has encouraged visitors to use their experiences in Chaco to connect with the natural and archaeological world. Chaco Culture NHP has exceptionally dark night skies, and these skies are one of the park's most important archaeological and natural resources. We know Chacoans looked at the night skies; in fact, for most of human history, night skies were an important dimension of the human experience. Chaco Culture NHP is an exceptional place to study and learn about the stars. It is the only national park with a working astronomical observatory available to visitors, donated by an astronomer in 1998. Over two decades ago Chaco initiated a Night Skies program for visitors. The program has been immensely successful and has fostered the development of similar programs in other parks. In 2013, Chaco was named an International Dark Sky Park. Today, however, ambient light pollution, particularly from mineral extraction activities on the borders of the park, threatens Chaco's night skies.

DOI: 10.5876/9781646421701.c012

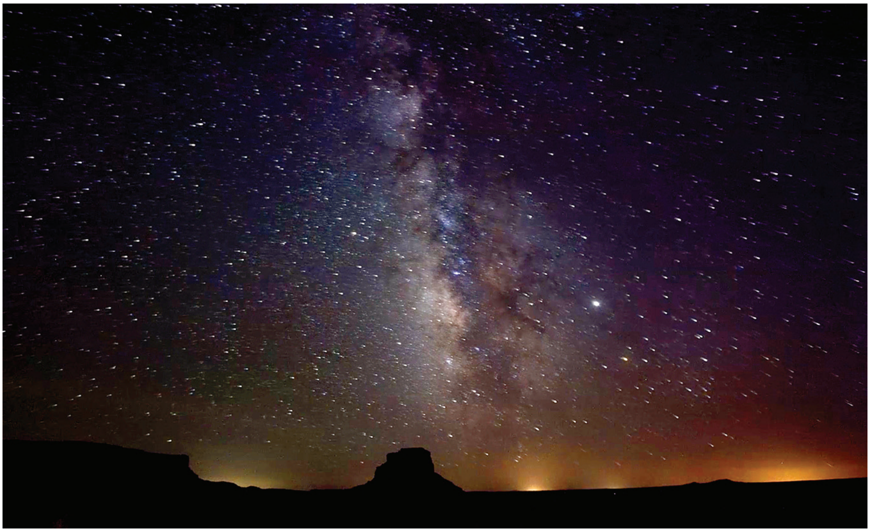


Figure 12.1. *Night sky view from Chaco Canyon. Photo by G. B. Cornucopia.*

V

Geospatial Investigations and Big Data

13

LiDAR and 3-D Digital Modeling Reveal the Greater Chaco Landscape

Richard A. Friedman,
Anna Sofaer,
and Robert S. Weiner

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 14, 2017.

https://doi.org/10.5876/9781646421701.c013.v000

INTRODUCTION

Across the vast desert region of the Four Corners, monumental sites of the Chaco culture and their associated linear "roads" are vanishing through the effects of erosion, deposition, and human activities. Often, even better-preserved features are so subtle that they are detectable only to the trained eye. The technologies of Light Detection and Ranging (LiDAR) and Structure from Motion Photogrammetry (SfM) introduced in this chapter provide an opportunity to appreciate the original grandeur and enormous geographic expanse of the 150-to-200 Chacoan Great House complexes of massed architecture, earthworks, and roads: their impressive scale, geometric rigor, and uniformity of style.

The creation of highly resolved three-dimensional (3D) models of these great complexes set in their distinctive, culturally modified landscapes can aid researchers in understanding and interpreting (1) the interrelationships between architectural sites, and (2) the significance of interrelationships of natural features and associated architectural/architectonic structures. Questions that these types of landscape-scale datasets may help answer include the Chacoans'

DOI: 10.5876/9781646421701.c013

choices for site location, the interrelationship of public architecture (Great Houses, Great Kivas, etc.) across time and space, design evolution of public architecture and architectonic features over time, and their possible alignments to celestial cycles. Roads in particular can be studied for their intricate relationships to buildings, earthworks, and landscape features, as well as for their role in connecting sites through time. Insights into what was uniform and synchronous in outlier Great Houses and what traits were similar or not to the buildings of Chaco Canyon will shed light on the extent and nature of power and influence held by the great architectural complex in Chaco Canyon.

In this chapter we demonstrate our use of two recent technologies—LiDAR for large-scale, landscape-scale analysis, and SfM Photogrammetry for more refined, smaller-scale analysis—showing highly effective results in precisely documenting and studying Chaco sites and landscapes. What in the past entailed manual mapping at remote sites with a high cost can now be accomplished with far less investment and greater accuracy and, most significant, can encompass the site's important relationships within their larger landscapes. Although use of the new technologies requires follow-up ground truthing at each site, the person hours for such survey work is minimal compared to the time involved in the use of earlier survey techniques. Features located outside protected Great House boundaries that have often not been documented in earlier surveys, such as roads and their associated shrines and earthworks, can now be efficiently recorded and therefore be afforded better protection.

Three-dimensional models created by these technologies will allow both researchers and the public to appreciate the spatial extent, time depth, and nearly incomprehensible monumentality of the Chacoans' built environment. Chaco sites are rarely visualized in three dimensions, and yet 3D digital models can now provide an experiential sense of the monumentality of Great Houses and "roads" that one seldom gets when visiting the site in person. Ultimately, these technologies can provide a comprehensive overview of the Chaco World in its impressive geographic expanse and time depth. The more that policy makers, researchers, and the public can experience the scale and refined nature of the Chacoans' investment in their harshly challenging environment, encompassing a region of up to 100,000 sq km, and the degree of conceptual planning required to achieve it, the greater the chance for recognition and support—as well as knowledgeable guidance and policies—for protecting their extraordinary legacy.

BACKGROUND ON CHACO LANDSCAPES AND ROADS

Great Houses, Outliers, and Landscapes

Previous research has contributed critical insights into the nature of Chaco landscapes and the Chacoans' immense investment in their layered, multi-component constructions. The eleven monumental Great Houses within Chaco Canyon are examples of some of the most captivating architecture in the ancient Americas. The extravagance of Pueblo Bonito is especially striking. It stood four stories tall with over 700 rooms and 36 kivas and contained vast quantities of precious objects: tens of thousands of pieces of turquoise, conch shell trumpets, wooden staffs, macaws, cylinder vessels with cacao residues, copper bells, gambling implements, and finely crafted, hachured pottery (Judd 1954; Pepper 1920). The labor and management required to construct Chaco Canyon's Great Houses is impressive, requiring the transport by foot of 240,000 timbers from distant mountains, located 70–90 km from the canyon (Guiterman et al. 2016).

Pioneering surveys in the 1970s and 1980s documented approximately seventy Chacoan Great House communities across the 20,000-sq-km San Juan Basin, revealing a larger geographic cultural influence of Chaco Canyon than had previously been understood. These surveys showed the replicated styles of these structures to be similar to Great Houses in the central canyon, with ceremonial kivas blocked into monumental multistoried constructions (Lekson, chapter 2 in this volume; Marshall et al. 1979; Marshall and Sofaer 1988; Powers et al. 1983). Later studies showed a still broader expanse of repeatedly replicated Chacoan architecture at 150–200 Great House sites up to 250 km from the canyon (Cameron 2009; Fowler and Stein 1992; Kantner and Mahoney 2000; Stein and Lekson 1992). In the words of Stephen Lekson, "The explosive expansion of outliers outdistanced our abilities to render them believable" (2015:19–20).

Clearly, such uniform expression of architecture across 100,000 sq km required a powerful and compelling conceptual framework to unite diverse populations. John Stein and Lekson (1992) called this bonding ideology the "Big Idea," which they saw as expressed in the canonical layout of a Chaco outlier community: a Great House ringed by large earthworks, with 9-m-wide linear roadlike features (described in depth below) emanating from breaks in the mounds (earthworks) in a spokelike configuration. These Chacoan complexes, they noted, "are . . . inextricably tied, physically and cognitively, to a broader sacred geography that embraces the natural landscape" (Stein and Lekson 1992:87). This research was fundamental in establishing that a shared belief system underlay the organization of Chacoan landscapes and architecture.

The Solstice Project has reached a similar conclusion regarding the primary role of Chacoan buildings less as functional structures but rather as symbolic expressions of cosmology. Four decades of research have revealed that Chacoan rock art (Sofaer et al. 1979; Sofaer et al. 1982; Sofaer and Sinclair 1983), Great House architecture (Sofaer 2007), roads (Sofaer et al. 1989), and shrines (Sofaer et al. 2017) commemorated solar and lunar astronomy through light and shadow markings, wall alignments, internal geometries, and intersite alignments.

The principle of uniting the sun and moon is evident in the Chacoans' astronomical commemorations at multiple levels and scales. At the Sun Dagger site, for example, sunlight channeled through the slabs from above produces a set of "light daggers" that mark the summer and winter solstices on a large spiral petroglyph (Sofaer et al. 1979). The lunar standstill cycle is also marked by shadows cast onto this same spiral petroglyph by the rising moon (Sofaer et al. 1982). Similarly, Pueblo Bonito and Chetro Ketl, the two largest Great Houses in Chaco, are solar and lunar aligned, respectively, and located east-west of each other as part of a cardinal cross that forms the central axis of "downtown Chaco" (Sofaer 2007). An astronomy that united the sun and moon in powerful displays at the center of the Chaco culture must have helped to enable its expanse across the Colorado Plateau.

While developing monumental constructions in a surprisingly challenging environment, the Chaco people apparently endowed this rugged landscape with special powers, in some cases interconnected with astronomy. Earlier studies show that the Chacoans were cognizant of dramatic viewsheds and relationships to prominent landforms in the placement of Great Houses (Van Dyke 2007). Studies of Chaco roads have shown that many were built as connections with distinctive landscape features of buttes, pinnacles, canyons, and springs, including the Great North Road as an alignment joining the direction north with the topographic feature of Kutz Canyon (Marshall 1997; Sofaer et al. 1989). Similarly, the Chimney Rock Great House was located on a sharp precipice to view, once every eighteen to nineteen years, the rise of the northern major lunar standstill moon between two large rock pillars (Malville 2004). Most recently, analysis of the locations of twelve shrines on high positions of the three mesas that form the south side of Chaco Canyon show that they were located on numerous intersite alignments to the major standstill moon (Sofaer et al. 2017). This finding in turn reveals that the canyon itself is aligned to the moon, suggesting that such a topographic relationship of the central canyon may have inspired in part the Chacoans' extensive commemorations of the sun with the moon.

The sharply sculpted landscape of Chaco Canyon itself, and its surrounding distinctive landforms that emerge or drop down from the flat desert terrain, may have provided special assets for landscape planning on a cosmic scale. Powerful attractions could have been the canyon's apparent lunar alignment, its location at the approximate center of the San Juan Basin, and the distinctive form at its entrance of Fajada Butte's towering mass, site of the Sun Dagger, as well as the distant northern and southern features of, respectively, Hosta Butte and Kutz Canyon. These distinctive land formations may have provided an inspiring setting for the Chacoans' vastly conceived cosmographic road connections and buildings alignments.

Pueblo and Navajo people perceive Chaco as a living, breathing entity with great relevance in the present (e.g., Tsosie, chapter 8 and chapter 7 in this volume; Vallo, chapter 7 in this volume). While these histories and information are only shared under certain circumstances, at particular times of year, and within an appropriate context, they reveal the deep knowledge of Chacoan landscapes held within Native traditions. In some cases archaeological findings suggest resonances with the cultural traditions of descendant peoples (e.g., Sofaer 1999; Stein et al. 2007; Weiner 2018).

Chaco Roads

Chaco roads are linear surface anomalies, generally 9 m wide, marked by excavated roadbed cleared of rocks and vegetation and occasionally paved with caliche, adobe, or stone. Masonry walls, low stone curbs, cairns, or earthen mounds/berms sometimes define road edges, and elongated linear ceramic scatters consisting of distinct, scattered vessels (rather than single pot drops) are often present along roadbeds (Nials 1983:6.21–6.23). Crescent-shaped masonry *herraduras*, earthen mounds and berms, and ritual architecture also commonly accompany these linear features (Nials et al. 1987:6.8–6.18).

Numerous pieces of evidence suggest that the word *road* may be a misleading descriptor for these monumental linear features. First, their 9 m width far exceeds any utilitarian necessity, especially considering the lack of pack animals or wheeled vehicles among the Chaco culture. Second, these features maintain their linearity across topographic obstacles, a finding that conflicts with the notion of trade conduits. Third, only a few roads have been definitively shown to exist as long continuous features (e.g., the North and South Roads), and most are short segments either connecting Great Houses and Great Kivas or emanating as short (i.e., less than 1 km) "spokes" from a Great House (Roney 1992). Other examples exist as enigmatic circles or loops, such as at the Holmes

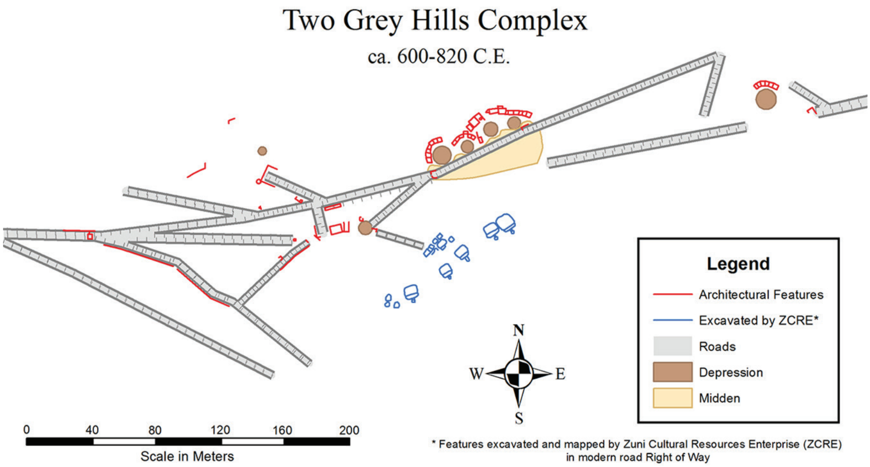


Figure 13.1. *Map showing prehistoric roads documented at Two Grey Hills, a Basketmaker III site. Modified by Richard Friedman after Ruppe' et al. (2001:fig. 1).*

Group. The possibility of further length to these segments should, however, be evaluated with new technologies. Finally, Bureau of Land Management (BLM) researchers involved in the last large-scale roads study concluded: "There is no evidence . . . roads encouraged either construction of individual residences or establishment of settlements along the road alignment. There is no evidence that purely domiciliary sites articulate with the roads" (Nials et al. 1987:25).

We also wish to redress the misconception that "roads" are associated solely with the so-called Chaco Phenomenon of the eleventh century AD. Roads have been recognized at sites from AD 600 to AD 1250, spanning the Basketmaker III through Pueblo III periods. For example, roads articulate with architectural features at Two Grey Hills, a Basketmaker III site that yielded AMS radiocarbon dates between AD 600 and AD 650 (Ruppe' et al. 2001; figure 13.1). Other roads have been documented from the thirteenth–fourteenth centuries (Fowler and Stein 1992).

It is of particular interest that certain roads connect sites separated by generations and even centuries, appearing to mark ancestral relationships between sites. Fowler and Stein (1992) called these roads "time bridges." This phenomenon is present at sites associated with Manuelito Canyon, the South Road, Padilla Wash (figure 13.2), Red Willow, Taylor Springs, and numerous other Great House complexes.

Other roads appear to have been built to express relationships with the distinctively sculpted landforms of the Chaco region. The 55 km South Road

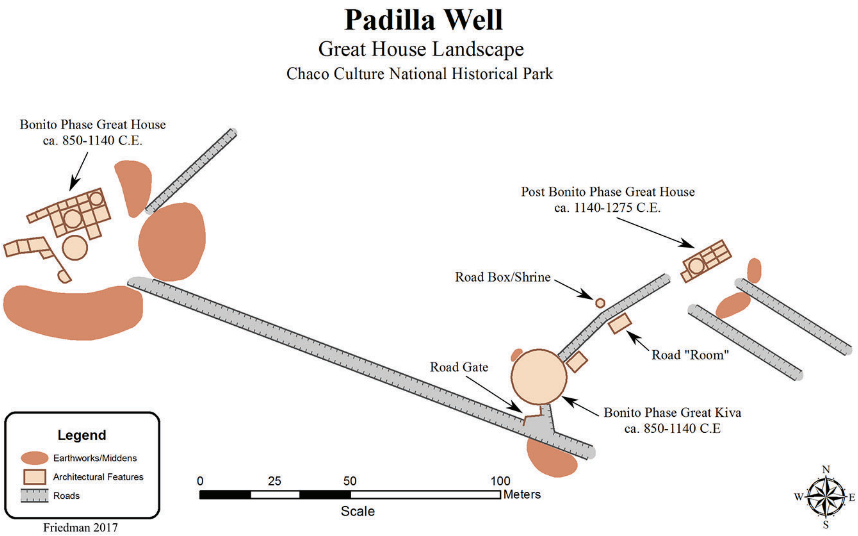


Figure 13.2. *The Padilla Wash Great House landscape, with prehistoric roads connecting two great houses with a great kiva, and roads linking a noncontemporaneous great kiva and great house. Modified by Richard Friedman after Friedman et al. (1999).*

articulates with the towering Hosta Butte, and the 10 km Ah-shi-sle-pah Road leads to Black Lake, an ephemeral pond (Sofaer et al. 1989). Some short road segments emanating from Great Houses in a "spoke" pattern appear to mark alignments to distinctive landscape features including lakes, caves, springs, pinnacles, and buttes (Marshall 1997). Other roads appear to mark astronomical alignments, such as one at the Skunk Springs Great House that is oriented to the winter solstice sunrise (for another possibility, see Tuwaletstiwa and Marshall, chapter 4 in this volume).

Chaco's 50.5 km Great North Road is perhaps the most compelling illustration of the Chacoans' regard for landforms and their inherent power, especially when joined with astronomical direction. Anna Sofaer et al. (1989) suggest its purpose was to materialize an alignment to the direction North from Chaco Canyon while also commemorating the striking badlands topography of Kutz Canyon in a "cosmographic expression." Numerous scaffolds and rampways ascend the cliffs behind the central canyon great houses and join at Pueblo Alto. From Pueblo Alto, these routes converge and travel north within a quarter of a degree of accuracy across one of the least-inhabited sectors of the Chaco region.

The absence of population centers, camping sites, resources, or evidence of trade along the road demonstrate that it was "overbuilt and underused"

(Sofaer et al. 1989). One portion of the North Road exists as parallel routes, each 9-m-wide (Marshall 1997:68–69; Sofaer et al. 1989). Pierre's Complex, "a constellation of special-function architecture" built onto "the summits of precipitous buttes and pinnacles," is the only major Chacoan site along the road (Stein 1983:8–9; Van Dyke, De Smet, and Bocinsky, chapter 11 in this volume). From Pierre's, the road appears to intentionally deviate—by 1.5°—from astronomic north in order to articulate with the steepest edge of Kutz Canyon, where a stairway was found with a concentration of broken ceramics.

The traditions of descendent Pueblo peoples suggest the Great North Road's possible symbolic significance. In Pueblo cosmologies, North holds great importance as the place of emergence and return of the spirits of the dead (White 1942:77, 1960:59). In Tewa, one translation of "road" is "channel for the life's breath" (Alfonso Ortiz, qtd. in Sofaer, Marshall, and Sinclair 1989), and the image of two parallel roads conveys the relationship between the living and the deceased (Ortiz 1969:57). The Great North Road's significance to descendent Pueblo and Navajo peoples, as well as its location within an area of extensive oil and gas extraction, were key in the National Trust for Historic Preservation's designation of the Greater Chaco Landscape as one of the Eleven Most Endangered Places in 2011.

LIGHT DETECTION AND RANGING (LIDAR) DOCUMENTATION OF CHACO ROADS

We have recently demonstrated that airborne LiDAR is a highly effective method for detecting and quantitatively documenting the current surface expressions of Chaco roads (Friedman et al. 2017). In brief, airborne LiDAR consists of mounting a laser scanner and associated data recording devices to an aircraft and flying over a target area. The onboard equipment records the aircraft's location and orientation and the time for a laser pulse to be reflected by the ground or an object on the ground back to the aircraft. These data allow one to compute the location in 3D space of the ground/object that reflected a given light pulse. The resulting product is referred to as a point cloud and can be used to create a highly accurate, 3D model of the surface flown by the aircraft.

Airborne LiDAR is currently the most accurate method of creating digital elevation models (DEMs) and can "penetrate" vegetation or tree canopy where photogrammetric methods typically cannot resolve the elevation of the ground surface. The point cloud data can be used to create Digital Surface Models (DSM) and Digital Terrain Models (DTM, also known as bare earth surface). Digital Terrain Models can be used to reveal features such as rivers, paths, ancient architecture, or Chaco roads that are concealed by trees or other vegetation. The strictly linear character of Chaco roads produces a particularly distinctive signature.

We used LiDAR to record the comprehensively studied 50.5-km Great North Road and Pueblo Alto Landscape, as well as the lesser-known Aztec Airport Mesa Road. The results of these primary applications demonstrate LiDAR's ability to produce a highly accurate, cost-effective, and quantitatively measurable digital model of the current physical expression of Chaco roads.

Data Processing and Visualization

The results described below are derived from a 1 m resolution LiDAR dataset. A fuller description of the steps involved in processing the raw LiDAR dataset into a product suitable for analysis is available in Friedman et al. (2017).

We used Global Mapper for quick and easy visualization of point cloud data where the measurement of road/feature cross sections or profiles was desired (Version 12) (e.g., figure 13.4). For this type of work, the point cloud is converted "on the fly" to a Global Mapper elevation grid (raster surface). Typically, the default pixel values recommended by the software during import are used. If the data needs further filtering to remove low vegetation noise, if more aesthetically pleasing colors are desired (especially for the creation of illustrations), or if easier manipulation of the lighting direction and height are desired in a Geographic Information System (GIS) environment, a gridded dataset is exported out of Global Mapper in "ARC ASCII Grid" format and imported as a surface into Manifold GIS (Version 8).

In Manifold, the elevation color ramp can be easily modified to improve visual analysis or cartographic output, and the lighting can also be easily manipulated for visual analysis (e.g., fig. 13.5c). Occasionally, the LiDAR data are imported into ArcGIS as an LAS Dataset to be able to easily move across the numerous LiDAR tiles in a contiguous seamless environment. This has the advantage of allowing one to perform a visual preanalysis using all the data in the LiDAR datasets and to then pick the tile of interests for further analysis.

As we describe below, shadow enhancement within a digital GIS environment was hugely helpful in identifying Chaco road segments. Most GIS software allow interactive real-time, or near real-time, visualization of the effects of light and shadow on the terrain using some type of polygonal surface generated using Triangular Irregular Networks.

We also employed 3D rendering and animation software for visual analysis and preparation of illustrations and animation. For the illustrations in this paper, a Digital Elevation Model format file (.dem) was exported from Global Mapper and imported into Carrara 8.5 Pro (DAZ 3D) using the Ground Control Plugin (Digital Carvers Guild). The gridded DEM data was converted to a proprietary Ground Control 3D mesh for use in Carrara 8.5 Pro. This format gave us the ability to modify the resolution of the data on the fly (i.e., use every point in the original data to create at full fidelity the 3D mesh, or decimate the data to a desired level) using an internal algorithm that gives the ability to retain mesh detail while dramatically reducing the mesh density and system load. The animation facilities in Carrara 8.5 Pro were then used to automate changing of the "sun angle" for visual analysis, static image production, or animation production.

LiDAR and Chaco Roads

Many ancient roads that were highly visible in 1930s aerial photography and on the ground during surveys in the 1980s can now only be seen using LiDAR technology. Wind, rain, snow, frost, and vegetation growth/loss are constantly contributing to the loss of Chaco road traces in the Four Corners Region, the pace of which has accelerated in recent decades (Heitman and Field, chapter 14 in this volume). Overgrazing also affects Chaco roads by removing surface vegetation, causing more rapid and higher volume runoff, and depositing larger quantities of windborne sediments.

An analysis of the Aztec Airport Mesa Road (~1.6 km W of Aztec Ruins National Monument) using LiDAR data collected by a consortium of San Juan County, the city of Farmington, New Mexico, and the city of Aztec, New Mexico, in 2007 illustrates the deterioration of Chaco roads in the last century. In 1919 the Aztec Airport Mesa Road was a dominant, highly visible feature on the landscape, "marked with pebbles and boulders" and finished with a white (possibly clay) surface treatment (figure 13.3; Wadleigh 1916:52). This same road segment, though not as obvious as in the 1919 ground photo, is still clearly visible in aerial photographs from 1934 (figure 13.4a). In the 1970s and 1980s, this could be easily identified on the ground. Today, it is comparatively difficult to see traces of this road on the ground or in contemporary standard aerial photography (figure 13.4b).

The Aztec Airport Mesa Road is clearly visible in LiDAR data (figure 13.4c), and the quantitative nature of its dataset also allows its extant cross-sectional profile to be measured with an unprecedented degree of precision (figure 13.4d).

In 2010 the Solstice Project was awarded a grant by the National Trust for Historic Preservation to document Chaco's Great North Road and the Pueblo Alto Landscape using LiDAR. We chose this road to further test LiDAR's

Figure 13.3. *The Aztec Airport Mesa Road in 1919. Note the monumental scale and white surface treatment. Wadleigh (1916:52).*

utility in roads research given the extant corpus of detailed documentation by the BLM (Stein 1983) and Solstice Project (Marshall and Sofaer 1988; Sofaer et al. 1989); the road's cultural significance to descendent Pueblo people (interviews in Sofaer 1999); and the alarming encroachment of energy development activities on and near the road.

Again, LiDAR proved highly effective. All segments of the Great North Road documented in previous studies were markedly pronounced in the LiDAR data, even though many of these segments are not currently visible on the ground or in contemporary aerial photography. Additionally, we detected 3.2 km of previously undocumented road segments along the North Road corridor. LiDAR data also successfully detected all segments visible in 1934 aerial photography of the Pueblo Alto Landscape, and it aided our identification of two road segments running south from Pueblo Alto, which do not appear in any previous imagery (figures 13.5 and 13.6).

Manipulation of the direction (azimuth) and angle above the horizon of the light source proved a highly effective method for detecting, documenting, and measuring Chaco roads (video 13.1). The ability to change the sun angle using GIS has been critical for their recognition. Roads trending east-west, which are never shadow enhanced by natural east-west sun angles and therefore have been difficult to detect with traditional methodologies, were visible in the digital GIS environment.

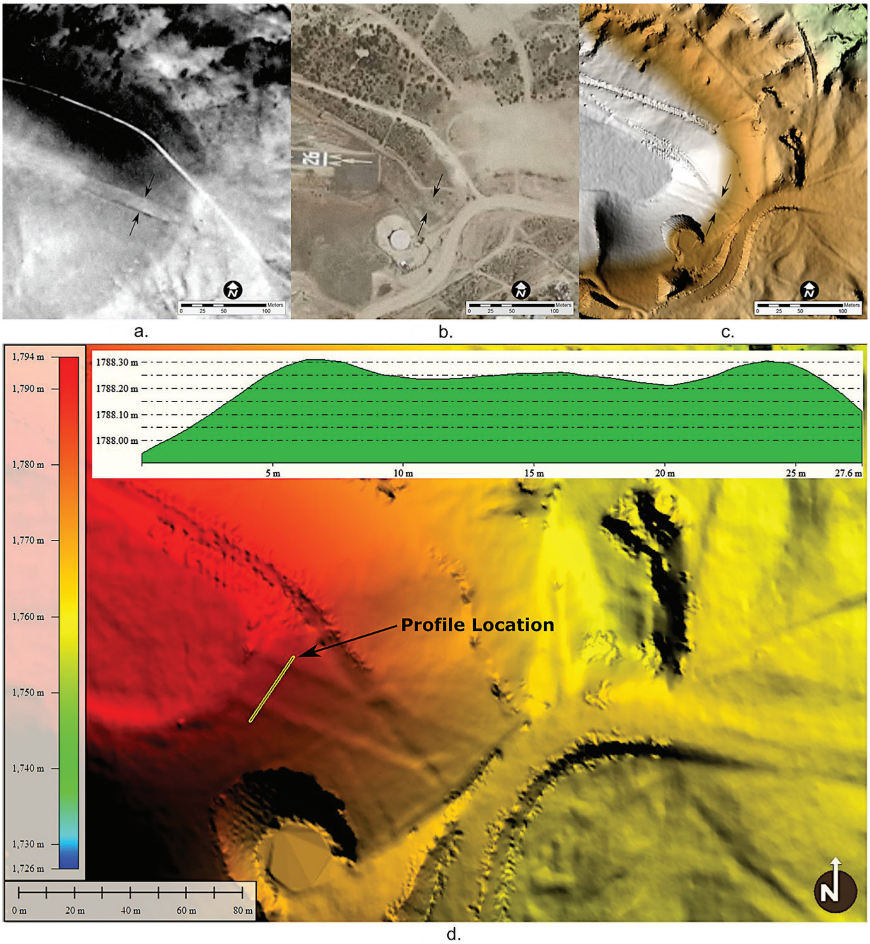
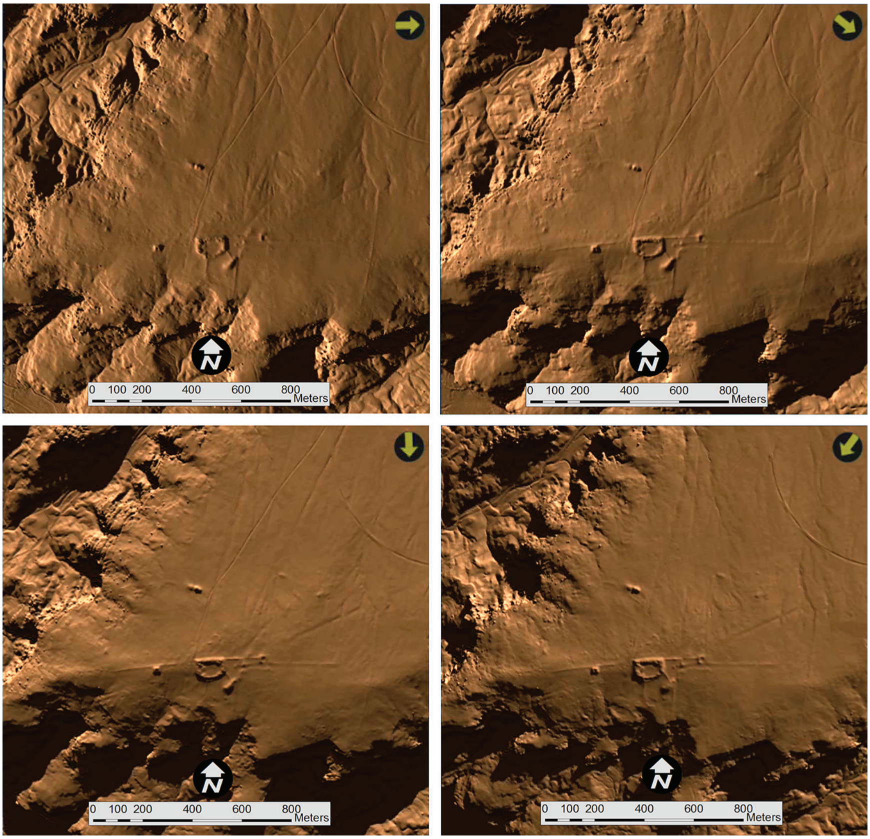


Figure 13.4. *The Aztec Airport Mesa Road in Soil Erosion Service aerial photography from 1934 (a); 2009 Google Earth Imagery (b); LiDAR data (c); and the road's cross-sectional profile as documented by LiDAR (d).*

We were also able to quantitatively measure the morphology of Chaco roads at centimeter levels of relative vertical precision, which is not possible using traditional field methods. For example, figure 13.6 shows the cross-sectional profile of a previously undocumented segment of the North Road that has only 9.1 cm of vertical relief across a distance of approximately 9.5 meters. This road segment could never be seen on the ground, yet it is easily discernable using LiDAR data.



Video 13.1. *Different "sun angles" applied to LiDAR data of Pueblo Alto Landscape. Note how roads with different trajectories are sharpened by different light angles. The arrow in the upper right shows the direction of the light source.*

Preliminary analysis of LiDAR data recently acquired by the BLM Farmington office revealed numerous Chaco road segments, including previously undetected possible roads. For example, an approximately 500-m-long segment running southwest from the Reservoir Site, a Pueblo III Great House, is clearly visible in the shadow-enhanced DEM derived from the new BLM LiDAR data (figure 13.7). Additionally, a possible parallel alignment of the South Road was perceptible (figure 13.8). These and other newly detected segments await ground verification.

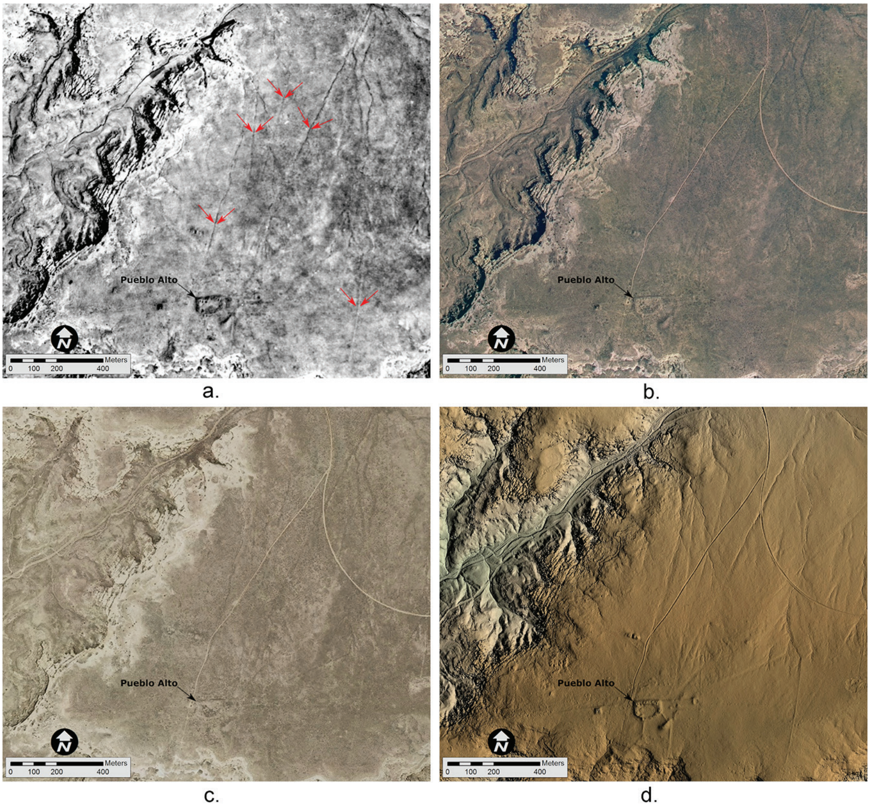


FIGURE 13.5. *The Pueblo Alto Landscape as documented through various remote-sensing methods, including 1934 Soil Erosion Service aerial photography (a); 2005 with low sun angle NAIP photography (b); 2009 NAIP photography with standard sun angle (c); and hill-shaded LiDAR (d). Note the vast decrease in visibility over time and the clear definition of roads in the LiDAR image.*

As this brief discussion shows, LiDAR holds great promise for further cost-effective, widespread documentation of Chaco roads and the opportunity for in-depth study of their enigmatic character. Potential topics include investigating projected road alignments where no evidence has been visible on the ground; least cost path analyses of newly discovered roads; and road relationship with resource locations, settlement areas, landscape features, and astronomic-directional azimuths. In comparison to other areas of Chaco research, there has been relatively little investigation of Chaco roads since the large BLM studies of the 1980s. These features, however, hold profound

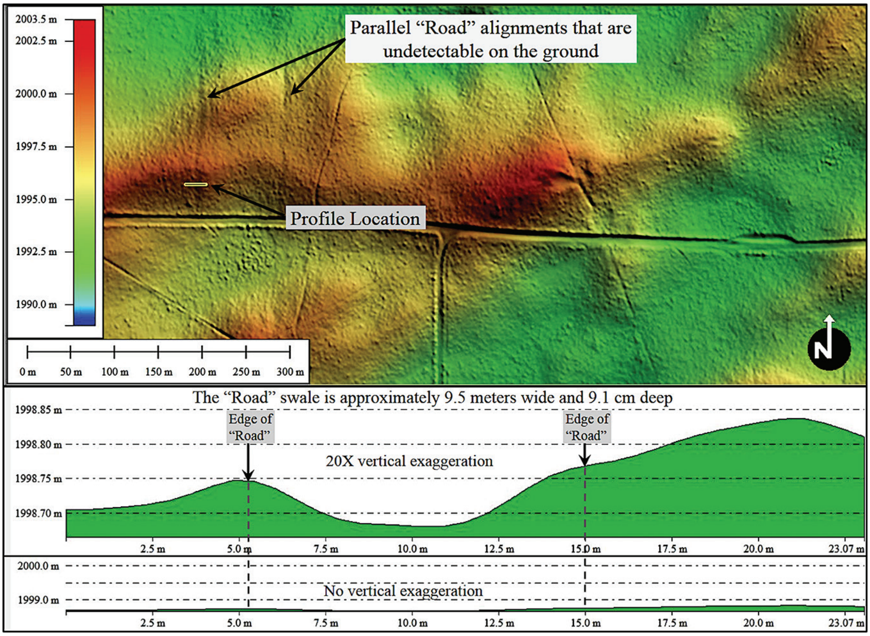


Figure 13.6. *Example of twenty-times exaggerated vertical profile versus no vertical exaggeration vertical profile of a section of the North Road detected by LiDAR that is not visible on the ground.*

insight into the priorities, values, planning, and beliefs of the ancient peoples of the Four Corners region. In the discussion below, we outline some suggestions for a large-scale renewed roads study building on the results of this preliminary work.

STRUCTURE FROM MOTION (SFM) PHOTOGRAMMETRY AND POLE AERIAL PHOTOGRAPHY

While LiDAR is an outstanding tool for landscape scale investigations, it can be costly and may be beyond the budget for many research and documentation projects. An emerging photogrammetric technology known as Structure from Motion (SfM) can provide a more cost-effective alternative for smaller landscape-scale projects and site excavation/documentation. Acquiring appropriate data for 3D photogrammetric measurement traditionally required expensive instrumentation and significant expertise, but here we demonstrate an approach that uses only digital photographs taken with

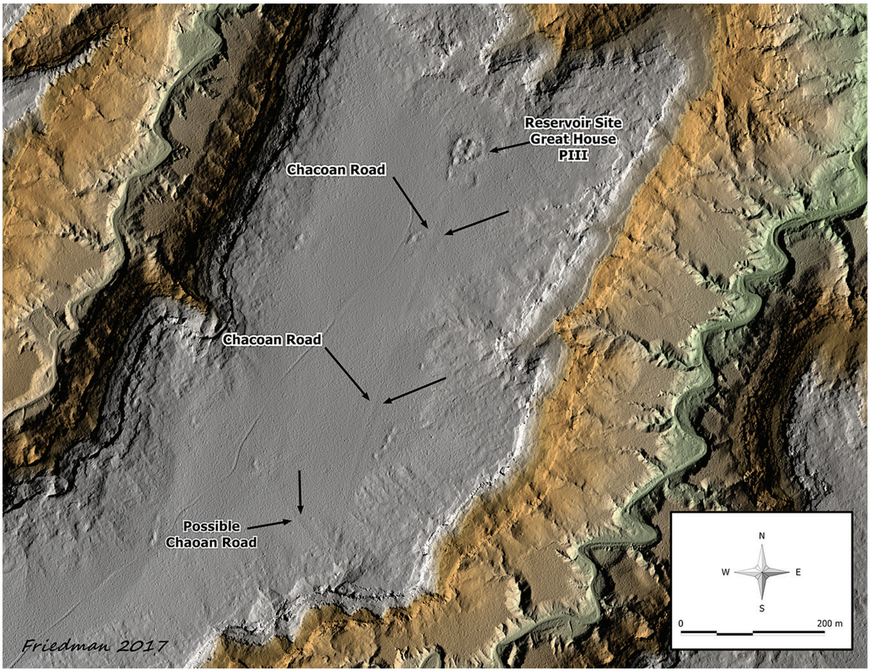


Figure 13.7. *LiDAR data showing a road running southwest from the Reservoir Site.*

a consumer camera and commercial (or freely available) software (James and Robson 2012). With incorporation of additional measurements for scaling and georeferencing, SfM can deliver data suitable for many archaeological and cultural resource management applications. Most significant, this technique also offers the capability to use digital photography, covering spatial scales of centimeters to kilometers, to construct accurate 3D models and DSMs.

Structure from Motion is a photogrammetric range imaging technique for estimating 3D structures from digital photo image sequences that are coupled with local motion vectors. It is studied in the fields of computer vision and visual perception. In biological vision, SfM refers to the phenomenon by which humans (and other living creatures) can recover 3D structure from the projected 2D (retinal) motion field of a moving object or scene.

Discussion of the various aspects of SfM—such as accuracy, specifics of methodology, camera sensors, and software options—are well beyond the scope of this chapter. Our purpose here is to show examples of SfM use for architectural, architectonic, and landscape research and documentation. The methods used for these examples are quite simple and yet extremely effective.

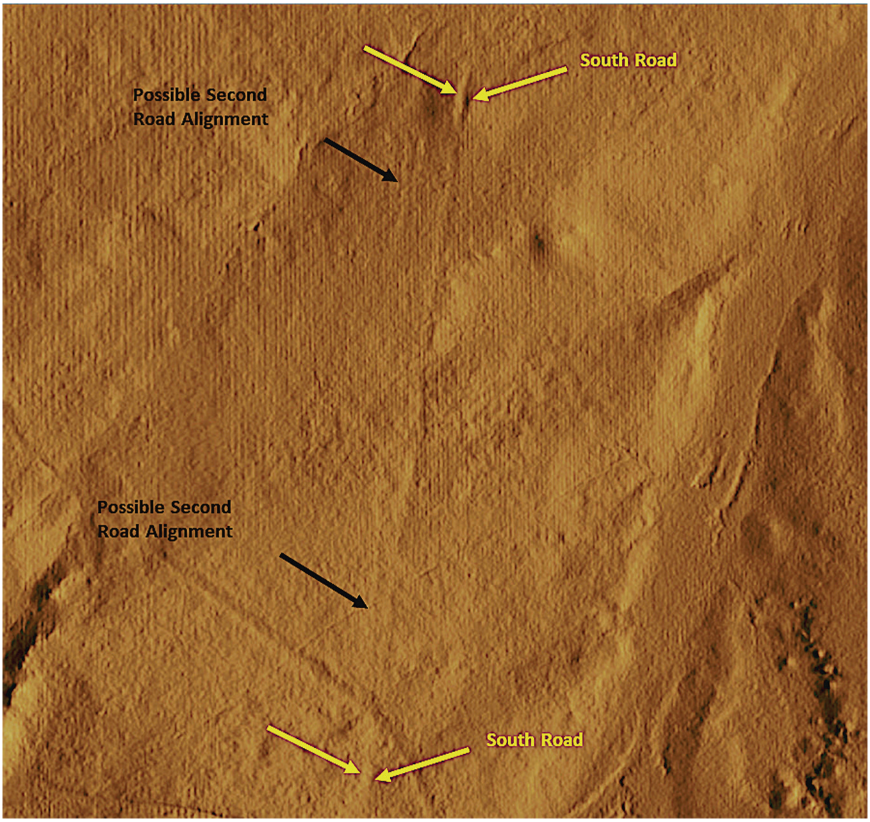


Figure 13.8. *Possible second, parallel alignment of the South Road in the new BLM LiDAR data.*

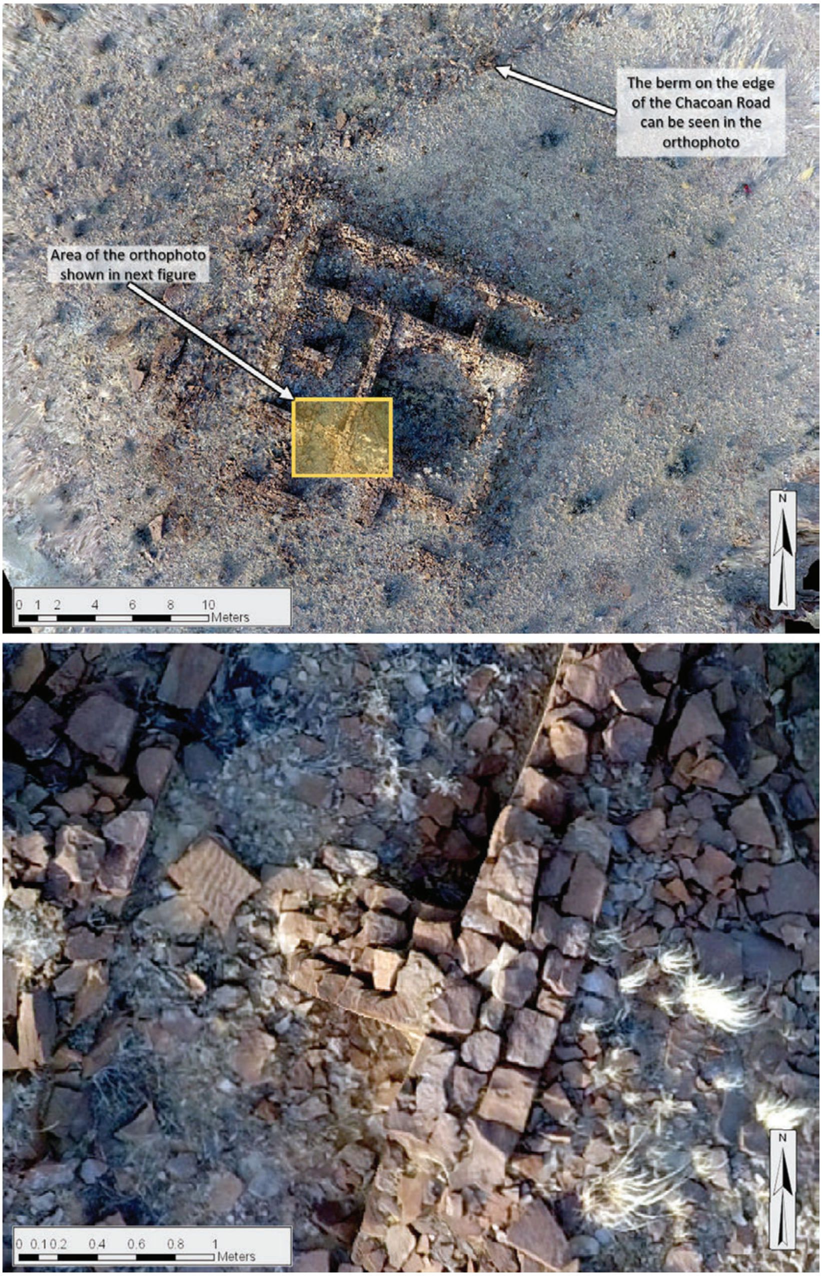
For these projects an aerial perspective was needed, but the use of a small Unmanned Aerial System (sUAS) was not feasible for a variety of reasons. The restrictions for "commercial" use of an sUAS at the time of the project required that a licensed airplane pilot fly the craft. This was well beyond the budget for the project, so the less expensive Pole Aerial Photography (PAP) option was selected. National Park Service regulations and visitor safety concerns would have also made the use of an sUAS much more difficult.

Instead, PAP was used to acquire photos from an aerial perspective. The setup used was similar to what is seen in figure 13.9 but often had multiple cameras mounted on the pole for improved data collection. The pole used was 7 m long, with the base of the pole inserted into a belt mounted cloth holder or pouch (effectively increasing the maximum potential camera height to ~8 m). The stability of the pole was greatly enhanced by keeping the base in a relatively solid mount. The cameras were set to take images at an appropriate interval for a slow methodical walking speed. Typically, a 2-second interval was used, because it is much better to oversample the data rather than undersample and not have photos that provide proper overlap to resolve the 3-D point cloud.

Figure 13.9. *Example of a typical Pole Aerial Photography setup. Photo of R. Friedman, by S. Friedman 2019.*

The cameras were consumer-grade Canon Sure Shot and GoPro action cameras. Due to the fish-eye lens of the GoPro cameras, they were typically most useful to ensure adequate coverage of the subject. It was determined that for our application, the GoPro 3 or better cameras provide more than adequate accuracy (Helmholz et al. 2016), as long as movement of the camera was relatively slow to avoid distortion from the rolling shutter.

As a simple proof-in-concept exercise for the documentation of architecture and architectonic features, PAP was tested at Casa Cielo, a small Chaco outlier. The results from this study show an excellent comparison between data collected by this method versus "off the shelf" photography and 1 m LiDAR data. The Casa Cielo video/photos (Video 13.2) demonstrates the differences between other data sources and the high-resolution photogrammetric products from low-altitude pole-based photography. Note the high detail of the site compared to other sources. The



Video 13.2. *Example PAP data from Casa Cielo Great House. 7 mm resolution orthophotograph derived from SFM photogrammetry. By R. Friedman.*

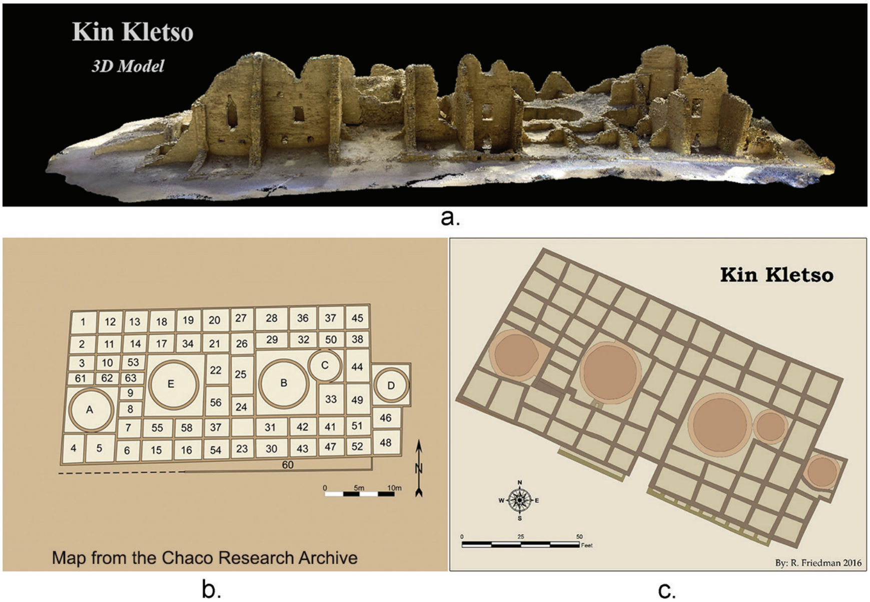


Figure 13.10. *View of "as built" 3D model of Kin Kletso as it is today (a); example of a common map of Kin Kletso (from the Chaco Research Archive) (b). and map of Kin Kletso created using SfM-derived orthophotos and elevation data (c).*

end of the video also illustrates its capability to generate textured 3D models for site visualization and long-term site condition assessment.

Another project focus was to create an accurate "as built" map of Kin Kletso, a Great House in Chaco Canyon (figure 13.10a–c). This effort provides an excellent example of how SfM technology can enable a single person to perform 3D documentation of a moderately complex structure with a large spatial extent (approximately 50 × 20 m). While the creation of a 2D map was the primary focus of this project, the 3D data were an important by-product to aid in the creation of a 3D reconstruction of the massive building. The 3D reconstruction was then used in the creation of a physical model for exhibit in the Chaco Culture National Historical Park Visitor Center Museum.

For this project the data was collected with a GoPro Hero 3 Silver (12 MP). Georeferencing and scaling of the model was provided by using survey-grade GPS receivers to obtain centimeter-level coordinate accuracy of locations that could easily and accurately be observed in the field and on the photography.

This SfM documentation of Kin Kletso also led to numerous archaeological insights regarding the building's form and errors in existing maps. First, north is incorrectly shown on some existing, widely distributed maps of the site (see, e.g., figure 13.10b). In figure 13.10b, it is assumed via cartographic convention that the north arrow is displaying true north, since there is no text or other indication of direction. It may be referencing magnetic north (or what was believed to be magnetic north on the original map); however, even then it would be considerably off: the approximate deviation from true north on this map is 24.62° W. An educated guess is that possibly the creator of the original map adjusted the magnetic declination on his/her compass the wrong direction, thus doubling the magnetic declination value.

The north arrow in figure 13.10c depicts true north, or very nearly true north. The north arrow in this case is set to "grid" or projection north. The projection used for the map and original data is New Mexico State Plane Coordinate System, West Zone, NAD83, US Ft. This projection was selected over the projection more commonly used Universal Transverse Mercator (UTM) projection because Chaco Culture National Historical Park is split by UTM Zone 12N and UTM Zone 13N. The distortion of "grid" north versus true north at the edge of the UTM zone boundaries here is well over 1°.

Additionally, while all previously published maps show a complete wall with a closed room in the center of the building's south side, our documentation revealed that no room ever existed there. There is no foundation or abutment for a wall in this location, which is currently the location of a National Park Service drainage system. Furthermore, this feature of Kin Kletso fits with the style of numerous McElmo Great Houses that have a similar "notch" for ladders. Finally, it became apparent that this "notch" is road related; it is the destination point of an ancient road visible in LiDAR data that connects 29SJ835, a monumental stepped platform mound on the south side of Chaco Canyon (see Stein et al. 2007:214–216), with Kin Kletso.

We have also included images to illustrate how the data from the new 2D map of Kin Kletso were used to generate a 3D massing reconstruction of Kin Kletso. Figure 13.11a shows the computer-generated and -rendered version of the model, and figure 13.11b shows the final physical model in the Chaco Culture National Historical Park Visitors Center Museum.

There are many other ways to capture photography for SfM documentation for cultural resource research and documentation. Small Unmanned Aerial Systems (sUAS) are the most commonly used and extremely effective. However, there are times, situations, and locations in which using a sUAS may not be possible, such as a project in a wilderness area. While using a

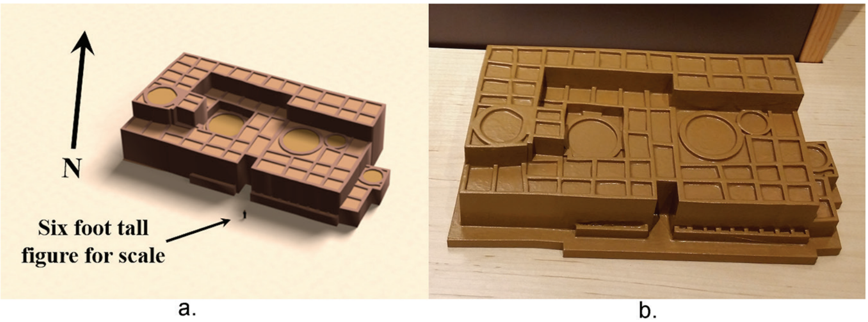


Figure 13.11. *A computer-generated 3D massing model of Kin Kletso (a); and physical massing model created from computer model data in the Chaco Culture National Historical Park Museum (b).*

pole to capture low-altitude aerial photography may be labor intensive, the low cost, ease, and simplicity of deployment make it a very viable method in many situations.

DISCUSSION AND CONCLUSION

In this chapter we propose that wider use of the emerging technologies of LiDAR and SfM can support vital documentation, management, and protection of greater Chaco landscapes, especially the fragile roads and their associated features that expand beyond Great House boundaries. This documentation can also potentially assess aspects of the uniformity and distinctive character of sites throughout the larger Chaco cultural region, provide an overview of the grandeur of the Chaco Phenomenon, and deepen our understanding of its tremendous expanse. We suggest that wider landscape-scale mapping and precise 3D modeling of a Great House can help to reveal relationships of sites to celestial bodies, land formations, and other constructions, perhaps of different time periods. These central components of Chacoan complexes and their multifaceted landscapes must be taken into consideration when determining how to preserve them. The relationships (sometimes nonvisual) of Chacoan complexes with elements of the cosmos, the natural landscape, and other structures throughout time challenge notions of a "site" as confined to a single time period and physical location.

Thoughtful consideration of Native oral traditions is also critical to continued engagement with and management of Chacoan sites. While these historic associations and records often cannot be printed or reproduced, they can guide and illuminate work at Chaco sites and greatly foster respect for their continuing cultural significance and sensitivity.

While technology is a "moving target," the results reviewed in this chapter demonstrate the great potential of LiDAR and SfM at this time to reveal previously unknown aspects of the archaeological record, redress errors in existing documentation, and produce a lasting, quantitative record of these sites. For example, while many Chaco roads are rapidly deteriorating and disappearing, LiDAR documentation captures *x*-, *y*-, and *z*-value data on road morphology that can be utilized by future researchers as roads continue to erode. When added to state archaeological databases such as the New Mexico Archaeological Records Management Section (ARMS), these recordings will provide critically needed legal protection to roads as archaeological sites under Section 106 legislation.

Finally, ground-truthing of newly detected roads and training a new generation of archaeologists in road identification methods are key aspects of continued research and management of Chaco landscapes. Individuals with experience in the subtle art of road recognition should ground-truth possible road segment identified through LiDAR and other emerging technologies. Since only a few archaeologists have long-term experience and capability to identify roads *on the ground*, we recommend that they themselves train a new generation of archaeologists in the full suite of methodologies of Chaco roads study—including analysis of aerial photographs and other remotely sensed data, as well as ground-truthing. Such skills will be especially necessary to ground-truth the extremely subtle traces of roads revealed by new remote sensing techniques. We also recommend that a comprehensive Chaco roads study should include not only an analysis of landscapes associated with Bonito-era Great Houses, but all large sites/complexes from the Basketmaker III to Pueblo III periods where roads identified in previous studies have often been overlooked.

The Chaco culture conceived, planned, and coordinated the construction of Great Houses, roads, and earthworks across a vast region of challenging, high desert terrain. The intensely ritual nature of their sites and their many uniform characteristics suggest that a powerful ideology inspired this regional phenomenon. It appears to be time to consider Chaco's regional culture across centuries as an accomplishment of equal standing among other such expansive cultures of the ancient world.

The complexity of the Chaco regional system, however, is often underappreciated and oversimplified, in large part due to the remoteness and subtlety of the remnants of Chacoan sites. In addition, it has taken decades of study to appreciate their multifaceted relationships to landscape features and celestial cycles. Emerging technologies will now allow us to re-create Chacoan sites in 3D models that bring them to life and reveal their full, formidable monumentality in their larger environments. Documentation of Great Houses and roads also creates lasting datasets so that sites can be preserved. These products can then be shared to inspire the public, enrich scholarly studies, and foster appreciation of Chaco within a global perspective. Such efforts can also contribute to governmental support to protect Chaco and its invaluable cultural heritage. Emerging technologies and new research are allowing us to appreciate Chaco's deep significance on levels that are not easily comprehended but that suggest an immensely brilliant conceptual planning and envisioning.

ACKNOWLEDGMENTS

We thank Ruth Van Dyke, Carrie Heitman, and Steve Lekson for creating and hosting the Chaco Landscapes: What We Know and What We Don't Conference and inviting us to participate. We would also like to acknowledge the insights, research, and support over decades of John Stein, Michael Marshall, Taft Blackhorse, Phillip Tuwaletstiwa, John Roney, Dabney Ford, and William Stone. For early insights into the cosmological significance of landscape, we especially thank Alfonso Ortiz of Ohkay Owingeh. We appreciate the efforts of Brian Deaton, formerly of the BLM, to secure the recent LiDAR scan in the region surrounding Chaco and the National Trust for Historic Preservation for support to the LiDAR recording of the Great North Road. No permits were required for the research described above.

REFERENCES

Cameron, Catherine M. 2009. *Chaco and after in the Northern San Juan: Excavations at the Bluff Great House*. University of Arizona Press, Tucson.

Fowler, Andrew P., and John R. Stein. 1992. "The Anasazi Great House in Space, Time, and Paradigm." In *Anasazi Regional Organization and the Chaco System*, edited by David Doyel, 101–122. Maxwell Museum of Anthropology Anthropological Papers 5. University of New Mexico Press, Albuquerque.

Friedman, Richard, Dabney Ford, and John R. Stein. 1999. A Map of Padilla Wash Great House Landscape. Document on file at Chaco Culture National Historical Park, Nageezi, NM.

Friedman, Richard A., Anna Sofaer, and Robert S. Weiner. 2017. "Remote Sensing of Chaco Roads Revisited: Lidar Documentation of the Great North Road, Pueblo Alto Landscape, and Aztec Airport Mesa Road." *Advances in Archaeological Practice* 5(4):365–381.

Guiterman, Christopher H., Thomas W. Swetnam, and Jeffrey S. Dean. 2016. "Eleventh-Century Shift in Timber Procurement Areas for the Great Houses of Chaco Canyon." *Proceedings of the National Academy of Sciences* 113, no. 5 (February): 1186–1190. DOI: 10.1073/pnas.1514272112.

Helmholz, Petra, John Long, T. Munsie, and David Belton. 2016. "Accuracy Assessment of GoPro Hero 3 (Black) Camera in Underwater Environment." *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, vols. 41-B5 and 23, 477–483. ISPRS Congress, July 2016, 12–19, Prague.

James, Mike R., and Stuart Robson. 2012. "Straightforward Reconstruction of 3D Surfaces and Topography with a Camera: Accuracy and Geoscience Application." *Journal of Geophysical Research* 117, F03017. doi:10.1029/2011JF002289.

Judd, Neil M. 1954. *The Material Culture of Pueblo Bonito*. Smithsonian Miscellaneous Collections 124. Smithsonian Institution, Washington, DC.

Kantner, John, and Nancy M. Mahoney. 2000. *Great House Communities across the Chacoan Landscape*. Anthropological Papers of the University of Arizona no. 64. University of Arizona Press, Tucson.

Lekson, Stephen H. 2015. *The Chaco Meridian: One Thousand Years of Political and Religious Power in the Ancient Southwest*. 2nd ed. Rowman and Littlefield, Lanham, MD.

Malville, J. McKim. 2004. "Ceremony and Astronomy at Chimney Rock." In *Chimney Rock: The Ultimate Outlier*, edited by J. McKim Malville, 131–150. Lexington Books, Lanham, MD.

Marshall, Michael P. 1997. "The Chacoan Roads: A Cosmological Interpretation." In *Anasazi Architecture and American Design*, edited by Baker H. Morrow and V. B. Price, 62–74. University of New Mexico Press, Albuquerque.

Marshall, Michael P., and Anna P. Sofaer. 1988. "Solstice Project Archaeological Investigations in the Chaco District 1984 and 1985: The Technical Report." Manuscript on file, Laboratory of Anthropology, Santa Fe, NM.

Marshall, Michael P., John R. Stein, Richard W. Loose, and Judith E. Novotny. 1979. *Anasazi Communities of the San Juan Basin*. Historic Preservation Bureau, Santa Fe, NM.

Nials, Fred L. 1983. "Physical Characteristics of Chacoan Roads." In *Chaco Roads Project, Phase 1: A Reappraisal of Prehistoric Roads in the San Juan Basin*, edited by Chris Kincaid, 6.1-6.51. Bureau of Land Management, Albuquerque.

Nials, Fred L., John R. Stein, and John R. Roney. 1987. *Chacoan Roads in the Southern Periphery: Results of Phase II of the BLM Chaco Roads Project*. Bureau of Land Management, Albuquerque.

Ortiz, Alfonso. 1969. *The Tewa World: Space, Time, Being, and Becoming in Pueblo Society*. University of Chicago Press, Chicago.

Pepper, George H. 1920. *Pueblo Bonito*. Anthropological Papers No. 27. American Museum of Natural History, New York.

Powers, Robert P., William B. Gillespie, and Stephen H. Lekson. 1983. *The Outlier Survey: A Regional View of Settlement in the San Juan Basin*. Reports of the Chaco Center No. 3. National Park Service, Albuquerque.

Roney, John R. 1992. "Prehistoric Roads and Regional Integration in the Chacoan System." In *Anasazi Regional Organization and the Chaco System*, edited by David E. Doyel, 123–132. Anthropological Papers No. 5. Maxwell Museum of Anthropology, Albuquerque.

Ruppe', Trish, John R. Stein, Richard Friedman, and Taft Blackhorse. 2001. "Chacoan Roads on the Eastern Chuska Slope." Paper presented at Sixty-Sixth Annual Meeting of the Society for American Archaeology, New Orleans.

Sofaer, Anna P. 1999. *The Mystery of Chaco Canyon*. Documentary film. Bullfrog Films, Oley, PA.

Sofaer, Anna P. 2007. "The Primary Architecture of The Chacoan Culture: A Cosmological Expression." In *The Architecture of Chaco Canyon, New Mexico*, edited by Stephen H. Lekson, 225–254. University of Utah Press, Salt Lake City.

Sofaer, Anna, Michael P. Marshall, and Rolf M. Sinclair. 1989. "The Great North Road: A Cosmographic Expression of the Chaco Culture of New Mexico." In *World Archaeoastronomy*, edited by Anthony F. Aveni, 365–376. Cambridge University Press, Cambridge.

Sofaer, Anna, and Rolf M. Sinclair. 1983. "Astronomical Markings at Three Sites on Fajada Butte." In *Astronomy and Ceremony in the Prehistoric Southwest*, edited by John B. Carlson and W. James Judge, 13–70. Maxwell Museum of Anthropology Anthropological Papers No. 2. University of New Mexico, Albuquerque.

Sofaer Anna, Rolf M. Sinclair, and L. E. Doggett. 1982. "Lunar Markings on Fajada Butte, Chaco Canyon." In *Archaeoastronomy in the New World*, edited by Anthony F. Aveni, 169–181. Cambridge University Press, Cambridge.

Sofaer Anna, Robert S. Weiner, and William Stone. 2017. "Inter-site Alignments of Prehistoric Shrines in Chaco Canyon to the Major Lunar Standstill." In *The Science of Time 2016: Time in Astronomy and Society, Past, Present and Future*, edited by Elisa Felicitas Arias, Ludwig Combrinck, Pavel Gabor, Catherine Hohenkerk, and P. Kenneth Seidelmann, 79–102. Astrophysics and Space Science Proceedings Vol 50. Springer, Cham, Germany.

Sofaer Anna, Volker Zinser, and Rolf M. Sinclair. 1979. "A Unique Solar Marking Construct." *Science* 206(4416):283–291.

Stein, John R. 1983. "Road Corridor Descriptions." In *Chaco Roads Project, Phase 1: A Reappraisal of Prehistoric Roads in the San Juan Basin*, edited by Chris Kincaid, 8-1–8-15. Bureau of Land Management, New Mexico, Albuquerque.

Stein, John, Richard Friedman, Taft Blackhorse, and Richard Loose. 2007. "Revisiting Downtown Chaco." In *The Architecture of Chaco Canyon, New Mexico*, edited by Stephen H. Lekson, 199–224. University of Utah Press, Salt Lake City.

Stein, John R., and Stephen H. Lekson. 1992. "Anasazi Ritual Landscapes." In *Anasazi Regional Organization and the Chaco System*, edited by David Doyel, 87–100. Maxwell Museum of Anthropology Anthropological Papers 5. University of New Mexico Press, Albuquerque.

Van Dyke, Ruth M. 2007. *The Chaco Experience: Landscape and Ideology at the Center Place*. School for Advanced Research Press, Santa Fe, NM.

Wadleigh, F. A. 1916. "Ancient Road Near Aztec, N.M." *El Palacio* 3(4):52.

Weiner, Robert S. 2018. "Sociopolitical, Ceremonial, and Economic Aspects of Gambling in Ancient North America: A Case Study of Chaco Canyon." *American Antiquity* 83(1):34–53.

White, Leslie A. 1942. *The Pueblo of Santa Ana, New Mexico*. Memoirs of the American Anthropological Association 60. American Anthropological Association, Menasha, WI.

White, Leslie A. 1960. "The World of the Keresan Pueblo Indians." In *Culture in History: Essays in Honor of Paul Radin*, edited by Stanley Diamond, 53–64. Columbia University Press, New York.

14

The Impact of Digital Data Ecosystems on Our Understanding of the Greater Chacoan Cultural Landscape

Assessing Geospatial Information, Remote Sensing, and Aggregating Roads Data

Carrie C. Heitman and Sean Field

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 14, 2017.

https://doi.org/10.5876/9781646421701.c014.v000

Our contribution to this volume on the Greater Chaco Landscape (GCL) is both retrospective and prospective, covering where we have been with regard to specific forms of geospatial, remote sensing and prehispanic roads data and where we might go in light of current work. As anthropologists, we would also like to place these efforts in a broader frame as there are a number of "big picture" issues that emerge from the projects discussed here. We begin with some broad observations and cautionary notes about how cultural resource information is accessed and used for making land management decisions. In light of the threats to the GCL, we take a closer look at how New Mexico site data is recorded, managed, updated, and shared. We then review three recent data aggregation efforts and provide insights on the lessons learned and the ongoing needs demonstrated thereby. These projects include a reconciled Geographic Information System (GIS) database on Chacoan great house locations, a NASA collaboration to identify sites at risk using remote sensing technologies, and aggregated data on Chacoan roads.

DOI: 10.5876/9781646421701.c014

IMPACTS OF DATA SEGREGATION

When land management agencies, such as the Bureau of Land Management (BLM), make oil and gas leasing decisions, they depend upon digital data ecosystems such as a Geographic Information System (GIS). Their GIS in turn relies on other digital data ecosystems (e.g., the New Mexico Cultural Resource Information System, or NMCRIS) to gather and import archaeological site location data into their GIS to help inform their land management plans. In short, data-driven decision making currently requires mediation between various digital data platforms or ecosystems. And while this is a perfectly reasonable workflow to help inform land management decisions, there are inherent weaknesses in these systems that have real-world (and sometimes compounding) consequences for land managers, archaeologists, researchers, and landowners.

In this era of digital data and quick-access expectations, nondigital data, such as paper maps or printed data tables that survive outside of these digital data ecosystems, effectively do not exist. The intermediation between separate data ecosystems is further confounded by incomplete digitization efforts given that older archaeological records (also known as legacy data) do not necessarily exist in digital form. In such cases, even bad digital data that is easily accessible can supersede good, analog data that is more difficult to track down. What's more, data segregation (Balkanized in separate digital data ecosystems such as those maintained by state or federal agencies, tribes, or separate scholarly networks), has hampered our collective ability to manage and preserve the Greater Chaco Landscape due to inaccurate locations or incomplete site information within some of these bureaucratically authoritative systems.

From a research perspective, such Balkanized practices have resulted in inefficient, duplicated efforts to refine those data. No singular entity or agency has the authority or sufficient resources to *continually* gather and reconcile both older, legacy (historic) data from the last 125 years and new archaeological data (e.g., raw or processed LiDAR data) about the Greater Chaco Landscape. Hence, relying on one set of site location data (e.g., NMCRIS) can lead to land management decisions based on incomplete or perhaps even inaccurate data. Academic and applied cultural resource specialists are not fully integrated within any one of these data ecosystems. As a result, we cannot always effectively share new findings and learn from one another. Academic archaeologists working outside of the cultural resource management sector, for instance, do not routinely review or contribute their research findings to state databases such as NMCRIS. The converse is also true whereby new work conducted by cultural resource management (CRM) professionals does not always (or efficiently) reach academics. New observations and interpretations may therefore proceed on separate, albeit parallel, tracks. Similarly, the Chaco Culture National Historical Park unit of the National Park Service (NPS) does not routinely share federal archaeological site data with NMCRIS. The ramifications of incomplete and Balkanized data for the successful management and protection of cultural landscapes should concern cultural heritage specialists of all stripes. And yet, the challenges are bigger still.

Constraints of Information Architecture

We must also look closely at what these separate digital data ecosystems both enable and constrain by virtue of their internal information architectures: how the fields, values, and data table relationships were constructed when the systems were designed. Databases engineer data values to enable specific kinds of queries and bring order to human observations. This might be as simple as restricting date input formats (e.g., DD/MM/YYYY) or as complicated as providing an authoritative controlled vocabulary for archaeological site type designations. And while the observations of a particular field archaeologist may not fit a proscribed database category, analysts are often constrained by systems that were designed with specific end-goals in mind. We refer to this process as the technocratic tyranny of digital data ecosystems, or what Athina Karatzogianni and Jacob Matthews (2017) have (somewhat tongue-in-cheek) referred to as "evil intermediation platforms."

These challenges are well documented and have been the object of vibrant discussion within the digital humanities (e.g., Bailey 2011; McPherson 2012; http://transformdh.org/) and anthropological discourse (e.g., Kelty 2017). "Much of the work in the digital humanities," McPherson points out, "proceeded as if technologies from XML to databases were neutral tools" (McPherson 2012:142). In order to push back against the systems that constrain and enable certain kinds of knowledge production, McPherson argues we need to critically engage with these systems and expand the pool of practitioners: "We need database literacies, algorithmic literacies, computational literacies, interface literacies. We need new hybrid practitioners: artist-theorists, programming humanists, activist-scholars; theoretical archivists, critical race coders. We need new forms of graduate and undergraduate education that hone both critical and digital literacies" (McPherson 2012:154). The tools and the information architectures we build, McPherson argues, are products of our human biases and engineered to suit the goals of the developers.

At the same time, digital information architectures are often hampered by technological limitations. Chacoan roads provide a vivid example. In earlier versions of NMCRIS, the information system was not able to accommodate linear archaeological features. All sites, including roads, were recorded as centroids or circles (think "dots a map"). The larger the recorded site area, the bigger the circle diameter on the NMCRIS map. And so for linear features such as prehispanic roads, the only way to previously display them within NMCRIS was for the linear extent to display as the diameter of a circle. The map would display a circle that was as big as the road was long. This is a case of a data system that was engineered to display a specific kind of information being stretched beyond its original design constraints. And yet, the real world is always messier than the systems we devise to record information about the world. What happens, for instance, when a land management agency decides to apply a circular buffer zone of 10 m or 100 m to a GIS data point for a Chacoan Great house community that does not conform to the centroid or circular datapoint expectations (Van Dyke et al. 2016) born out of such data ecosystems?

The prior example is not only a potent reminder of how technical limitations can hamper our ability to represent archaeological features, but it also reminds us that these digital viewing platforms (e.g., GIS environments, Google Earth, Google Maps, etc.) both enable expansive perceptions of landscapes over time while simultaneously removing us from the human scale and embodied experience of space and place (see Van Dyke et al., chapter 11 in this volume). So for those of us accustomed to apprehending, interpreting, and managing landscapes through these computer-mediated interfaces, we must recognize how these visualization platforms remove us from the real-world experiences and embodied impacts for the human occupants and stewards who live in these places.

There can be no doubt that tools such as GIS provide us with a robust toolkit for archaeological recording and analysis. Our goal here is not to reject these tools but rather to shed light on their strengths as well as their limitations in light of current Chacoan research and preservation efforts. Not all of the management, preservation, and research challenges facing the greater Chacoan landscape can currently be addressed through technical solutions, *nor can we expect future technical advancement to entirely remediate those challenges*; therefore, we cannot uniformly succumb to the siren song of technocratic solutionism. In theory, we might all agree with the principles of data-driven management and governance as well as promise of expansive digital futures. But what happens when we have bad data? Or when our information architectures are inadequate for the needs at hand? What happens when the expansive purview of landscape recording infrastructures infringe on the sovereignty of Native lands? Geospatial viewers provide unfettered access to global locations. If we take the 27,413 sq. mi. Navajo Nation as but one example, under what conditions can or should data about cultural resources on Navajo Nation lands circulate, be considered, or represented by academics and land managers?

Causes for Optimism

While there are a number of challenges for effectively protecting the greater Chacoan cultural landscape, there are also a number of reasons we are optimistic for the future. In the remainder of this chapter, we will highlight and review various recent cases of productive data sharing. As a result of such efforts, we are learning from one another and learning to make better use of historical or legacy data. What's more, this volume and the working conferences that led to its creation are very tangible signs of success as archaeologists and cultural heritage specialists endeavor to collaborate for the protection and preservation of greater Chaco.

GEOSPATIAL DATA

As a sister agency to the BLM, the NPS has an active interest in the land management decisions that impact the Greater Chacoan cultural landscape. In 2013, Tom Lincoln (NPS) and Steve Lekson of the University of Colorado, Boulder, began developing a Rocky Mountain Cooperative Ecosystems Study Unit (CESU) Task Agreement that would outline the research and preservation needs for the Chaco landscape. In collaboration with Dr. Ruth Van Dyke and myself, we developed a proposal for a series of activities that would help address these needs (see chapter 1, this volume).

In 2013, prior to the CESU agreement, Dr. Van Dyke and Dr. Heitman had started talking about the separate but parallel GIS developments that were focusing on Chacoan great house locations and descriptions. Between the two of us, we knew of at least three or four such efforts that had started with the same data but had then gone on to refine and augment those data for their own research purposes. In light of the management challenges for the greater Chaco landscape, we saw a real need to bring these efforts back together (see figure 14.1).

During our early meetings with then–assistant director of cultural resources, Tom Lincoln (see chapter 17, this volume), we identified a number of needs or gaps in Chacoan Landscape research data. The planned activities included

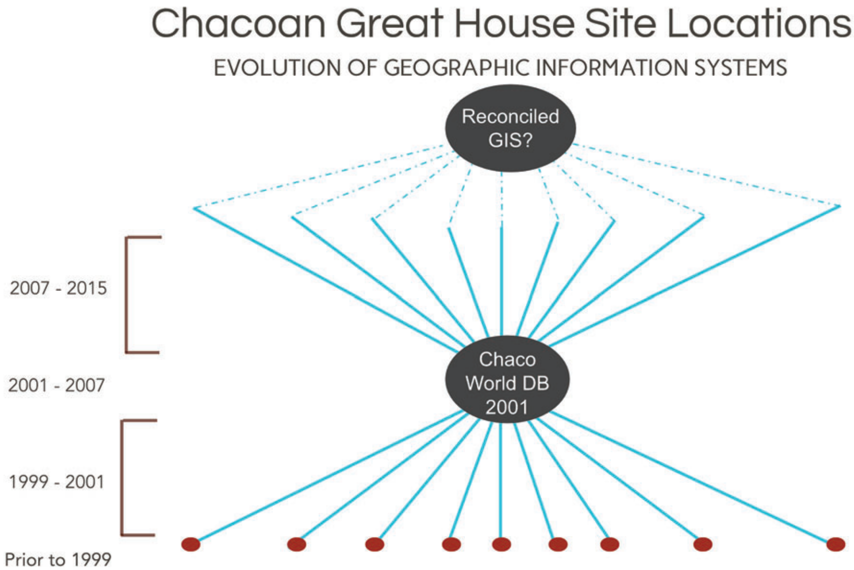


Figure 14.1. *GIF animation (for web) / static figure (for print) showing the ongoing process of the geospatial Chaco Great House data's disaggregation and reaggregation. Image by Carrie Heitman.*

an initial stakeholders meeting, a GIS reconciliation project, the publication of a white paper (Van Dyke et al. 2016), a subsequent conference with video recorded presentations, and this resulting publication. The senior author's home institution, the University of Nebraska–Lincoln, took the lead on the GIS reconciliation project.

In 1999, ten archaeologists worked together to assemble a comprehensive database reflecting what was known about great houses and the communities in which they were built.[1] Each archaeologist focused their attention on the region of the Southwest that they knew best, reviewing records for every great house in that area. A standardized set of variables was collected, and each participant also added annotated information and references for each great house. The resulting database served as a focus for discussions when twenty-two archaeologists met at Arizona State University to consider issues related to Chacoan patterns outside of Chaco Canyon.[2] This meeting, called the Chaco World Conference, was sponsored by the NPS, University of Colorado, and Arizona State University. It was one of several such seminars that took place around the Southwest as part of the final stage capstone for The Chaco

Center research project, which investigated Chaco Canyon during the 1970s and 1980s.

In 2001 the National Center for Preservation Training and Technology awarded a grant to build a complete online spatial database using the results of the 1999 Chaco World Conference. This spatial database, titled The Chaco World Database, was built and maintained by John Kantner from 2001 to 2007 and hosted at Georgia State University. The Chaco Canyon Outlier Database was built by Dr. Kantner and generously donated to the Chaco Research Archive (CRA) in 2011. In 2012 the Chaco World data were supplemented with contributions from various researchers.[3]

The CRA wanted to responsibly use this GIS to publicly share general information about the extent and organization of the greater Chacoan world. This meant coming up with creative solutions to obscure UTM locations of Chacoan site locations within the outlier great-house database (http://www.chacoarchive.org/bibl_database/greathouses/map). We had limited resources available to address this challenge, and so our senior developer, Robert Bingler, came up with a creative process and low-cost solution to dynamically re-project those site locations elsewhere in the world each time the Google Maps API loads. We also had to use a deliberately low-resolution background satellite image so that modern roads and access routes would be less visible to the user relative to archaeological site locations. This process is invisible to the user, who sees the same satellite imagery and observes the sites in their correct locations relative to the image and to one another. But for those looking to access site locations from the page's HTML source code, that information has been deliberately altered. The senior author has referred to this elsewhere as "moderated openness" (Heitman 2019). Why not just omit information about the great house locations altogether? We felt it was important to give CRA users a sense of the full geographic extent of the Chaco World, and we needed a map to be able to do that effectively. One might also ask why we should even bother to go through such machinations to obscure site locations given the public accessibility of high-resolution satellite imagery via Google. The answer is that we have a responsibility to not be the purveyors of any information that can be used by looters to do harm to these cultural resources.

In the intervening years after the Chaco World Database was published via the Chaco Research Archive, various researchers were busy refining and expanding from that same original Chaco World Database. In July 2015, the senior author hosted four scholars for a Chaco GIS Summit to help aggregate existing geospatial datasets, discuss how to resolve existing discrepancies, and decide if/how to share these data with scholars and the public. The project team included

- University of Nebraska–Lincoln (UNL) / Chaco Research Archive dataset (C. Heitman, project lead)
- Southwest Social Networks dataset (P. Reed, M. Peeples)
- Binghamton University dataset (R. Van Dyke and K. Bocinsky)
- Independent Scholar (R. Friedman)
- UNL's Center for Advanced Land Management Technologies (M. Vaitkus)

Through collaboration with UNL's Center for Advanced Landscape Management Information Technologies, we were able to quantify discrepancies in great house site locations, reconcile those discrepancies into an authoritative dataset, and create the necessary GIS metadata. The final stages of this process are outlined in table 14.1. Together we identified and reconciled disparate UTM locations for 49 sites and were able to aggregate reconciled data on 262 total great house community locations. The resulting GIS (Heitman et al. 2016) was shared with the BLM Farmington Field Office as well as the NPS. The Chacoan Great House Community dataset is not intended to be comprehensive, but it is currently the most complete and accurate information available for Chacoan great house locations within the greater Chaco Canyon cultural landscape. This dataset provides feature geometry representations (point only) and is intended to be supplemented with descriptive attributes maintained by other external database systems.

COLLABORATION BEGETS COLLABORATION: NASA DEVELOPMENT PARTNERSHIP

In the midst of these activities in the spring of 2016, Tom Lincoln was approached by NASA's DEVELOP program to see if he had any NPS projects in mind that might benefit from NASA data and expertise. Richard Friedman and others (Friedman et al. 2017, chapter 13 in this volume) have been able to show how LiDAR data can dramatically enhance our ability to locate prehispanic roads. With Friedman's prior success in mind, we wrote a NASA DEVELOP proposal focused on developing LiDAR workflows and data-processing methods to identify previously unrecorded Chacoan landscape features. The NASA program did not have the capacity to obtain

Table 14.1. Outline of the process of reconciling the two most complete great house community databases.

	Van Dyke et al.	*SWSN*	*Reconciled*
Number of sites in original dataset	366	464	
Matched by location and UNIQUE_ID	208	214	213
Sites unique to dataset	111	203	
Sites matched by UNIQUE_ID only	47	47	
Total Number of sites analyzed for location differences	47		49
Total number of sites in final dataset			262

Source: Van Dyke et al. and the Southwest Social Networks.
Note: Shrines and other non-great-house site locations were removed from both datasets prior to reconciliation.

additional LiDAR data for the San Juan Basin, so we worked together to develop an alternative proposal.

Over a series of conference calls and shared documents, we came up with a project proposal that would utilize existing NASA data in hopes of identifying a more cost-effective method and workflow for identifying cultural landscape features in the San Juan Basin. Our main objective was "to identify Chacoan community signature profiles, such as roads, villages, middens, and structures, throughout the San Juan Basin to help with preservation and protection strategies by using NASA Earth observations." The project was thus named "Chaco Canyon Cross-Cutting." Our objectives for this project included using remotely sensed data to identify areas with the potential to contain unknown Chacoan features as well as identifying known Chacoan sites and roads that are in areas that could be threatened by encroaching infrastructure. Additionally, we sought to further delineate known Chacoan sites and roads using remotely sensed data. The NASA team focused on a smaller study area within the greater Chaco Landscape (figure 14.2).

Two data sources created and supplied by UNL were fundamental to this project's success. The team relied on the reconciled GIS of Chacoan Great House locations (put together by Heitman et al.) as well as the GIS of prehistoric Chacoan roads created by Sean Field for his MA thesis research (discussed below).

The NASA project created a Chacoan Sites Risk Map to identify areas where Chacoan sites would be at risk from developing infrastructure. Risk was defined in the model as any area in close proximity to one of the following: (1) areas with an expected population increase from 2015 to 2020, (2) existing roads, (3) existing or planned oil and gas drills, and (4) perennial hydrological

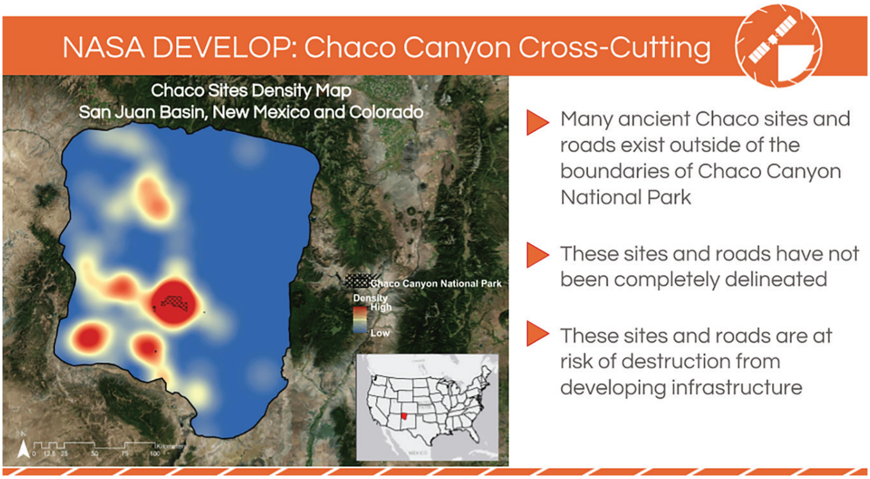


Figure 14.2. *NASA DEVELOP Chaco Canyon Cross-Cutting study area.*

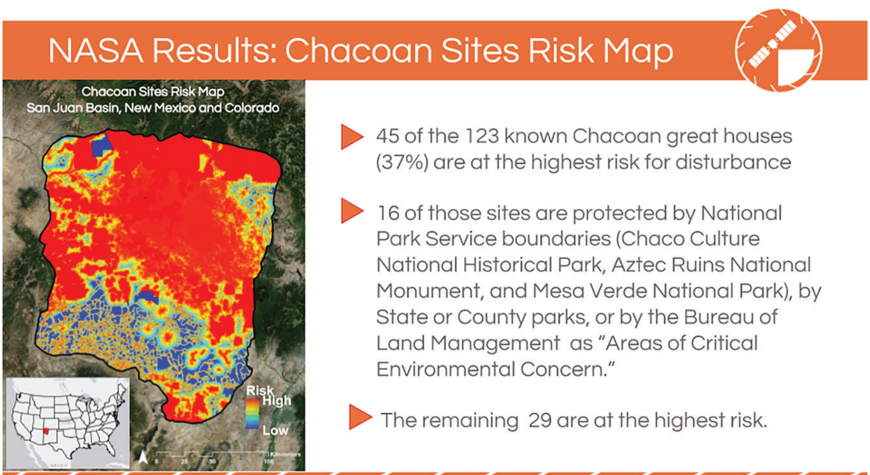


Figure 14.3. *NASA DEVELOP Chacoan Sites Risk Map.*

features. They used the "Fuzzy Membership" tool in ArcMap 10.3 to assign a fuzzy membership between 0 and 1 to each variable. Spread, midpoint, and membership type were decided based on a review of the literature describing the size and extent of these variables.

The NASA risk map (figure 14.3) suggests that a large area of the San Juan Basin is being impacted by developing infrastructure. Forty-five of the 123

(37%) known Chacoan great houses in the study area are at a high risk for disturbance from developing infrastructure. Fortunately, thirteen of these sites are already protected by National Park Boundaries and at least three others are protected by the Bureau of Land Management as "Areas of Critical Environmental Concern."

This project revealed both the potential and challenges of using remote sensing to identify and describe ancient Chacoan sites in the San Juan Basin. The NASA project analysts concluded that higher-resolution satellite imagery is needed to delineate known ancient Chaco sites and roads and to identify new sites and roads. Their risk map showed that many Chaco sites and roads are at risk from developing infrastructure, and they highlighted particular areas within the San Juan Basin that we recommend be given priority in protection strategies. Future NASA ECOSTRESS and HyspIRI missions will provide thermal data that can be used to identify archaeological features in Chaco Canyon and throughout the world.

Looking ahead, we have a number of leads we'd like to explore. In addition to doing more work with the HyTES data, we'd like to compare the relative cost of flying HyTES imagery relative to LiDAR to see how we might best leverage this technology. We'd also like to look for intersections where known prehistoric roads have now been impacted by active oil and gas wells or access roads. We also plan to look at other "high value" areas to see if these same data sources might reveal additional archaeological features. Our ultimate goal is to leverage these technologies to better document and protect these fragile cultural resources and to help guide future research.

AGGREGATING ROAD DATA

The challenges of identifying prehispanic roadways has resulted in significant variability in the estimates, interpretations, and representations of the Chacoan road network. Consequently, there is no consistent researcher-based documentation on the Chacoan road system, resulting in a "general uncertainty as to the empirical basis for evaluating Chaco roads—thus hindering our ability to better understand what they are" (Snead 2017:2). This uncertainty is easily demonstrated in the numerous maps delineating the Chacoan road network (see Betancourt et al. 1986; Friedman et al. 2017; Kantner 1997; Kincaid et al. 1983; Snygg and Windes 1998). Although similarities exist, the cartographic variation demonstrated in these maps directly impacts (1) researcher interpretations of Ancestral Puebloan relationships at a landscape scale and (2) land management efforts. For instance, how can we understand the cultural affiliation between sites if we have not accurately documented the physical features (i.e., roads) that connect those sites? Furthermore, how can we protect and manage features or cultural landscapes that are inconsistently documented? Therefore, addressing the confusion on Chacoan roads (and thus changing the negative consequences that follow) is a vital objective in continuing the preservation and archaeological analysis of the Chacoan cultural landscape. Overcoming this challenge requires reconciling many existing inconsistencies in Chaco road data. This reconciliation has proven difficult due to several key factors:

1. Shortcomings in the geospatial documentation of Chacoan roads
2. Difficulties in reconciling diverse data types
3. Feature degradation

Recognizing and accurately documenting prehispanic roads is complex, fuzzy work, which makes empirical validation of entire road surfaces difficult. Chacoan roads are archaeologically ambiguous; they are difficult to identify on the surface, do not share wholly consistent characteristics, and are not ground-truthed in many places. Further, long-distance roads have most often been interpreted phenomenologically, where short linear depressions that appear to align are translated as continuous features. These challenges have not stopped researchers from delineating large regional roads throughout the San Juan Basin. Take, for instance, the empirical basis for the South Road—considered by many as one of the most prominent regional roads that extends from Chaco Canyon. The Chaco Roads Project (Kincaid et al. 1983; Nials et al. 1987) documented most of the South Road via aerial photography, but only a small portion of the corridor was ground surveyed, and only ~6 km of the road was mapped with high locational accuracy in the project's final report. Small sections of the road, in the area surrounding the Kin Ya'a outlier, are also mapped in John Kantner (1997), but these too only represent a fraction of the entire road surface. Therefore, even though researcher consensus validates the South Road as a long prehispanic feature, our geospatial documentation of it is poor.

Diverse data types, housed in variable formats, by multiple agencies, and in different databases, also provide significant challenges for reconciling Chaco road data. Foremost, accessible road data (especially geospatial data) is relatively sparse. The best exceptions are analog datasets created from aerial photography, gathered by the Chaco Roads Project (Kincaid et al. 1983; Nials et al. 1987) who published both specific and generalized location maps. However, few source images were published by the Chaco Roads Project or other reports, and currently, most aerial data exists in analog form and can be accessed either through BLM offices or R.GIS.UNM, requiring various monetary, technological, and time allocations. Similarly, digital data on Chacoan roads exists in fragmentary datasets belonging to independent researchers, institutions, or universities. Integrating digital data, especially geospatial data, carries its own complications, which are reviewed earlier in this chapter. Due to these access issues, full aggregation of high-resolution data for the regional road system has yet to be successfully achieved.

Feature degradation is perhaps the most pressing threat to reconciling Chacoan road data. There is no doubt that roadway features are becoming more and more difficult to identify in the landscape, and in many cases they cannot be observed on the surface without additional\sensing methodologies. As the NASA DEVELOP partnership demonstrated with the Holmes Group, HyTES data have allowed for the identification of roadway features when traditional aerial/satellite imagery has proven ineffective. Further, recent work by Friedman et al. (2017, chapter 13 in this volume) has demonstrated highly effective use of LiDAR for documenting the North Road. Although expanding sensing parameters is an exciting option for the future, it is imperative that we review, coalesce, and digitize legacy data to realize the rate of feature erasure in the region and efficiently direct additional remote sensing technologies. To better contextualize how legacy data can increase our understanding of the Chaco road network, we refer to a case study of the Pueblo Pintado to Chaco Canyon Road.

The Pueblo Pintado to Chaco Canyon Road is hypothesized to connect Pueblo Pintado with the eastern mouth of Chaco Canyon. Today the origin of this road is protected within the Pueblo Pintado protected boundary, and the assumed termination of the road (which is open for interpretation) would also be protected within the Chaco Culture National Historical Park, both of which are managed by the NPS. The identification and extent of this roadway are supported through ethnohistoric evidence (Kincaid et al. 1983) and aerial imagery taken by the Soil Conservation Service (SCS) in the mid-1930s. Over the years skepticism has grown, questioning whether the road is actually a fully continuous segment. This skepticism is evident in published maps (from research directly analyzing the Chacoan road system) that do not delineate the feature (see Betancourt et al. 1986, and Kantner 1997), which is likely a result of degradation and decreased visibility of the feature over time. To contextualize the variation in the Pueblo Pintado Roads signature profile across time, we review a host of survey data (figure 14.4) on the road gathered in the last half-century.

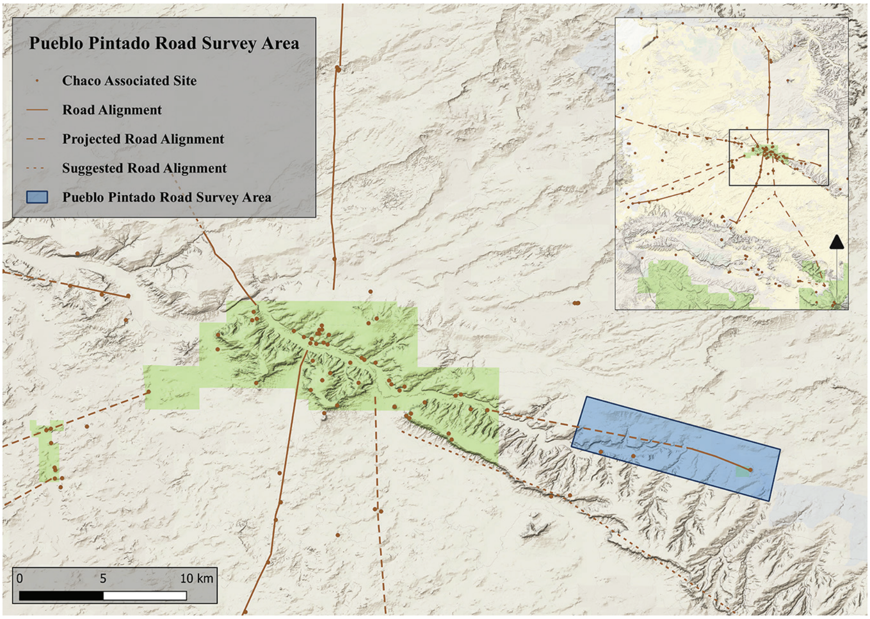


Figure 14.4. *Pueblo Pintado Road Survey Area. Graphic by Sean Field.*

In the SCS aerial imagery, the road is marked by four aligning depressions, which emanate several kilometers northwest from rooms 18 and 22 of Pueblo Pintado. These aligned segments are highlighted here (figure. 14.5) to demonstrate the continuity of characteristics in width, coloration, and context shared among each of these linearities. Aerial imagery and ground survey conducted on behalf of the Chaco Roads Project in the 1970s and 1980s revealed a long, semicontinuous segment of the road (see Kincaid et al. 1983:fig. 5-3), noting considerable vegetation differences between the general landscape and the roadway surface. At the time of the ground survey, this vegetation difference was readily visible for much of the distance between Pueblo Pintado and the head of Chaco Canyon. Unfortunately, aerial imagery covering the full distance from Pueblo Pintado to the canyon was not published with the report. Reviewing aerial imagery taken by Jacob Smith III in 1991 (figure 14.6), and donated to the University of Nebraska–Lincoln (UNL), it is clear that most of the Pueblo Pintado Road had become largely undetectable through aerial surveillance by this time.

While the short segment within the protected boundary is observable, no other segments outside of the protected boundary can be confidently

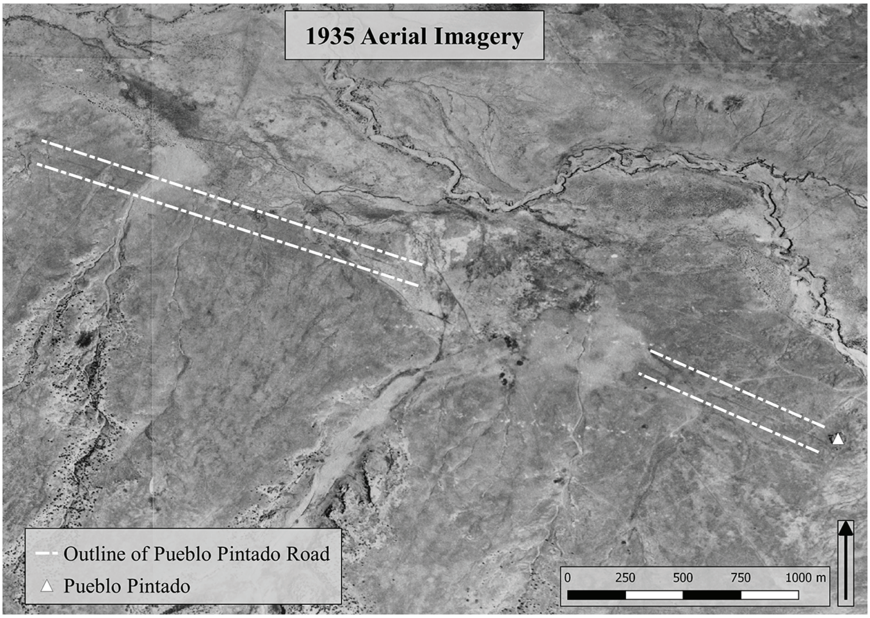


FIGURE 14.5. *1935 Soil Conservation Service Aerial Imagery of Pueblo Pintado Road. Four aligning segments are visible and are framed by the orange dashed line.*

identified. Interestingly, modern remotely sensed data demonstrate conflicting reports for the presence and quality of this road. Modern (2017) Google Earth LANDSAT data do not support the presence of a continuous feature; again, only the short segment within the protected boundary is visible. However, LiDAR data conducted, processed, and shared by the BLM Farmington office in 2017 tells a different story. Most of the segments seen in the 1935 SCS imagery are also present in the modern LiDAR data (figure 14.7).

In examining this chronology, we observe a decreased ability for aerial photography to detect the Pueblo Pintado to Chaco Canyon road. Specifically, we cite a difference between the 1935–1983 and the 1991–2017 timeframes, wherein the former displayed greater feature visibility. Although this trend has been previously recognized (Kincaid et al. 1983:4-4), we direct attention to the speed of recent feature degradation through certain methodology. From this comparison we find that the Pueblo Pintado to Chaco Canyon Road, a once highly visible feature, became invisible through aerial photographic methodology between the years 1983 and 1991. Additionally, this degradation appears to be prominently impacted by land management decisions. In the 1991–2017 imagery, the only viable segments are within the protected boundary, while

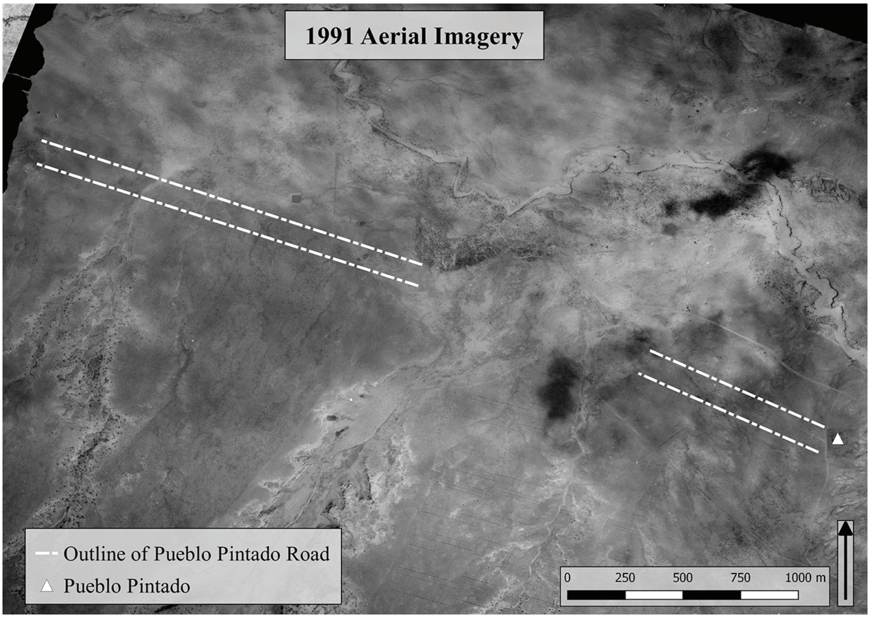


Figure 14.6. *1991 Aerial Imagery of Pueblo Pintado Road. Only one portion of the road is visible and articulates directly with Pueblo Pintado ruins. The orange dashed line, which framed the visible road in 1935, is shown for reference. Aerial imagery provided by Jacob Smith III.*

all segments outside of that boundary are either completely absent from the landscape or are decontextualized by modern infrastructure (two-track roads, dirt-pack roads, and fencing).

Advances in remote sensing technology provide a possible response (but not a solution) to feature degradation. As demonstrated here and in Friedman et al. (2017, chapter 13 in this volume), LiDAR has proven useful in detecting prehispanic roads when traditional imaging methodologies were not successful. Further, the efficacy of the BLM acquired LiDAR as shown here should signal for increased collaboration between researchers and federal agencies to pursue joint efforts of advanced remote sensing survey of prehispanic roadway features.

Even though LiDAR supersedes aerial imagery as a detection tool, we argue that if similar sensing technologies reveal different feature signatures over time, there must be degrading landscape shifts of some form. Advances in sensing technologies should not be seen as solutions to the forces that impact feature degradation. Through the use of aerial imagery, coupled with a reassessment of ethnohistoric and archaeological legacy data, we have

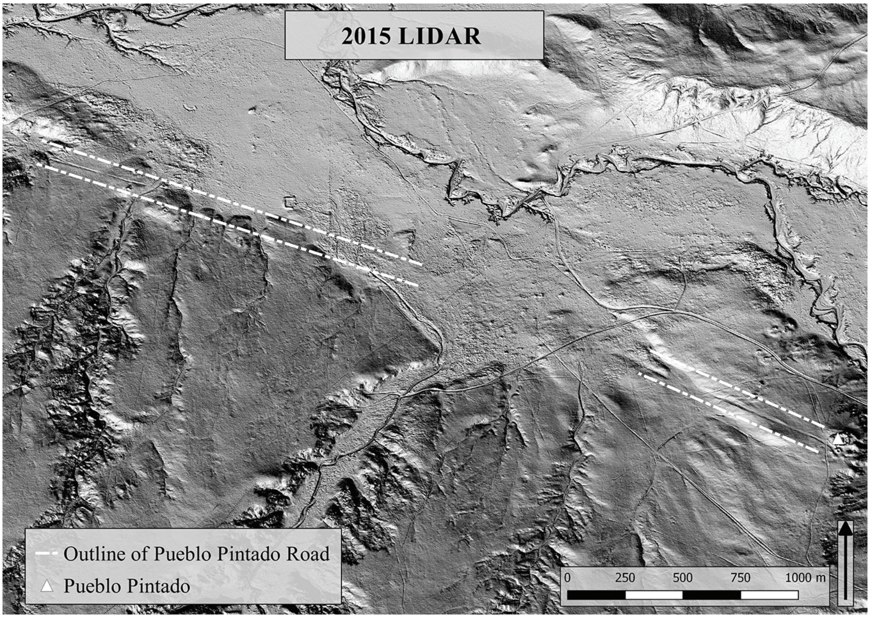


Figure 14.7. *2015 Farmington Field Office LiDAR data of the Pueblo Pintado Road. All segments that were visible in the 1935 aerial imagery are also visible in portions of the 2015 LiDAR data. Visible segments are framed in the blue dashed line.*

demonstrated that unprotected Chacoan roadway features are vanishing in some capacity from the landscape. Extant roadways outside of protected boundaries are demonstrated to be at a greater risk. If the landscape shifts exhibited here are applied to the region as a whole, it is plausible that we are left without indication or awareness of the extent of the Chacoan road network, leaving researchers empirically blind to the extent of the Chacoan cultural landscape.

We have thus outlined the primary factors that challenge the reconciliation of Chacoan road data, an obstacle that has certainly exacerbated the cartographic miscommunications seen in Chacoan road representations and the varied interpretations of where prehispanic roads are, where they lead to, and what they look like. While data reconciliation challenges cannot be immediately overcome, we contend that some of the confusion regarding Chacoan roads can be addressed through different cartographic methods. In most maps outlining the Chacoan network, all roads are given one or two symbolic representations, leading to unilateral interpretations of their actual presence within the landscape and significant misconceptions that may unintentionally misdirect preservation efforts or misinform our understanding of the past. To counteract these challenges, we propose demonstrating Chacoan roads through more diverse symbologies. Under this system, roads would be given a confidence ratio that is determined through two confidence variables described as the following.

Presence confidence—degree of confidence that road is prehispanic in origin and exists in the landscape, connecting specific places

Geospatial confidence—degree of sensing/survey confidence that describes specific location and extent of verified road surface

We have constructed a generalized confidence map of the major Chacoan roads (figure 14.8), populated from maps published by the Chaco Roads Project (Kincaid et al. 1983; Nials et al. 1987) and a popular NPS map (2000), to illuminate the diversity in research-based consensus on Chacoan roads.

We demonstrate a confidence map with three road qualifications. Roads qualified as "road alignments" have both high presence and geospatial confidences; "projected road alignments" have moderate presence and/or geospatial confidences; "suggested road alignments" have low presence and/or geospatial confidences.

We do not intend for this map to be disseminated on the basis of geospatial accuracy, but rather to be employed as a heuristic guide; this map demonstrates a far different interpretation of the Chacoan road network from what has been communicated in the past, and it highlights the challenges faced in aggregating Chaco road data. Confidence ratios seen here are nonuniform and complex, largely due to the factors we have spent time reviewing—shortcomings in the geospatial documentation, diversity of data types, and feature degradation.

CONCLUSIONS

In conclusion, we would like to make a number of recommendations. Collectively, we need to (1) acknowledge the cumulative and lasting negative impacts data segregation has had on our ability to document, preserve, and manage the Greater Chaco Landscape; (2) foster awareness of the weaknesses and potential improvements for the digital data ecosystems on which we rely; (3) incorporate legacy data sources into land management decisions; (4) recognize that some of our digital data ecosystems have the capacity to infringe on the sovereignty of Native lands and take appropriate actions to

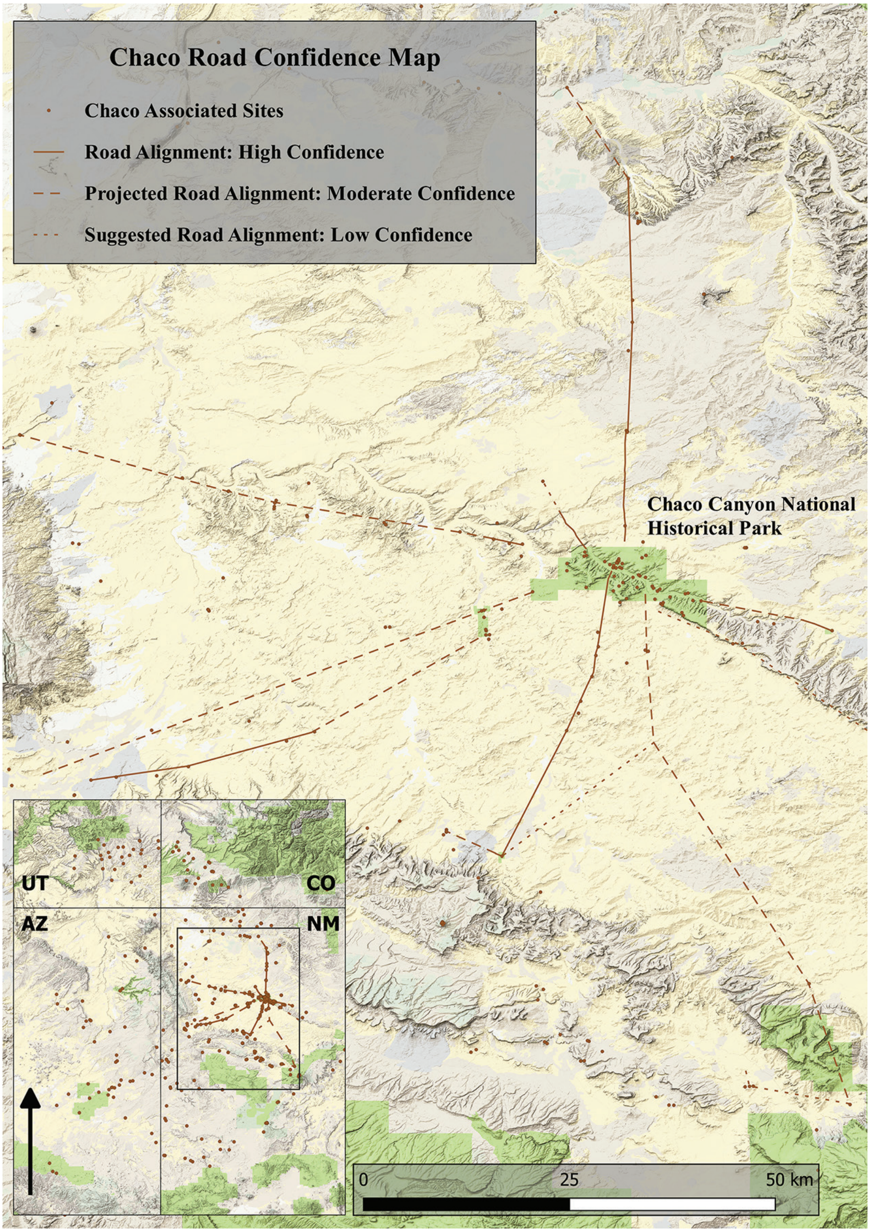


Figure 14.8. *Chacoan Road Confidence Map. Graphic by Sean Field.*

prevent this; and (5) promote and support responsible data sharing and the timely dissemination of research findings. While there is no perfect digital data ecosystem, we have an opportunity and an obligation to do the most with the information in hand.

NOTES

1. John Kantner, Dennis Gilpin, Sarah Herr, Winston Hurst, Jim Kendrick, Keith Kintigh, Nancy Mahoney, Kathy Roler, Ruth Van Dyke, and Mark Varien.

2. Organizers: John Kantner, Keith Kintigh, Nancy Mahoney; Participants: David Anderson, Roger Anyon, David Doyel, Dennis Gilpin, Sarah Herr, Winston Hurst, James Kendrick, Timothy Pauketat, Kathy Roler, Sarah Schlanger, Ruth Van Dyke; National Park Service: Dabney Ford, Frances Joan Mathien, Robert P. Powers, Charles Wilson, Thomas C. Windes; Other Attendees: Karin Burd, Michael Larkin, Stephen H. Lekson.

3. Paul Reed (Preservation Archaeologist and Chaco Scholar, Archaeology Southwest) provided comparable information about the Salmon Pueblo great house. R. G. Matson and Bill Lipe, Mark Varien, Scott Ortman, and Susan Ryan also provided updated information on various sites.

REFERENCES

Bailey, Moya. 2011. "All of the Digital Humanists Are White, All of the Nerds Are Men, but Some of Us Are Brave." *Journal of Digital Humanities* 1(1). http://journalofdigitalhumanities.org/1%E2%80%931/all-the-digital-humanists-are-white-all-the-nerds-are-men-but-some-of-us-are-brave-by-moya-z-bailey/.

Betancourt, Julio L., Jeffrey S. Dean, and Herbert M. Hull. 1986. "Prehispanic Long-Distance Transport of Construction Beams, Chaco Canyon, New Mexico." *American Antiquity* 51(2):370–375.

Friedman, Richard A., Anna Sofaer, and Robert S. Weiner. 2017. "Remote Sensing of Chaco Roads Revisited: Lidar Documentation of the Great North Road, Pueblo Alto Landscape, and Aztec Airport Mesa Road." *Advances in Archaeological Practice* 5(4):365–381.

Heitman, Carrie C. In press. "Theorizing the Archive and Ethics of Open Access Archaeology." In *Digital Heritage and Archaeology in Practice*, edited by Lynne Goldstein and Ethan Watrall. University of Florida Press, Gainsville.

Heitman, Carrie C., Ruth Van Dyke, Matthew Peebles, and Kyle Bocinsky. 2016. "Greater Chaco Landscapes Great House Communities GIS Integration Dataset." GIS dataset submitted to the National Park Service in partial fulfillment of

Rocky Mountain Cooperative Ecosystems Study Unit Task Agreement Number: P14AC01703, Project #: UCOB-109.
Kantner, John. 1997. "Ancient Roads, Modern Mapping: Evaluating Chaco Anasazi Roadways Using GIS Technology." *Expedition* 39(3):49–61.
Karatzogianni, Athina, and Jacob Matthews. 2017. "Evil Intermediation Platforms." Theorizing the Contemporary, *Fieldsights*, April 28. https://culanth.org/fieldsights/evil-intermediation-platforms.
Kelty, Christopher. 2017. "Evil Infrastructures." *Theorizing the Contemporary*, Cultural Anthropology website, April 28. https://culanth.org/fieldsights/1117-evil-infrastructures.
Kincaid, Chris, ed., Daisy F. Levine, Fred L. Nials, Margaret Senter Obenauf, Benjamin P. Robertson, John R. Stein, and R. Gwinn Vivian. 1983. *Chaco Roads Project, Phase I: A Reappraisal of Prehispanic Roads in the San Juan Basin*. United States Department of the Interior, Bureau of Land Management, Albuquerque and Santa Fe, NM.
McPherson, Tara. 2012. "Why Are the Digital Humanities So White? or Thinking the Histories of Race and Computation." In *Debates in the Digital Humanities*, edited by Matthew Gold, 139–160. University of Minnesota Press, Minneapolis.
Nials, Fred L., ed., John R. Stein, and John R. Roney. 1987. *Chacoan Roads in the Southern Periphery: Results of Phase II of the BLM Chaco Roads Project*. Cultural Resources Series No. 1. United States Department of the Interior, Bureau of Land Management, Albuquerque.
Obenauf, Margaret Senter. 1980. "The Chacoan Road System." MA thesis, Department of Anthropology, University of New Mexico, Albuquerque.
Snead, James E. 2017. "Introduction: 'Forgotten Maps' and the Archaeology of Chaco Roads." *Kiva* 83(1):1–5.
Snygg, J., and Windes, Thomas C. 1998. "Long, Wide Roads and Great Kiva Roofs." *Kiva* 64(1):7–25.
Van Dyke, Ruth M., Stephen Lekson, and Carrie Heitman. 2016. "Chaco Landscapes: Data, Theory and Management." White Paper submitted to the National Park Service in partial fulfillment of Rocky Mountain Cooperative Ecosystems Study Unit Task Agreement Number: P14AC01703, Project #: UCOB-109.

VI

Management

15

The Protection of Monuments and Landscapes in Britain

A Historical View

Julian Thomas

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 15, 2017.

https://doi.org/10.5876/9781646421701.c015.v000

INTRODUCTION

One of the key points raised by the "Chaco Landscapes White Paper" (Van Dyke, Lekson, and Heitman 2016) is that ancient monuments cannot be properly appreciated in abstraction but must be addressed in their visual, auditory, and haptic envelopes. It follows that the preservation of these structures for the benefit of future generations is not just a matter of drawing a red line around a dot on a map but must involve securing the entire landscape that is integral to their apprehension and understanding. This argument has been strengthened by the growth of "experiential archaeologies" since the 1990s (e.g., Thomas 1993; Tilley 1994; Van Dyke 2007). In the British context, the imperative to place isolated sites into their broader setting has a long pedigree, through General Pitt-Rivers's investigation of the Bokerley Dyke in Dorset, to O.G.S. Crawford's "field archaeology" and Crawford and Alexander Keiller's *Wessex from the Air* and on to traditional landscape archaeology (Aston and Rowley 1974; Crawford 1953; Crawford and Keiller 1928; Darvill 2008; David and Thomas 2008; Pitt-Rivers 1887). Despite this, British efforts to protect monuments on the one hand and landscapes on the other have not always entirely harmonized: "buildings,"

DOI: 10.5876/9781646421701.c015

"ruins," and "countryside" have often been safeguarded by different people, and for different reasons.

In Britain, the historic environment has formed the focus for struggles based on class and property, but these are set against a constellation of philosophical viewpoints, distinguishing numerous interest groups (Bender 1998:114). These may be marked by mutual indifference or incomprehension but only occasionally by hostility. Equally, the priorities of the statutory bodies and legal frameworks charged with preservation have shifted through tangled histories, while generally remaining laudable. Here I will briefly outline changing circumstances in England over the past two centuries before addressing the Stonehenge landscape as a comparator to the Chaco situation. In so doing, I will consider the intellectual frameworks underpinning both conventional and "fringe" perspectives on monuments, landscape, nationhood, and identity. While the variety of stakeholders and interests that swirls around Stonehenge is entirely different from that in the Chaco region, the overall configuration provides an instructive parallel, and the closest affinity lies in the way that modern economic, political, and technological forces are presently encroaching on the fringes of a valued prehistoric landscape (transport infrastructure versus oil and gas exploitation) (see Van Dyke and Heitman, chapter 1 in this volume).

LANDSCAPE, NATIONHOOD, AND THE "NATIONAL PAST"

In the British and specifically English case, one complicating factor is the particular role of landscape in the formation and maintenance of national identity. David Lowenthal (1994:20) has argued that by comparison to other European countries, Englishness has depended less on formal symbols than on "scenic nationalism." Notwithstanding the enhanced importance of the St. George Flag in these Brexit-y times, Englishness is grounded in a set of recognizable topographic images (the white cliffs of Dover, the Yorkshire Dales, the Lake District, the Wessex chalk), and the rural archetype of nucleated villages set in a patchwork of meadows, fields, and woodlands (figure 15.1). The English landscape is one that has been made and remade by former generations; has been crafted, cultivated, and ordered; and demands nurture and husbandry to avoid falling into disarray (Lowenthal 1994:21). In a related argument, the English and their landscape were identified as the products of a historical process of accretion, strengthened by successive waves of migrations, from prehistory through to the Vikings and Normans. In this way the later British colonization of an Empire was identified as a beneficial gift bestowed on other peoples (McNiven and Russell 2005:128).

FIGURE 15.1. *A stone barn and drystone wall in the Yorkshire Dales, one of the iconic regional landscapes of England. Photo: Julian Thomas.*

Yet while landscape has long been connected with Englishness, the development of a "national past" arguably took longer in Britain than in other European countries. Modern nation-states may be "imagined communities" (Anderson 1983), but in Britain the ancient past only became integral to the national imagination in the later nineteenth century. Bruce Trigger (1995:269) argues that the shared cultures of modern states were grounded in "Romantic nationalism," but for Britain this development was impeded by the divisions of property and class. In Scandinavia, the notion of a shared past that stretched back into prehistory had emerged by the start of the nineteenth century (Klindt-Jensen 1975:48). By 1807, Frederik VI had set up a Danish Royal Commission for the Preservation and Collection of Antiquities (Trigger 1989:75). Similarly, France had a commission on national monuments by 1837 and an official list of national monuments by 1889 (Chippindale 1983:3). But in England, private property was sacrosanct to Whigs and Tories alike, overriding any claim by the nation on antiquities held by an individual.

During the nineteenth century a growing public preoccupation with the past was fostered by the popularity of historical novels and the circulation of steel engraving images of historic buildings (Kehoe 1998:5; Thurley 2013:12). The visiting of historic sites such as Castle Acre Priory, the Tower of London, and Westminster Abbey became progressively more popular as people began to have more free time (culminating with the introduction of bank holidays in 1871), as the proliferation of railways and bicycles enabled them to travel more widely, and as guidebooks began to be produced (Bailey 2014:56). But it was only gradually that these sites came to be collectively identified as a *national* heritage (Fry 2014a:2; Thurley 2013:22). Both countryside and ancient ruins were generally understood as a precious inheritance that was best left in the careful stewardship of the landowning classes.

The First Ancient Monuments Legislation

As Christopher Chippindale has argued (1983:3), the classically educated landowners of Victorian England adhered to a narrative of civilization that focused on the Mediterranean and had no place for the ancient British, who had in any case been ousted by their own Anglo-Saxon ancestors. The Scandinavian three-age system, involving the progressive elaboration of technology, had been introduced to Britain by Daniel Wilson (1851) but only found wider approval in the context of a synthesis with Darwinian ideas in the work of John Lubbock (1865, 1870). It was Lubbock who, having been elected as member of Parliament for Maidstone in 1870, began stoically championing a private member's bill for the protection of ancient monuments. In seeking to conserve specifically *prehistoric* remains, Lubbock's contention was that new knowledge about the distant past can be derived from the archaeological study of monuments and that this knowledge substantiated the extreme antiquity of humankind, on an evolutionary timescale (Murray 2008:155; Thompson 2009:69).

Lubbock's Bill was first introduced to Parliament in 1873, included a schedule of eighty sites throughout the United Kingdom worthy of protection, and would have established a national monuments commission, funded by the treasury (Kains-Jackson 1880). However, it was opposed by Tory MPs such as Lord Francis Hervey, who opined: "Are the absurd relics of our barbarian predecessors, who found time hanging heavily on their hands, and set about piling up great barrows and rings of stone, to be preserved at the cost of an infringement of property rights?" (Wright 1985:50).

Even Lubbock's fellow Liberals considered the proposal unfeasibly costly. Over the following decade, Lubbock was able to convince a growing number of other MPs of the need for some form of legislation, but the notion that an independent board of commissioners might be given the power to compulsorily purchase threated sites was universally unacceptable. A compromise was eventually found in the form of a government bill drafted by Shaw Lefevre, the first commissioner of works, which made provision for one or more inspectors of ancient monuments and which allowed landowners to voluntarily place sites into the guardianship of the state, without any

Figure 15.2. *Kit's Coty House, Kent, a Neolithic dolmen that was the first site taken into guardianship following the Ancient Monuments Act of 1882, with its surrounding railings erected by General Pitt-Rivers. Photo copyright Adam Stanford/Aerial-Cam.*

compulsion to do so (Chippindale 1983:17; Murray 2008:162). The resulting Ancient Monuments Act of 1882 contained a schedule of sixty-eight sites in England, Scotland, and Wales (excluding Ireland) that the state might choose to take into protection through purchase and made provision for other similar sites to be accepted by Order in Council (Fry 2014a:10).

Under the 1882 Act, the care of ancient monuments was placed in the hands of a government body, the Office of Works. The office had been established in the fourteenth century to build and maintain the royal palaces and castles (Thurley 2013:24). A consequence of this purpose was that the organization was somewhat aristocratic in outlook and also that it primarily perceived monuments as *buildings*. Consequently, prehistoric monuments were for long treated primarily as architecture, isolated from their surroundings. The very first monument taken into state care, the Kit's Coty House dolmen in Kent (figure 15.2), was promptly enclosed within a set of railings (upon which a Cambridge undergraduate famously impaled himself in 1906) (Bowden 1991:97).

The first inspector, appointed in 1883, was General Augustus Pitt-Rivers, a close associate of Lubbock (Thompson 1977:64). Thereafter, Pitt-Rivers toured the country annually, with his own paid assistants, reporting on the condition of the listed sites and encouraging landowners to place their monuments into the care of the state (Bowden 1991:97). Pitt-Rivers saw a major part of the inspector's job as making a record of nationally significant monuments and considered that the Ordnance Survey should have been given a role in this process, which would have integrated heritage protection with the practice of map-making (Thurley 2013:46). However, after the general's death in 1900 the inspectorship effectively lapsed for a period, and the task of inventory of ancient monuments and historic buildings was given to three Royal Commissions on Historic Monuments, established in 1908.

Access to the Landscape

Early steps to safeguard ancient monuments took place alongside the development of an "open space movement," dedicated to making the countryside available to the people. From the eighteenth century, common lands that had been collectively used for economic and recreational purposes began to be legally enclosed by larger landowners, on the grounds that they would provide better stewardship and management (Neeson 1993:259). This process of enclosure coincided with the concentration of population in the cities, and the right of working people to seek exercise in the open country was defended by the Commons Preservation Society (CPS) and the emerging rambling clubs during the 1860s and 1870s (Murphy 2002:19). The CPS, the National Footpaths Preservation Society, and the Kyrle Society were among a number of groups seeking to improve access to the countryside or enhance urban environments in the later nineteenth century, but they were all essentially small, elite pressure groups. In the Lake District of northwest England, threats ranging from the potential incursion of the railways to the private purchase of Lodore Falls had exercised the clergyman Hardwicke Rawnsley, who identified the need for a nongovernmental landholding body that could acquire places of natural beauty or historic interest on behalf of the nation. Influenced by John Ruskin's belief that access to the countryside was a life-enhancing right that should be enjoyed by all people, Rawnsley, together with Octavia Hill of the Kyrle Society and Robert Hunter, the legal representative of the CPS, founded the National Trust in 1894 (Waterson 1994:36). The background of the National Trust was in the patrician radicalism of liberals and Christian socialists who operated through contacts and personal influence, and its main priority was *access*, in contrast with Lubbock's focus on the *conservation* of monuments. The trust provided a means by which landowners could donate property to the nation, both for recreation and education. The first properties acquired were the coastline of Dinas Oleu in Wales and the wetlands of Wicken Fen in Cambridgeshire, but these were followed by a historic building: Alfriston Clergy House in Sussex, in 1896 (Morgan Evans 1996:28; Waterson 1994:42). So, interestingly, the Trust was capable of taking ownership of roofed buildings, while under ancient monuments legislation the Office of Works were initially restricted to "ruins."

These developments provided the background to a transformation in the social significance of both landscape and ancient monuments during the earlier twentieth century. During this period relationships between the state and the citizen altered, arguably as a culmination of the process that Michel Foucault identified as the shift from *sovereignty* to progressively more encompassing forms of *governmentality*, regulating the production of political subjects (Foucault 2003:247). David Matless (2016:31) has argued that in the interwar period in Britain, planning and preservation became linked in a form of modernism that stressed both progress and tradition and, above all, order and discipline. Under these circumstances the landscape took on a new moral significance, as a space for the activation of both embodiment and subjectivity. The landscape became the context in which orderly, modern citizens achieved self-realization through their healthy leisure pursuits, in contrast with selfish, untidy, and immoral forms of recreation. This new kind of English citizenship was supported by a dramatic expansion of the open-air movement, with the foundation of the Youth Hostels Association in 1930 and the Rambler's Association in 1935. Hiking was the paradigm example of this modernist self-formation, as it combined healthful bodily discipline with the observation of nature and navigation (Matless 2016:105). Yet while country walking was identified as a moral pursuit, the demand for access to the land had also taken on a more radical edge, manifested in the April 1932 mass trespass on the grouse moor at Kinder Scout in Derbyshire, supported by the communist British Worker's Sports Federation (Hey 2011:208).

At the same time, an entirely different kind of modernist leisure activity was developing with the increasing popularity of motoring among the middle classes. Motor touring was often portrayed as a means of immersing oneself in an older England, as in H. V. Morton's *In Search of England* (1932), which Matless describes as a "motoring pastoral" (2016:101). Here the English landscape comes to be identified as a set of experiences to be consumed and explicitly as a way of engaging with a premodern world. Morton's writings coincided with a popular upsurge of interest in archaeology within its wider landscape. This tendency was manifested in the popularity of the Ordnance Survey's maps of Roman Britain and Neolithic Wessex, which opened up the possibility of visiting ancient monuments by car. Although motor tourists and hikers were otherwise unalike, they shared a fascination with England's prehistoric past (Harris 2010:209).

In this new era the British state was increasingly willing to set aside the rights of private property in the public interest. The despoiling of the countryside was now often attributed to undisciplined development, including the proliferation of advertising billboards and the creeping expansion of the towns along the arterial routes, which Clough Williams-Ellis referred to as "the Octopus." This extension of urban tendrils into the countryside had the effect of "averaging England out into a dull uneventfulness" (Williams-Ellis 1928:21). In place of unregulated growth, Williams-Ellis advocated orderly progress driven by planning, maintaining the separation of town and country, and restricting the spread of squalid bungalows. 1932 saw the passing of the Town and Country Planning Act, reflecting a desire to overcome unregulated development, property speculation, and a lack of designed order. "Preservation orders" could now be applied to inhabited buildings, affording them some level of protection (Thurley 2013:89).

Tidy Monuments and Country Houses

This same imperative for order, balance, clarity, and harmony manifested itself in an entirely different way in the activities of the Office of Works. Following the appointment of Charles Peers as inspector of monuments in 1910, a distinct Ancient Monuments Department was created, charged with producing plans, photographs, and guidebooks for all guardianship sites. With the 1913 Ancient Monuments Consolidation and Amendment Act, monuments were identified for the first time as material documents of national history, in which all citizens had an interest. As Simon Thurley points out, this development formed part of the general process by which the British state took responsibility for the nation's history, also seen in the creation of the Public Records Office, the National Library, and the National Portrait Gallery (2013:80). Thurley also makes the important point that it was at this time that ancient monuments and historic buildings were first identified as a "national heritage collection," a portfolio of properties that collectively had the function of educating the public about the past, rather than simply being preserved for their intrinsic value. As such, they constituted a kind of extended museum, dispersed across the nation.

So as the landscape became the space for the actualization of healthy, moral, clean-limbed citizens, monuments took on the didactic role of placing English identities into a chronological narrative of race and nation, complementary aspects of governmentality. At the same time, the 1913 act transformed the significance of the distinction that Lubbock had made between scheduled sites and monuments in guardianship, by offering a level of protection to the former on the understanding that not all places of archaeological importance would ever be taken into public ownership (Stout 2008:138).

Peers's new approach also manifested itself in a new aesthetic for the presentation of ancient monuments. From the 1840s onward, many English churches had been reconstructed in an overenthusiastic manner, resisted by William Morris and the "antiscrape" campaign of the Society for the Protection of Ancient Buildings, with the result that reconstruction had fallen into disrepute (Donovan 2007). Now, the Office of Works set about the ruthless clearance of many sites, removing any postmedieval additions in order to render the structure legible and comprehensible to the visitor (Thurley 2013:145). The emphasis on order and clarity was also reflected in the addition of neatly mown lawns, flower beds, and custodian's huts so that in later years it was a common joke to refer to the "Ministry of Tidy Monuments" (Adams 2015:41).

While the public role of ancient monuments was being transformed, the National Trust was undergoing fundamental changes. In 1907 the National Trust Act gave the organization the ability to acquire property inalienably so that it could not be sold, mortgaged, or appropriated by the government. Parliament may not have fully appreciated how powerful a gift it was giving to the trust (Waterson 1994:53). An important statement of the trust's changing philosophy was provided by G. M. Trevelyan's *Must England's Beauty Perish?* (1929), which demonstrated a growing interest in ancient monuments and historic houses, echoing the Office of Works' new emphasis on their educational value. Yet Trevelyan also identified the importance of the landscape setting of monuments, arguing that a site such as Bodiam Castle is best appreciated amongst the beauty of meadows and trees. In 1934, Lord Lothian raised the issue of the breakup of country house estates at the trust's annual general meeting, a process that had escalated since the First World War (Montgomery-Massingberd and Sykes 1994:181). Under the influence of James Lees-Milne, the secretary of the Country Houses Committee between 1936 and 1951, the trust began acquiring increasing numbers of great houses and developed a concern for Georgian as well as earlier architecture.

The country house policy of the 1930s was decisive in turning the trust away from its Christian socialist beginnings and toward domination by aristocrats, connoisseurs, and senior academics (Nixon 2015:531; Waterson 1994:171). The trust's shift from public access to preservation during this period was precisely opposite to the direction of travel of the Office of Works. After the Second World War, landowners who had fallen on hard times were generally more inclined to donate their properties to the trust than to the state, especially since the former would usually allow families to continue to occupy their ancestral homes. As a result, the trust received 168 new properties between 1949 and 1954 (Nixon 2015:532). Despite the comparative neglect of countryside and ancient monuments, the mushrooming scale of operations demanded an increase in staff and a more efficient organization. This expansion coincided with growing public affluence and leisure time and with increasing demand for access to the trust's properties. In 1965 the trust launched Enterprise Neptune, an ambitious project intended to secure stretches of beautiful and unspoiled coastline threatened by development. However, Neptune served to expose internal tensions and contradictions, between preservation and conservation *for* public amenity or *from* the wrong kind of public access, as well as a perceived lack of internal democracy. The resulting Benson Enquiry of 1967 caused the rapid professionalization of the National Trust, with stronger management and an increased emphasis on the commercialization of its assets (Nixon 2015:548). Subsequently, the trust also increased its commitment to archaeology and began to understand many of its properties as historic landscapes that demanded systematic investigation (Thackray 1996:218).

The Office of Works was now demonstrating a greater interest in the landscape surrounding its monuments. The Ancient Monuments Act of 1931 empowered the commissioners to restrict building or other activity in the vicinity of monuments, in response to the threat of quarrying in the "wild and beautiful scenery" around Hadrian's Wall (Thurley 2013:173). By the 1970s there was greater coordination in the protection of material heritage, with the listing of historic buildings and the scheduling of archaeological sites unified within the Directorate of Ancient Monuments and Historic Buildings of the Department of the Environment (Thurley 2013:236). However, the end of the seventies saw the eclipse of the statist "planner-preservationism" and the emergence of a more neoliberal outlook within government. The 1979 Ancient Monuments and Archaeological Areas Act brought a decisive end to the practice of bringing ancient monuments into state ownership, with greater protection for scheduled sites and an emphasis on management agreements negotiated with landowners (English 2002:7). The Office of Works, which had been subsumed into the Department of the Environment, was in 1983 replaced by a quasi-autonomous agency, the Historic Buildings and

Monuments Commission for England (HBMCE), which operated under the title of English Heritage (complemented by its devolved equivalents, Historic Scotland and Cadw in Wales). English Heritage was charged with developing more imaginative strategies for presentation, education, and marketing, with a view to making the national monuments collection self-funding. Its first chair was Lord Montagu, who had been highly successful in commercializing his stately home, Beaulieu Palace House in Hampshire, where he had established a National Motor Museum and a jazz festival (Bender 1998:117). Since April 2015, the HBMCE has been retitled as Historic England, while the name English Heritage has been reassigned to a self-funding, nongovernmental charitable trust, which is licensed to manage the national heritage collection, the state properties that are now entirely separate from the scheduled and protected archaeological sites in private ownership (English Heritage 2015).

Heterodox Perspectives

The views of the bodies charged with the conservation of heritage and landscape in England have been diverse and unstable and much the same is true of the wider society. As Matless points out, the modernist planner-preservationism that dominated official discourse between the 1920s and 1970s was always shadowed by other perspectives, including various forms of organic ruralism and radical traditionalism (2016:32). From an archaeological point of view, one of the most significant and long established of these was modern Druidry. The Ancient Order of Druids was founded in 1781 on the model of freemasonry, but also drew on ancient texts such as those of Diodorus Siculus and on the opinions of antiquaries including William Stukeley and the somewhat suspect *Barddas* manuscripts of the Welsh poet Iolo Morganwg (Hale 2011:88; Hutton 2011:210). Although there is little evidence that the prehistoric Druids were linked to Stonehenge or other megalithic sites, Stukeley's important insight that these monuments predated the Romans led him to attribute them to a generalized Druidic prehistory (Piggott 1985:80). This connection was picked up by William Blake in writing *Jerusalem: The Emanation of the Giant Albion* ([1804] 1991), which presented Britain as the original home of a primordial religion. Blake's narrative is one that links the essential national spirit of Albion with the possibility of redemption in a fallen world (Fisher 1959:592). "All things begin and end in Albion's ancient Druid rocky shore," says Blake, and his illustrations make repeated use of the image of the Stonehenge trilithon (figure 15.3).

By the start of the twentieth century, modern Druidry had taken on a greater interest in magical ritual, informed by its encounter with the Order of the

Figure 15.3. *A "Druid trilithon" from William Blake's* Jerusalem, *Plate 70. Image: Wikimedia Commons, public domain.*

Golden Dawn (Worthington 2004:56). The Ancient Order first conducted rituals at Stonehenge on August 24, 1905, but the Universal Bond, a more radical group influenced by Theosophy and occultism, had already been visiting the site at the summer solstice for some years (Stout 2008:144). While there was some mutual distrust between the Ancient Order and the Universal Bond, they shared the view that great wisdom, unequalled in the present, had existed in the past. This belief that people in antiquity were capable of brilliant feats, were sensitive to the earth's energies, lived in balance with nature, and were morally superior to modern capitalist societies is foundational to many "alternative archaeologies" (Chippindale 2004:249). The notion of a lost golden age contrasts with archaeology's increasing focus on evolution and progress as it became a professionalized discipline (Stout 2008:51). As we will see, it also explains why such perspectives proved so attractive to the counterculture from the 1960s onward, since they potentially serve to delegitimize the contemporary sociopolitical order. Yet while some contemporary Druids aligned themselves with the counterculture, others seek personal enlightenment and social respectability, and this remains a tension within the movement (Blain and Wallis 2007:38; Sebastian 1990:88).

A similar emphasis on the advanced achievements of past peoples distinguished a series of unorthodox viewpoints, which collectively fed into an alternative synthesis in the 1960s and 1970s. When Sir Norman Lockyer proposed an astronomical function for Stonehenge in 1906, it was resisted by archaeologists including Mortimer Wheeler and T. D. Kendrick, who preferred a funerary interpretation of the site (Michell 1977:17; Parker Pearson 2013:75). Subsequent approaches to archaeoastronomy have varied between the identification of megalithic monuments as computers capable of predicting lunar and solar eclipses (Hawkins 1965:98) and the more modest isolation of solstitial alignments (Ruggles 1999:41). Similarly, in proposing that "ley lines" (or straight, line-of-site trackways) connected significant sites of various periods in the British landscape, Alfred Watkins (1925) argued that they must have been laid out by skilled "men of knowledge," whose methods are now lost to us. Watkins had originally hypothesized that leys were related to ancient trade and navigation, and "ley hunting" became popular between the wars, helped by the wide availability of Ordnance Survey maps (Stout 2008:178). Nonetheless, Major Tyler, Watkins's successor as the central figure in the Old Straight Track Club, eventually resorted to the view that leys were an inheritance from a universal civilization originating in Atlantis (Stout 2008:206). Contemporary with Watkins was the ruralist, antimodern English organicism of H. J. Massingham, which disparaged evolutionism as "the religion of the modern state" (Radford 2010:108). Massingham presented the "Downland Man" of prehistory as possessing an instinctual bond with nature, which was broken by the introduction of metallurgy, beginning the descent into rootless urban life (Massingham 1926:145–6).

In the late 1960s, these various strands of unconventional thinking about prehistory and landscape were drawn together by John Michell, in his book

The View over Atlantis (1969). Although Michell was a central figure in the emerging London counterculture (Miles 2010:187), he identified himself as a "radical traditionalist" and advocated a return to a traditional society based on spiritual principals and a sacred monarchy. He viewed the modern world as disordered, degraded, and corrupt and followed Blake in arguing that England had a unique redemptive destiny (Hale 2011:79; Michell 2005:48). While there was already an interest in what have become known as "earth mysteries," Michell synthesized ideas of sacred geometry, Druidry, ley lines, earth energies, archaeoastronomy, and numerology, paving the way for the esoteric boom of the 1970s (Devereux 1990:53). He specifically identified prehistoric monuments as a source of connection and continuity with a past that was spiritually richer than the present and suggested that they might have a role to play in regenerating a rural way of life articulated around a series of seasonal festivals (Blain and Wallis 2007:22; Hale 2011:87).

THE STONEHENGE LANDSCAPE

Nowhere have the contrasts between the philosophies and motivations affecting the protection of monuments and landscape been so conspicuous as at Stonehenge and its environs in Wiltshire. The Stonehenge landscape makes up one element of a "serial" World Heritage Site (WHS) (which also includes the area around Avebury in north Wiltshire), inscribed in 1986 under the 1972 UNESCO convention for the protection of World Cultural and Natural Heritage. The Stonehenge part of the WHS covers an area of 2,600 ha, measures 5.4 km from east to west, and by the year 2000 contained a total of 196 scheduled ancient monuments (Bowden at al. 2015:9) (figure 15.4). The World Heritage Site status does not affect the ownership of the region: the monument itself is in the care of English Heritage, a large area of surrounding downland is owned by the National Trust, the land around Larkhill to the north is in the hands of the Ministry of Defence, and there are six other major landowners (English 2002:7; Wainwright 2000:334). Stonehenge itself is a monument whose significance has been debated for centuries, and successive surveys and excavations have not brought discussion and speculation to an end (Parker Pearson 2013). Stonehenge is both unique and anomalous (figure 15.5). It is composed of an earthwork bank and ditch constructed in the Middle Neolithic, around 3000 BC, immediately inside of which is a ring of fifty-six small pits known as the Aubrey holes, which probably originally contained a series of bluestone (dolerite, rhyolite, tuff, and sandstone) pillars that had been brought to Wiltshire from southwest Wales. A number of

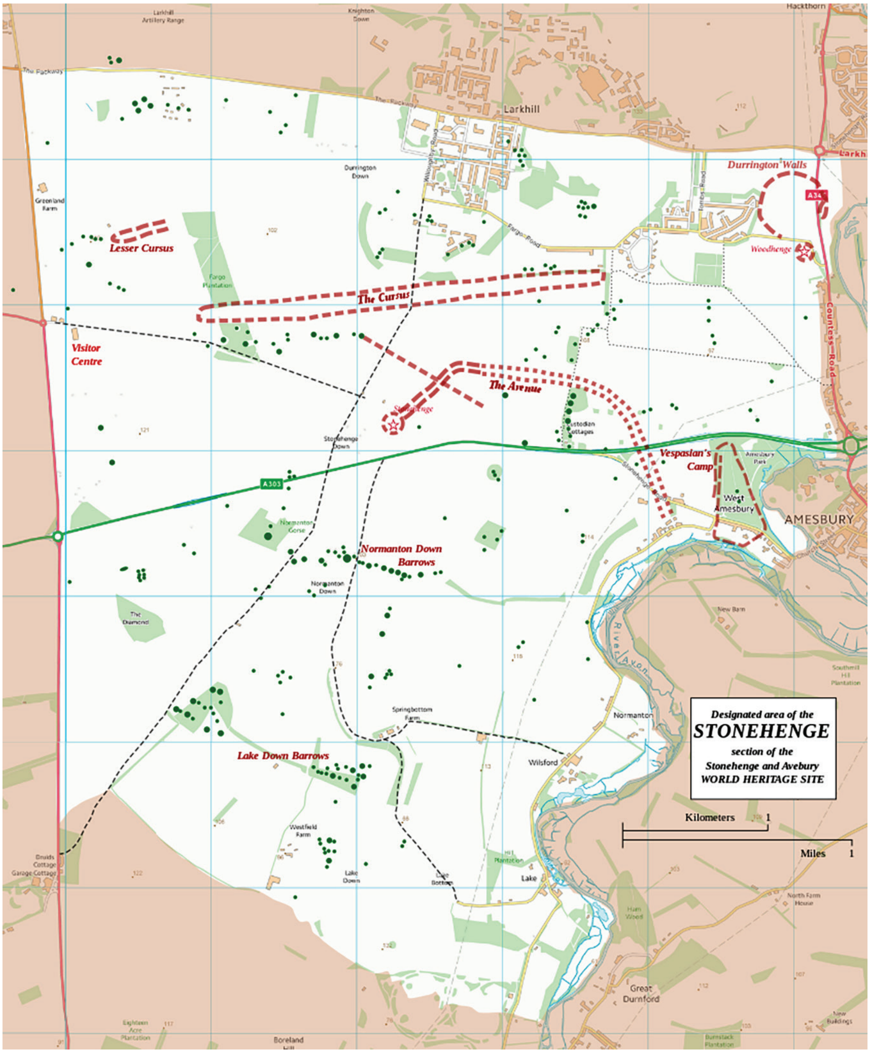


Figure 15.4. *The Stonehenge World Heritage Site. Image: Wikimedia Commons, Contains Ordnance Survey data © Crown copyright and database right.*

cremation burials were associated with these features. Around 2500 BC an arrangement of much larger sarsen (or sandstone) uprights (probably from north Wiltshire) was set up in the center of the enclosure, first a set of five trilithons in a horseshoe shape and then a surrounding ring of uprights with a continuous lintel. The bluestones were repositioned as part of this central

Figure 15.5. *Stonehenge: the façade of the sarsen circle, seen from the northeast. Photo copyright Adam Stanford/Aerial-Cam.*

setting, first as a double circle and later as a concentric circle and oval (Darvill et al. 2012:1026).

Although it is now possible to place Stonehenge into the broader traditions of Late Neolithic domestic and ceremonial architecture (Pollard 2009), its uniqueness only adds to its global recognition. Henry Browne, the semiofficial guardian of the site in the mid-nineteenth century, believed it to be a singular survival from before the biblical flood; Richard Atkinson argued that it was out of keeping with all other prehistoric buildings north of the Alps and must therefore have been of Mycenaean origin (1956:163; Chippindale 2004:146). The combination of architectural matchlessness and enduring mystery has rendered Stonehenge as a national symbol but one that can be claimed and understood in entirely different ways by different constituencies (Higgins 2019:9). The incompatibility of many of these interpretations has added to the perennial difficulty of presenting and granting access to Stonehenge. Different publics demand diverse experiences from the monument, just as the multiple authorities involved in its management have subtly different priorities of their own.

By the middle of the nineteenth century, the solstitial orientation of the central stone settings at Stonehenge was widely appreciated, and numbers of people were gathering at the site each year to witness midsummer sunrise (Chippindale 2004:156). After the 1890s the solstice crowd was sometimes over 3,000 strong and accompanied by entertainment in the form of brass or jazz bands, Morris dancers, and gramophones (Worthington and Deering 2005:6). Gradually, with agricultural intensification and the arrival of the railway at

Salisbury in 1847 and Amesbury in 1902, Stonehenge began to be subject to encroaching development, and already by 1901 Hardwicke Rawnsley was regretting its "disenchantment" (Rawnsley 1901). By the 1930s the Druids had become closely associated with Stonehenge in the popular imagination (Stout 2008:157). The Amesbury estate (including Stonehenge) had been purchased by the Antrobus family in 1824, and for long the monument was openly accessible to the public and subject to damage caused by the chipping of the stones for souvenirs. However, following the collapse of one of the outer sarsen uprights and its lintel in 1900, and the reerection of the largest trilithon (which had begun to lean alarmingly) in 1901, Sir Edmund Antrobus fenced the site and began to levy an admission charge. Revealingly, this enclosure was resisted for contrasting reasons. Archaeologists such as Flinders Petrie were troubled by the prospect of overenthusiastic restoration following Antrobus' resetting of uprights in concrete. Amesbury Parish Council complained that there was an established tradition of access to the downs for local people, while the National Trust argued that Stonehenge was a national monument and should be freely open to the public (Chippindale 2004:164). Sir Edmund then offered to sell Stonehenge to the government for £125,000, but threatened that if his price was not met, he would "sell the Stones to some American millionaire, who would ship them across the Atlantic" (Cole 2002:140). This danger was averted by the 1913 Ancient Monuments Act, which also protected the site from casual damage (Fry 2014b:12). Sir Edmund's heir was killed in action in 1914, and following his own death the following year. Stonehenge was sold at auction in Salisbury, where it was acquired for £6,600 by Cecil Chubb (Chippindale 2004:176). Chubb bought the site for his wife on a whim but in 1918 donated it to the nation, being rewarded the following year with a baronetcy.

Stonehenge was now taken into the guardianship of the Office of Works, who began a comprehensive program of straightening leaning stones and reerecting fallen ones, which was integrated with a series of excavations under the auspices of the Society of Antiquaries of London. Both projects were directed by Colonel Hawley, who had already served as the representative of the Office of Works during World War I, with the intention of rendering the monument comprehensible (in keeping with the policies of Charles Peers). However, both were abandoned incomplete (Barber 2014:86). During the First World War, the immediate environs of the monument had been adversely affected by the expansion of the military camp at Larkhill, with the construction of a horse isolation hospital and an aerodrome nearby (Chippindale 2004:175). Northward from Larkhill, and overlapping the World Heritage Site, the Salisbury Plain military training area is still today in use for live firing and tactical maneuvers. Despite damage by shell impacts and tracked vehicles, the lack of intensive agriculture has resulted in high levels of archaeological preservation (McOmish et al. 2002:2). However, the creep of military activity toward Stonehenge—together with the building of a café, several cottages, and a pig farm—had made the area increasingly untidy (Morgan Evans 1996:36). The last straw was the threat to build in the vicinity of the Avenue that links Stonehenge with the River Avon for what Williams-Ellis had epitomized vulgar, unregulated development: a row of holiday bungalows.

In 1929 a national appeal was launched by archaeologists, including O.G.S. Crawford and Alexander Keiller, to buy 587 hectares of downland surrounding Stonehenge, which, following the intervention of various celebrities, proved successful. The land was handed over to the National Trust, creating the curious situation in which the monument itself sat within a small triangle bounded by roads to the north and south that was held by the Office of Works (later English Heritage) but contained within a much more extensive tract of National Trust property. Once again, "ancient monument" and "landscape" were addressed in subtly different ways. The trust began the process of removing what were identified as unsightly elements in the landscape, eventually demolishing the Stonehenge Café in 1938. Initially, the land continued to be used for arable and pasture by tenant farmers, but more recently the trust has succeeded in returning much of it to a natural chalkland habitat (Worthington 2004:101). In 1999 the National Trust holdings in the eastern part of the World Heritage Site were increased by the purchase of 172 acres of Countess Farm. With the entire immediate environment of Stonehenge removed from private ownership, a lengthy deliberation began on the best way to display the site. The first step was the construction of a car park and somewhat brutalist concrete visitor facilities immediately to the north of the monument in 1968, linked to the site by an underpass beneath the minor road, the A344 (Fry 2014b:24). The local road system, as well as access to the stones, has been a central problem for the management of Stonehenge ever since.

Festivals and Travelers

The historical processes through which the interpretation and safeguarding of places of historic and scenic importance developed in Britain formed part of the concatenation of circumstances that hardened into conflict surrounding Stonehenge from the 1970s onward. The Druids had succeeded in popularizing the notion that the site represented a "national temple," a view that began to resonate in unexpected ways. One of the utopian ideas that

Figure 15.6. *Stonehenge free festival 1984, gathering at the stones on midsummer solstice morning. Photo: Richard Morris, licensed under Wikimedia Creative Commons.*

emerged at the end of the 1960s was that of free music festivals, self-policing and spontaneously organized. This notion lay behind the tearing down of the fences surrounding the Isle of Wight Festival in 1970 and also the planning of the Glastonbury Fayre in Somerset in 1971 by Arabella Churchill and Andrew Kerr. Kerr was inspired by John Michell in seeking to hold the Fayre at Worthy Farm, close to the location to which Joseph of Arimathea had reputedly brought the Holy Grail, within the terrestrial "Glastonbury zodiac" identified by the Theosophist Katharine Maltwood and beside the supposed ley-line linking Glastonbury Abbey with Stonehenge (Kerr 2011:190). The iconic pyramid stage was built by Bill Harkin on the basis of Michell's study of the Great Pyramid. Henceforth, esoteric views about the ancient past and the English landscape became integral to the free festival movement. From 1974 onward, official obstruction of the national free festival at Windsor Great Park led to the emergence of a Stonehenge Free Festival (figure 15.6) held at the summer solstice, inspired by countercultural figure Wally Hope (Phil Russell). This event was initially very small in size but gained in significance from 1976, when participants entered Stonehenge alongside the Druids in order to scatter the ashes of Phil Russell, who had died under suspicious circumstances in police custody. By the final year, 1984, the festival attracted 100,000 people on National Trust land north of the A344 (Worthington and Deering 2005:5).

By this time many of the attendees were "New Age Travellers," young people who had left the cities for a nomadic way of life in converted motor vehicles and who were viewed with suspicion by the authorities (Hetherington 1998:329; Martin 2002:724). For the travelers, Stonehenge had become a site of annual pilgrimage (figure 15.6). As Michell saw it, they "instinctively began to imitate their ancestors and gather at their national temple for free-spirited solstice ceremonies" (2005:60–61). However, the National Trust at best tolerated the festival, while the pressure of visitors on the site itself was increasingly being recognized, with access to the stone settings themselves being restricted from 1978 onward (English 2002:10). Fatefully, the travelers had attracted the attention of Margaret Thatcher's Conservative government, becoming closely associated with the antinuclear protest movement after the deployment of US cruise missiles at Greenham Common and Molesworth air bases, and the establishment of "peace camps" at both sites. In 1985 it was announced that the festival would not be allowed to take place, and English Heritage and the National Trust took out injunctions against eighty-three named individuals, forbidding them to enter the vicinity of the monument, as well as excluding Festival Welfare Services and the St John Ambulance Brigade (Worthington and Deering 2005:25). A convoy of 140 traveler vehicles set out from Savernake Forest on June 1, 1985, intending to break through the police cordon and enter the "exclusion zone," but at a roadblock at Shipton Bellinger they were turned into a field, where they were attacked by 1,400 police in riot gear. People, including pregnant women, were battered with truncheons, many vehicles were destroyed, and 500 were arrested. The tactics employed by the police echoed those used against striking miners at the "Battle of Orgreave" in South Yorkshire precisely a year earlier, and they demonstrated the government's willingness to deploy force against its perceived "enemies within." In 1991, twenty-one of the travelers received £28,665 in civil court damages for false imprisonment, damage to property, and false arrest (Aitken and Rosenberger 2005:147). The so-called Battle of the Beanfield explains why the question of access to Stonehenge became not only a matter of heritage management but of civil liberties.

After the Beanfield

The violent aftermath of the aborted festival, the exclusion of all members of the public from Stonehenge during the summer solstice, and the declaration of a parliamentary committee in 1975 that the visitor facilities represented “a national disgrace” (Millar 2006) made it imperative to find a solution for the management of the site. The fundamental problem that such a solution must contend with is the contradiction between huge visitor numbers and the desire for an authentic experience of the site in its setting (Chippindale 2004:272). In 1992–1993, a joint English Heritage (EH) and National Trust (NT) plan identified the main objectives as the closure of the A344; the diversion of the more major A303, which runs immediately to the south of the monument; and the creation of a new and more extensive visitor center farther away from the site. This immediately introduced another stakeholder into the equation, the Department of Transport. For while the EH/NT plan agreed that the best option for the A303 was to run the road through a bored tunnel throughout most of the WHS, the Department of Transport declared this too expensive and proposed a shorter cut-and-cover tunnel, which would be more archaeologically destructive (Kennet and Young 2000:949; Wainwright 2000:338). Approaching the millennium, new attempts to solve the Stonehenge problem were prefigured by the return of the Druids for the solstice of 1998 and of a wider public under conditions of “managed access” in 2000 (English 2002:15). Under the aegis of UNESCO, a WHS Management Plan was published in 2000, which sought to harmonize the views of numerous landowners and statutory authorities on issues of landscape and heritage conservation, tourism, traffic, and archaeological research (English Heritage 2000; Hunt 1996:214). However, the Management Plan was preempted by a “Stonehenge Master Plan” presented by EH and the NT with minimal consultation, which emphasized the importance of reestablishing the “dignity and isolation of the monument,” with a particular emphasis on the removal of the roads (Wainwright 2000:340). Some commentators believed that the “Master Plan” fell short of UNESCO’s requirements for the management of a World Heritage Site, which were embodied in the management plan (Fielden 2000:947). In particular, the latter emphasized the need for the A303 to be buried in a long bored tunnel and rejected the notion that the new visitor center should be placed in the hands of a commercial operator (Baxter and Chippindale 2000:944).

The management plan was complemented by a Stonehenge Research Framework (Darvill 2005:3), which followed the agenda set by the former, in identifying an agreed set of priorities for understanding the archaeology of the WHS through a resource assessment and a strategy for future work. This framework has now been upgraded to cover both the Stonehenge and Avebury areas, identifying common research themes between the two regions (Leivers and Powell 2010:12). Again, this framework has the benefit of achieving compromise between the different stakeholders involved in the WHS. Another recent achievement

Figure 15.7. *The new Stonehenge Visitor Centre at Airman's Corner in the World Heritage Site. Photo copyright Adam Stanford/Aerial-Cam.*

has been the creation of a new visitor center. After abortive attempts to build a facility at Larkhill, Fargo North, and Countess East, the new center at Airman's Corner in the west of the WHS was opened on December 18, 2013, following the closure and removal of the A344. The new center is intended to act as a "gateway" into the Stonehenge landscape and contains displays of artifacts as well as audiovisual facilities and a group of reconstructed Late Neolithic houses based on those excavated at Durrington Walls (figure 15.7).

More intractable has been the issue of the A303, which represents the principal trunk road from London to the southwest of England and passes within 165 meters of Stonehenge. Here the comparison with Chaco Culture National Heritage Park is clearest, for in each case the protection of the "core" monuments is not in doubt, but the integrity of the wider landscape is threatened by contemporary developments around its periphery (Higgins 2019:11). Years of stalemate over the best way to manage the Stonehenge landscape have meant that during the summer months, the overused A303 is regularly jammed with stationary vehicles with their engines running. Owing to expense, the plan for upgrading the A303 was again dropped in 2007, but in January 2017 it was reinstated as one of nine schemes managed by Highways England Southwest that will collectively create a southwest expressway. English Heritage have agreed to Highways England's proposal of a 2.9 km bored dual carriageway tunnel, on the condition that the western portal is moved farther away from the Normanton Down group of prehistoric burial mounds than initially intended. The proposal is opposed by the Stonehenge Alliance, composed of the Ancient Sacred Landscape Network, the Campaign for Better Transport, the Campaign to Protect Rural England, and Friends of the Earth and Rescue (the British Archaeological Trust). The alliance notes that the International Council on Monuments and Sites (ICOMOS)–UK, the official advisor to UNESCO on cultural World Heritage Sites, has expressed concern over the 2.9 km tunnel and the 1.6 km of new dual carriageway that would be constructed within the WHS (Stonehenge Alliance 2019). Troublingly, the eastern part of this carriageway and the expressway flyover at the Countess Roundabout are perilously close to Blick Mead, a long-lived Mesolithic site with evidence for the hunting of aurochs and for far-flung social contacts (Jacques and Phillips 2014). A 4.6 km tunnel would remove the need for any new road, and a 6 km tunnel would remove the entire surface road from the World Heritage Site. Such long tunnel solutions are supported by the Council for British Archaeology (2017) and the Prehistoric Society, but at its Annual General Meeting in October 2017, the National Trust voted to support the Highways England Plan (Stonehenge Alliance 2017). It is apparently unlikely that government will accept such a model on the grounds of expense, and it is argued that the 2.9 km tunnel is the best compromise that can presently be achieved (Higgins 2019:10). However, it is open to question whether future generations will agree that the destruction of archaeological heritage in the name of political expediency is an acceptable outcome.

By complete contrast, a case has been made for the retention of the A303 in its present form, on the grounds that it represents an integral part of the historic landscape. Dan Hicks (2017) argues that the "scraping" of later elements from the surroundings of Stonehenge—including the café, the cottages, and the horse hospital—has the effect of creating an artificial "heritage landscape" that never existed in the past. It is a tasteful museum landscape that has stopped developing and become static, an embodiment of middle-class values and aesthetics. Hiding the A303 in a long tunnel has the effect of stopping passing motorists from viewing the stones as they head toward Devon and Cornwall on vacation, obliterating the valued democratic experiences of a mobile public.

CONCLUSION

The Stonehenge landscape is comparable with Chaco Canyon in that numerous different interests converge on the site and its preservation (see

Lekson, chapter 2 in this volume). As we have already noted, no direct equivalence exists between the stakeholders concerned in the two situations. While the connection between the Chaco great houses and contemporary Native American communities is uncontentious, it is arguable that the more mysterious past of Stonehenge draws it into multiple competing processes of contemporary identity formation. The central paradox that I have sought to emphasize in this contribution is that ancient monuments can only be fully appreciated in a landscape context, but that the reasons why different organizations seek to preserve ruins, buildings, and countryside are often quite different. In the case of England, the situation is complicated by the way that landscape is freighted with associations of national identity, while some ancient monuments have become contested sites through which competing versions of Englishness have been worked out. Conservation bodies—whether governmental or independent—have complex and unruly histories of their own, in which the competing objectives of preservation, access, educational instruction, recreation, and commercialization have fluctuated in their relative importance. These organizations, and different segments of the public, are not motivated primarily by class interest and economic or political advantage but by philosophical ideas concerning history, property, authenticity, value, nationhood, and identity. These ideas are themselves not static, since they are linked to changing social and cultural conditions. As we have seen in the case of the Stonehenge landscape, the views of the different constituencies involved gradually shift in relation to each other, creating moments in which positive developments are possible. Notable in this example have been the management plans and research frameworks promoted by UNESCO, which have provided a means for establishing consensus among the diverse factions involved.

REFERENCES

Adams, Max. 2015. *In the Land of Giants: Journeys through the Dark Ages*. Head of Zeus, London.

Aitken, Don, and Alex Rosenberger. 2005. "Beanfield Battle Trial." In *The Battle of the Beanfield*, edited by Andy Worthington, 146–150. Enabler Publications, Teignmouth, UK.

Anderson, Benedict. 1983. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Verso, London.

Aston, Mick, and Trevor Rowley. 1974. *Landscape Archaeology: An Introduction to Fieldwork Techniques on Post-Roman Landscapes*. David and Charles, Newton Abbot, UK.

Atkinson, Richard J.C. 1956. *Stonehenge*. Hamish Hamilton, London.

Bailey, Peter. 2014. *Leisure and Class in Victorian England: Rational Recreation and the Contest for Control, 1830–1885*. Routledge, London.
Barber, Martyn. 2014. *"Restoring" Stonehenge 1881–1939*. English Heritage Research Report 06-2014, London.
Baxter, Ian, and Christopher Chippindale. 2000. "The Stonehenge We Don't Deserve." *Antiquity* 74(286):944–946.
Bender, Barbara. 1998. *Stonehenge: Making Space*. Berg, Oxford.
Blain, Jenny, and Robert Wallis. 2007. *Sacred Sites: Contested Rites/Rights*. Sussex Academic Press, Eastbourne, UK.
Blake, William. [1804] 1991. *Jerusalem: The Emanation of the Giant Albion*. Princeton University Press, Princeton, NJ.
Bowden, Mark 1991. *Pitt Rivers*. Cambridge University Press, Cambridge.
Bowden, Mark, Sharon Soutar, David Field, and Martyn Barber. 2015. *The Stonehenge Landscape: Analysing the Stonehenge World Heritage Site*. Historic England, London.
Chippindale, Christopher. 1983. "The Making of the First Ancient Monuments Act, 1882, and Its Administration under General Pitt Rivers." *Journal of the British Archaeological Association* 136:1–55.
Chippindale, Christopher. 2004. *Stonehenge Complete*. Thames and Hudson, London.
Cole, Daniel H. 2002. *Pollution and Property: Comparing Ownership Institutions for Environmental Protection*. Cambridge University Press, Cambridge.
Council for British Archaeology. 2017. "Stonehenge: Is the Proposed Tunnel the Answer?" *Council for British Archaeology Newsletter* 39 (February–June): 6–7.
Crawford, Osbert Guy Stanhope. 1953. *Archaeology in the Field*. Phoenix House, London.
Crawford, Osbert Guy Stanhope, and Alexander Keiller. 1928. *Wessex from the Air*. Oxford University Press, Oxford.
Darvill, Timothy. 2005. *Stonehenge World Heritage Site: An Archaeological Research Framework*. English Heritage, London.
Darvill, Timothy. 2008. "Pathways to a Panoramic Past: A Brief History of European Landscape Archaeology." In *Handbook of Landscape Archaeology*, edited by Bruno David and Julian Thomas, 60–76. Left Coast Press, Walnut Creek, CA.
Darvill, Timothy, Peter Marshall, Mike Parker Pearson, and Geoff Wainwright. 2012. "Stonehenge Remodelled." *Antiquity* 86(334): 1021–1040.
David, Bruno, and Julian Thomas. 2008. "Landscape Archaeology: Introduction." In *Handbook of Landscape Archaeology*, edited by Bruno David and Julian Thomas, 27–43. Left Coast Press, Walnut Creek, CA.
Devereux, Paul. 1990. "Stonehenge as an Earth Mystery." In *Who Owns Stonehenge?*, edited by Chris Chippindale, Paul Devereux, Peter Fowler, Rhys Jones, and Tim Sebastian, 35–61. Batsford, London.

Donovan, Andrea E. 2007. *William Morris and the Society for the Protection of Ancient Buildings*. Routledge, London.

English, Penny. 2002. "Disputing Stonehenge: Law and Access to a National Symbol." *Entertainment Law* 1 (2):1–22.

English Heritage. 2000. *Stonehenge World Heritage Site Management Plan*. English Heritage, London.

English Heritage. 2015. "English Heritage Has Changed." January 4. http://www.english-heritage.org.uk/about-us/search-news/english-heritage-has-changed.

Fielden, Kate. 2000. "Stonehenge Deserves the Right Road Solution." *Antiquity* 74(286):946–949.

Fisher, Peter F. 1959. "Blake and the Druids." *Journal of English and Germanic Philology* 58(4):589–612.

Foucault, Michel. 2003. *Society Must Be Defended: Lectures at the Collège de France, 1975–6*. Allen Lane, London.

Fry, Sebastian. 2014a. *A History of the National Heritage Collection*. Vol. 1, *1882–1900*. English Heritage, London.

Fry, Sebastian. 2014b. *A History of the National Heritage Collection*. Vol. 3, *Stonehenge*. English Heritage, London.

Hale, Amy. 2011. "John Michell, Radical Traditionalism, and the Emerging Politics of the Pagan New Right." *Pomegranate* 13(1):77–97.

Harris, Alexandra. 2010. *Romantic Moderns: English Writers, Artists and the Imagination*. Thames and Hudson, London.

Hawkins, Gerald S. 1965. *Stonehenge Decoded*. Doubleday, New York.

Hetherington, Kevin. 1998. "Vanloads of Uproarious Humanity: New Age Travellers and the Utopics of the Countryside." In *Cool Places: Geographies of Youth Cultures*, edited by Tracey Skelton and Gill Valentine, 328–342. Routledge, London.

Hey, David. 2011. "Kinder Scout and the Legend of the Mass Trespass." *Agricultural History Review* 59(11):199–216.

Hicks, Dan. 2017. "The A303 Is a Crucial Part of Stonehenge's Setting." *Conversation*. Blog. January 23. https://theconversation.com/archaeologist-the-a303-is-a-crucial-part-of-stonehenges-setting-71451.

Higgins, Charlotte. 2019. "The Battle for the Future of Stonehenge." *Guardian* August 2, 2019, 9–11.

Hunt, Tiffany. 1996. "The National Trust and World Heritage Sites." In *The Remains of Distant Things: Archaeology and the National Trust*, edited by David Morgan Evans, Peter Salway, and David Thackray, 211–216. Boydell Press, Woodbridge, UK.

Hutton, Ronald. 2011. *Blood and Mistletoe: The History of the Druids in Britain*. Yale University Press, New Haven, CT.

Jacques, David, and Tom Phillips. 2014. "Mesolithic Settlement Near Stonehenge: Excavations at Blick Mead, Vespasian's Camp, Amesbury." *Wiltshire Archaeological and Natural History Magazine* 107:7–27.

Kains-Jackson, Charles Philip. 1880. *Our Ancient Monuments and the Land around Them*. Elliot Stock, London.

Kehoe, Alice. 1998. *The Land of Prehistory*. Routledge, London.

Kennet, Wayland, and Elizabeth Young. 2000. "'The Stonehenge We Don't Deserve'—Continued." *Antiquity* 74(286):949–951.

Kerr, Andrew 2011. *Intolerably Hip: The Memoirs of Andrew Kerr*. Frontier Publishing, Kistead, UK.

Klindt-Jensen, Ole. 1975. *A History of Scandinavian Archaeology*. Thames and Hudson, London.

Leivers, Matt, and Andrew B. Powell. 2016. *A Research Framework for the Stonehenge, Avebury and Associated Sites World Heritage Site*. Wessex Archaeology, Salisbury, UK.

Lowenthal, David. 1994. "European and English Landscapes as National Symbols." In *Geography and National Identity*, edited by David Hooson, 15–38. Blackwell, Oxford.

Lubbock, John. 1865. *Pre-historic Times, As Illustrated by Ancient Remains, and the Manners and Customs of Modern Savages*. Williams and Norgate, London.

Lubbock, John. 1870. *The Origin of Civilisation and the Primitive Condition of Man*. Longmans, Green and Company, London.

Martin, Greg. 2002. "New Age Travellers: Uproarious or Uprooted?" *Sociology* 36(3):723–735.

Massingham, Harold John. 1926. *Downland Man*. Jonathan Cape, London.

Matless, David. 2016. *Landscape and Englishness*. Reaktion, London.

McNiven, Ian J., and Lynette Russell. 2005. *Appropriated Pasts: Indigenous Peoples and the Colonial Culture of Archaeology*. AltaMira, New York.

McOmish, David, David Field, and Graham Brown. 2002. *The Field Archaeology of the Salisbury Plain Training Area*. English Heritage, London.

Michell, John. 1969. *The View over Atlantis*. Sago Press, London.

Michell, John. 1977. *A Little History of Astro-archaeology: Stages in the Transformation of a Heresy*. Thames and Hudson, London.

Michell, John. 2005. *The John Michell Reader: Writings and Rants of a Radical Traditionalist*. Edited by Joscelyn Godwin. Inner Traditions, Rochester, VT.

Miles, Barry. 2010. *London Calling: A Countercultural History of London since 1945*. Atlantic Books, London.

Millar, Sue. 2006. "Stakeholders and Community Participation." In *Managing World Heritage Sites*, edited by Anna Leask and Alan Fyall, 37–54. Elsevier, London.

Morgan Evans, David. 1996. "National Landscapes, National Parks, National Figures and the National Trust." In *The Remains of Distant Things: Archaeology and the*

National Trust, edited by David Morgan Evans, Peter Salway, and David Thackray, 28–37. Boydell Press, Woodbridge, Suffolk, UK.
Montgomery-Massingberd, Hugh, and Christopher Sykes. 1994. *Great Houses of England and Wales*. Laurence King, London.
Morton, Henry Vollam. 1932. *In Search of England*. Methuen, London.
Murphy, Graham. 2002. *Founders of the National Trust*. National Trust, London.
Murray, Tim. 2008. "The History, Philosophy, and Sociology of Archaeology: The Case of the Ancient Monuments Protection Act (1882)." In *Histories of Archaeology*, edited by Tim Murray and Christopher Evans, 145–76. Oxford University Press, Oxford.
Neeson, Jeanette M. 1993. *Commoners: Common Right, Enclosure and Social Change in England, 1700–1820*. Cambridge University Press, Cambridge.
Nixon, Sean. 2015. "Trouble at the National Trust: Post-war Recreation, the Benson Report and the Rebuilding of a Conservation Organisation in the 1960s." *Twentieth Century British History* 26(4):529–550.
Parker Pearson, Mike. 2013. "Researching Stonehenge: Theories Past and Present." *Archaeology International* 16:72–83.
Piggott, Stuart. 1985. *William Stukeley: An Eighteenth-Century Antiquary*. Thames and Hudson, London.
Pitt-Rivers, Augustus Henry Lane Fox. 1887. *Excavations in Cranborne Chase near Rushmore on the Borders of Dorset and Wiltshire*. Vol. 1. Privately Printed, Rushmore, UK.
Pollard, Joshua. 2009. "The Materialisation of Religious Structures in the Time of Stonehenge." *Material Religion* 5(3):332–353.
Radford, Andrew D. 2010. *Mapping the Wessex Novel: Landscape, History and the Parochial in British Literature, 1870–1940*. Continuum, London.
Rawnsley, Hardwicke Drummond. 1901. "The Disenchantment of Stonehenge." *Manchester Guardian*, December 27.
Ruggles, Clive. 1999. *Astronomy in Prehistoric Britain and Ireland*. Yale University Press, New Haven, CT.
Sebastian, Tim. 1990. "Triad: The Druid Knowledge of Stonehenge." In *Who Owns Stonehenge?*, edited by Chris Chippindale, Paul Devereux, Peter Fowler, Rhys Jones, and Tim Sebastian, 88–119. Batsford, London.
Stonehenge Alliance. 2017. "National Trust Votes against Its Founding Principles." October 24. *Stonehenge Alliance Website*. http://stonehengealliance.org.uk/national-trust-votes-against-its-founding-principles/.
Stonehenge Alliance. 2019. "Case Against A303 Scheme." *Stonehenge Alliance Website*. https://stonehengealliance.org.uk/our-case/. Accessed 26 October 2020.
Stout, Adam. 2008. *Creating Prehistory: Druids, Ley Hunters and Archaeologists in Pre-war Britain*. Blackwell, Oxford.

Thackray, David. 1996. "Past Significances, Future Challenges." In *The Remains of Distant Things: Archaeology and the National Trust*, edited by David Morgan Evans, Peter Salway, and David Thackray, 217–225. Boydell Press, Woodbridge, UK.

Thomas, Julian. 1993. "The Politics of Vision and the Archaeologies of Landscape." In *Landscape: Politics and Perspectives*, edited by Barbara Bender, 19–48. Berg, London.

Thompson, Michael Welman. 1977. *General Pitt Rivers: Evolution and Archaeology in the Nineteenth Century*. Moonraker Press, Bradford-on-Avon, UK.

Thompson, Michael Welman. 2009. *Darwin's Pupil: The Place of Sir John Lubbock, Lord Avebury, in Late Victorian and Edwardian England*. Melrose Books, UK.

Thurley, Simon. 2013. *Men from the Ministry: How Britain Saved Its Heritage*. Yale University Press, New Haven, CT.

Tilley, Christopher. 1994. *A Phenomenology of Landscape*. Berg, Oxford.

Trevelyan, George M. 1929. *Must England's Beauty Perish? A Plea on Behalf of the National Trust*. Faber and Gwyer, London.

Trigger, Bruce. 1989. *A History of Archaeological Thought*. Cambridge University Press, Cambridge.

Trigger, Bruce. 1995. "Romanticism, Nationalism and Archaeology." In *Nationalism, Politics and the Practice of Archaeology*, edited by Philip L. Kohl and Clare P. Fawcett, 263–279. Cambridge University Press, Cambridge.

Van Dyke, Ruth. 2007. *The Chaco Experience: Landscape and Identity at the Centre Place*. School for Advanced Research, Santa Fe, NM.

Van Dyke, Ruth, Stephen Lekson, and Carrie Heitman with Julian Thomas. 2016. *Chaco Landscapes: Data, Theory and Management*. University of Colorado, Boulder.

Wainwright, Geoffrey. 2000. "The Stonehenge We Deserve." *Antiquity* 74(286):334–342.

Waterson, Merlin. 1994. *The National Trust: The First Hundred Years*. National Trust, London.

Watkins, Alfred. 1925. *The Old Straight Track: Its Mounds, Beacons, Moats, Sites and Mark Stones*. Methuen, London.

Williams-Ellis, Clough. 1928. *England and the Octopus*. Geoffrey Bles, London.

Wilson, Daniel. 1851. *The Archaeology and Prehistoric Annals of Scotland*. Sutherland and Knox, Edinburgh.

Worthington, Andy. 2004. *Stonehenge: Celebration and Subversion*. Alternative Albion, Loughborough, UK.

Worthington, Andy, and Deering, Alan. 2005. "Stonehenge and the Road to the Beanfield." In *The Battle of the Beanfield*, edited by Andy Worthington, 5–25. Enabler Publications, Teignmouth, UK.

Wright, Patrick. 1985. *On Living in an Old Country: The National Past in Contemporary Britain*. Oxford University Press, Oxford.

16

Protecting the Greater Chaco Landscape

Preservation and Advocacy

Paul F. Reed

Watch the video version of this chapter, recorded at Crow Canyon Archaeological Center on August 15, 2017.

https://doi.org/10.5876/9781646421701.c016.v000

Chaco Canyon was the center of a thriving society that flourished in the Four Corners region of New Mexico from 850 CE to 1150 CE (Lekson 2006; Reed 2004; Vivian 1990). The Chacoans and affiliated Pueblo groups built hundreds of great house structures across the region and connected many of these places with kilometers of roads and other landscape features (Heitman and Plog 2015; Van Dyke 2007). This extensive, ancient landscape is managed today by a variety of federal, state, private, and Tribal owners. These places have deep spiritual and cultural importance to nearby Pueblos and Tribes that are descendants of the Chacoan people (figure 16.1). In addition, the Chaco region holds great potential to further our understanding of ancient Puebloan culture and human-environment interaction in the past, among other topics.

Many sites associated with ancient Chacoan society are protected within the boundaries of Chaco Culture National Historical Park. Chaco Canyon and several outlying great houses are UNESCO World Heritage Sites that preserve the history and culture of the Pueblo people. Furthermore, Chaco Canyon is the ancestral home of Pueblo people, and it is where many of the cultural traditions that are practiced to

DOI: 10.5876/9781646421701.c016

Figure 16.1. *Pueblo Bonito, Chaco's grandest great house, from the air. Photo by Paul Reed.*

this day at Acoma, Zuni, Tesuque, Zia, the Hopi Mesas, Taos, Santa Ana, and other Pueblos in New Mexico emerged. Over more recent centuries the landscape around Chaco was settled by the Navajo people and other groups who have added their own unique traditions to the rich cultural legacy. Federal agencies are also a major, modern-day presence and oversee Chaco Canyon, a national park since 1980, along with important cultural and historic sites across the surrounding landscape.

Despite the protection offered by Chaco Culture National Historical Park, many sites lie outside the park across the Greater Chaco Landscape and are scarcely protected from the ravages of oil-gas development. Increased oil-gas development associated with the Mancos-Gallup Shale play in northwest New Mexico has been threatening fragile Chaco-affiliated cultural resources across a large portion of the San Juan Basin since late 2011 (figure 16.2).

In this chapter I discuss the Greater Chaco Landscape from a preservation and advocacy perspective. I describe the last six years of Archaeology Southwest's involvement in protection of the ancient Chacoan landscape. Furthermore, I summarize the concerns of a wide variety of interested parties, including the All-Pueblo Council of Governors (APCG), Tribes, a coalition of environmental and preservation organizations, and the interested public. Finally, I provide detailed recommendations to the Bureau of Land

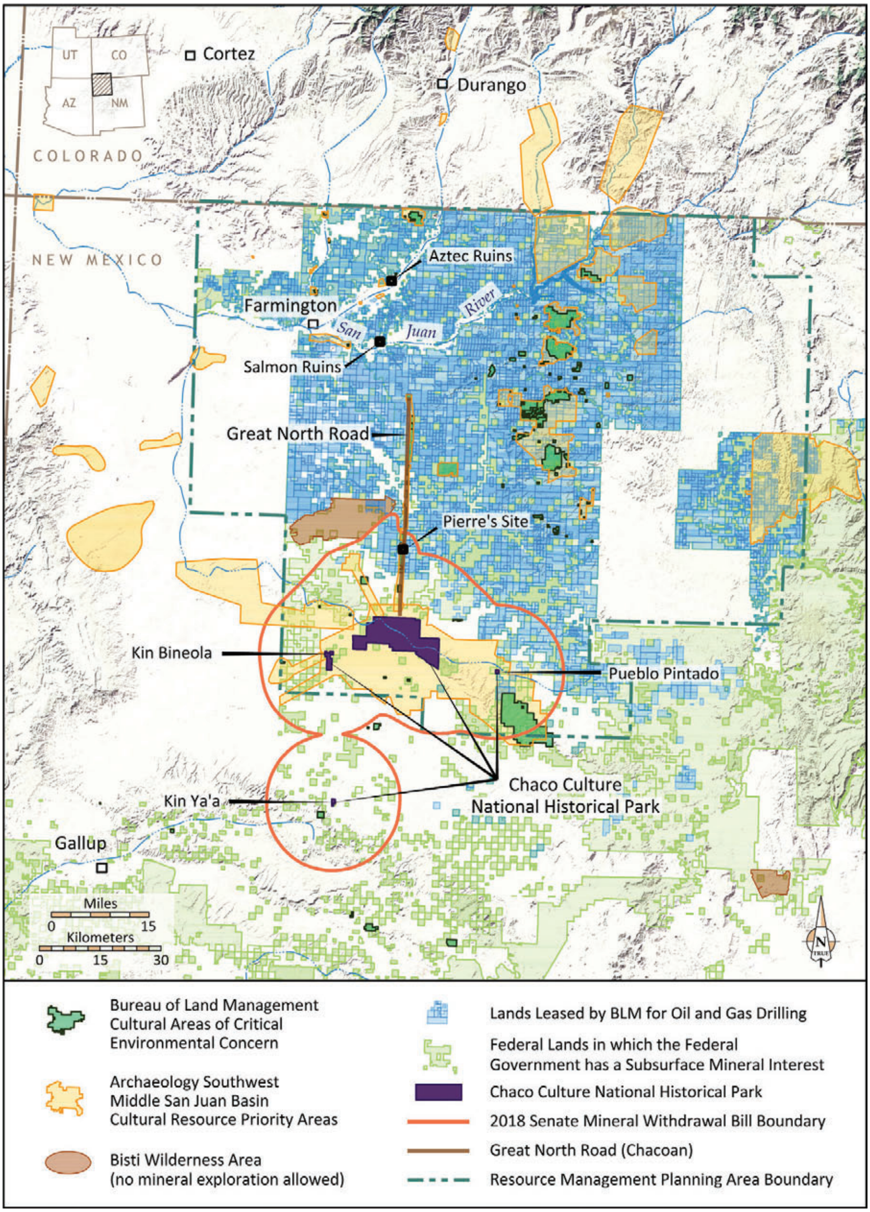


Figure 16.2. *Map showing the Greater Chaco Landscape, areas leased for oil-gas development, and the 10 mi. protection zone around Chaco Culture National Historical Park. Map by Catherine Gilman, for Archaeology Southwest.*

Management (BLM) and the Bureau of Indian Affairs (BIA) based on participation in this process for the last several years.

OIL-AND-GAS DEVELOPMENT IN BLM'S FARMINGTON FIELD OFFICE

In response to increased oil-gas development, and in conjunction with the Navajo Area Office of the Bureau of Indian Affairs (BIA), the Farmington Field Office of the Bureau of Land Management (BLM) is in the process of amending the 2003 Resource Management Plan (RMP) and draft Environmental Impact Statement (EIS). As part of this process, a variety of Tribal, environmental, preservation, and advocacy groups have offered input and formal comments at various points. This process is projected to be completed by mid-to-late 2021.

Archaeology Southwest's involvement in protecting the Greater Chaco Landscape dates to early 2014. At that time we were putting together the details necessary to hold a priority planning meeting for the Chaco and Middle San Juan region in Farmington, New Mexico. Our organization has completed these exercises in a number of BLM districts and other geographic locales around the American Southwest. In brief, the planning meetings gather local archaeologists, Tribal representatives, federal archaeologists, and other experts to identify those areas in a district or other locale that are of most concern for preservation. The meeting held in Farmington in May 2014 resulted in the identification of a number of areas that were of great concern to the people gathered. These areas were mapped and converted to GIS shape files and shared with Farmington BLM and other managing agencies in the hope that future development projects, particularly oil-gas related activities, could be managed to avoid impacts to these areas (see figure 16.2).

As we at Archaeology Southwest completed the priority planning exercise in mid-2014, we also made the decision to become involved in the RMP amendment process as an interested party. What followed over the next six years were numerous meetings with BLM, BIA, Tribal officials, state officials, and members of the public.

In 2015, Archaeology Southwest convened a series of public forums to discuss impacts to the Greater Chaco Landscape and get public input on the best approach to preservation and protection. I organized and chaired the events held at Crow Canyon Archaeological Center, Cortez, Colorado; at the University of New Mexico–Hibben Center; and at the main office of the National Congress of American Indians in Washington, DC. Panel members included then-governor Fred Vallo of Acoma Pueblo, Ora Marek-Martinez (Navajo Nation tribal historic preservation officer at the time), Tim Menchengo (of the Pueblo of Santa Ana), Dale Davidson (former BLM archaeologist in Utah), and David Fraley (private citizen in Cortez, Colorado). All of these events were well attended, and we gathered useful public input.

In 2016 Archaeology Southwest, with support from several partners, produced a handout brochure on the Greater Chaco Landscape (Archaeology Southwest 2016). The goal was to summarize the key issues for the general public and interested parties and make more information readily available. We distributed thousands of brochures between 2016 and 2018 and have increased awareness of the issue and the choices before the American public as oil-gas development continues to threaten Greater Chaco and other fragile ancient landscapes.

Following on the heels of the NPS-sponsored conference at Crow Canyon, of which this volume is one product, Archaeology Southwest organized a telephone press conference with media to discuss concerns about protecting the Greater Chaco Landscape (Reed et al. 2017). This event generated nationwide interest and resulted in articles in major newspapers (e.g., the *Washington Post*). A group of scholars and advocates wrote short essays highlighting their research and concerns about oil-gas development across the Greater Chaco Landscape.

DETAILED FEEDBACK TO THE AGENCIES ON PROTECTING THE GREATER CHACO LANDSCAPE

Archaeology Southwest and our partners—Audubon New Mexico, Coalition to Protect America's Parks, Izaak Walton League, National Audubon Society, National Parks Conservation Association, National Trust for Historic Preservation, National Wildlife Federation, New Mexico Wilderness Alliance, New Mexico Wildlife Federation, the United States Committee for the International Council on Monuments and Sites, and the Wilderness Society—have provided detailed comments to BLM and BIA at various points over the last several years. Most recently, in September 2020, we prepared comprehensive comments during the final period of public review as the agencies finish the draft RMP amendment and EIS documents (Archaeology Southwest et al. 2020). Because of the importance of those planning documents for the protection of Chaco's resources, below I reiterate, in some detail, the most relevant comments provided to the agencies in September 2020.

1. BLM and BIA must include a robust role for the National Park Service (NPS) in future oil and gas management decisions.

I encourage BLM and BIA to improve interagency coordination and give the NPS a more active role in planning the decisions that affect the visitor experience at Chaco Culture National Historical Park (NHP). Regular and frequent consultations among the agencies are necessary to give the NPS a strong role in the decision-making process for oil-gas development on Chaco's boundary.

In addition, NPS staff possess unique expertise that can be beneficial to the agencies as they evaluate future proposals. Not only does NPS coadminister the Chaco Archaeological Sites Protection System, along with BLM and the Navajo Nation, but it also possesses expertise in managing night sky, viewsheds, and soundscape values in and around units of the NPS. The National Park Service has already provided BLM with some information on night skies around Chaco Culture NHP as part of recent oil- and gas-leasing proposals. This role should be formalized and broadened as part of the BIA-BLM planning process.

Furthermore, working with NPS, I recommend that BLM and BIA sponsor and conduct a comprehensive viewshed and soundscape analysis from Chaco Culture NHP (see Van Dyke 2017). In addition, stipulations should be developed to protect Park Resources, including a requirement for NPS consultation before development can proceed near the park. In the planning documents adopted by BLM and BIA, I urge the agencies to ensure that there is a robust, ongoing role for NPS in future oil and gas management decisions.

2. The Agencies must do a much better job consulting with the Pueblos and Tribes who are the descendant communities to the ancient sites and landscapes across the Greater Chaco Landscape and the primary residents of the region subject to oil-gas development.

In addition to their interagency coordination obligations, BLM and BIA share important Tribal consultation and public engagement duties. The National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), and a number of executive orders require notice and outreach to Tribes, allottees, residents, and the public at various stages of the oil and gas development process. BLM Manual 1780 and Handbook 1780-1 have also set the Interior Department on an important new path to improving relationships and coordination with Tribes and allottees.

By joining as co-lead agencies and expanding the planning area, BLM and BIA have already taken initial steps toward improving Tribal engagement and public outreach around Farmington and northwest New Mexico, but much more needs to be done. The new scoping process, which began in the fall of

2016, saw BLM and BIA representatives meet directly with Tribal representatives and residents at community centers and Navajo Chapter Houses and brought a critical set of stakeholders to the table. It set the stage for an inclusive planning process with robust Tribal engagement and consultation, but, again, more needs to be done.

I urge BLM and BIA to be sure that this type of outreach and engagement continues after the current planning process is complete. The agencies should view the completed RMP Amendment and EIS documents as the start of an ongoing relationship and open dialogue with Tribes, allottees, and the public about oil- and gas-planning decisions in Farmington. Residual impacts to Tribal communities from expanded oil and gas development can include distortions in labor markets, housing prices, public infrastructure, and disruptions in social systems. This ongoing relationship should both monitor and implement outreach programs to help communities adjust to changes.

Thus, I recommend that in the joint planning documents, a permanent, interagency BLM-BIA-NPS working group be established that meets regularly with Tribes, allottees, State of New Mexico personnel, and the public to discuss and provide recommendations on ongoing minerals management decisions. Additionally, to increase transparency, I urge the agencies to make all NEPA documents (including categorical exclusions) for federal, Tribal, and allotted mineral development decisions (e.g., leasing, permitting, right-of-way, suspensions, etc.) available online for public review.

3. The joint planning documents should manage the 10 mi. radius cultural protection zone around Chaco Culture NHP in a proactive manner, designed to maximize protection of cultural resources.

The first area that BLM and BIA should manage under common allocations, stipulations, and development conditions is the checkerboard of federal, Tribal, New Mexico State Trust, and allotted lands within 10 mi. of Chaco Culture NHP (see figure 16.2). This area is less leased and developed than surrounding areas and thus has retained much of its cultural integrity and natural characteristics. It contains many undisturbed cultural sites and is critically important to preserving the resources and visitor experience within Chaco Culture NHP, as well as the homes, ranches, and traditional lifestyles of the Navajo people who live near the park. It also contains at least twelve Chacoan great houses and associated communities.

In October 2019 the US House of Representatives passed bill HR 2181—the Chaco Cultural Heritage Area Protection Act. This bill will withdraw the

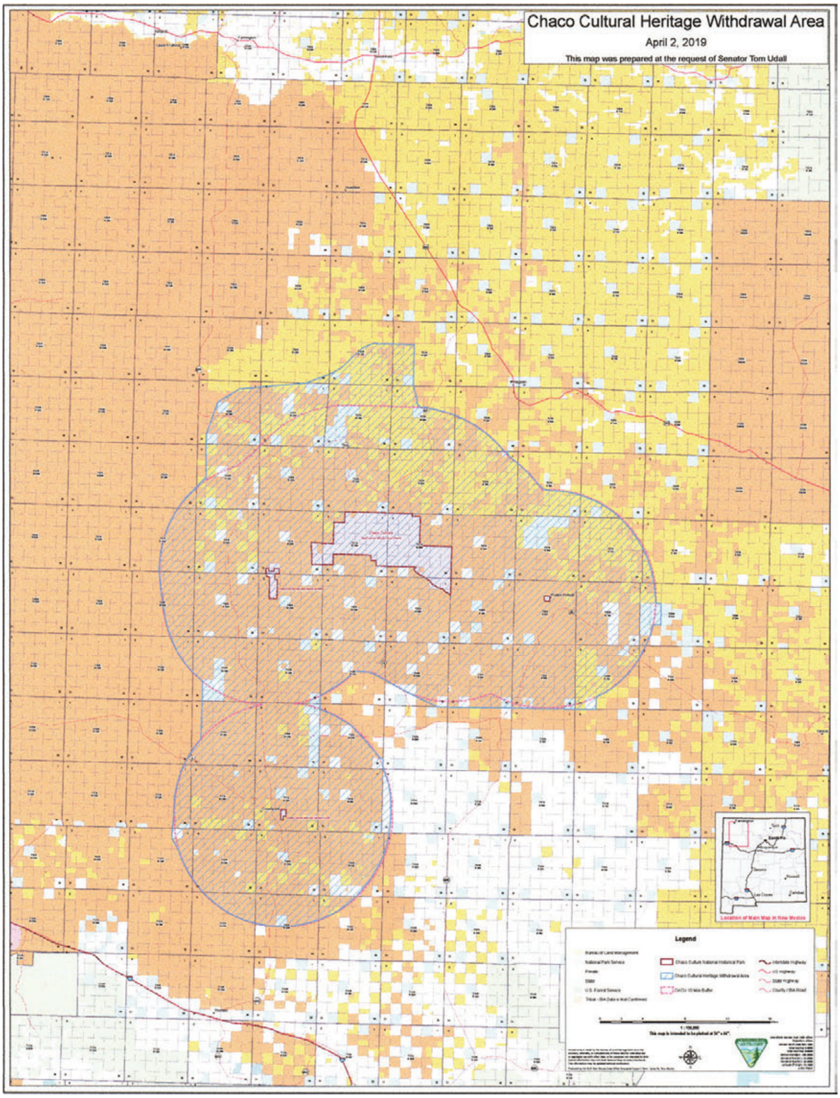


Figure 16.3. *Map showing the Co-administered Chaco Cultural Heritage Area Protection Act withdrawal area (10 mi. zone) adjacent to Chaco Culture National Historical Park. From House bill HR 2181 (2019).*

minerals owned by the US government—and only the US government—from future leasing and development that are located within the Proposed Chaco Protection Zone (figure 16.3), which surrounds the Chaco Culture NHP. This act will withdraw 316,076 acres of oil, natural gas, coal, and other minerals owned by the US federal government. A companion bill to HR 2181 died in committee in the US Senate but should be reintroduced in 2021. This one bill will not solve all of the issues surrounding protection of the Greater Chaco Landscape, but it is an important step.

The state of New Mexico elected a new land commissioner in November 2018. Commissioner Stephanie Garcia-Richards recognized the need to protect the 10 mi. zone around Chaco Canyon and indicated full support for the Senate bill. To protect state trust lands within the 10 mi. protection zone, Garcia-Richards issued an executive order that created a moratorium on new oil-gas leasing on state trust lands in the area until December 31, 2023 (State Land Office 2019). Coupled with the proposed federal legislation, this is a huge step toward protecting the most sensitive archaeological and cultural zone around Chaco Canyon.

Archaeology Southwest recently completed a reconnaissance project in the area (Reed 2020). The primary finding of the project is that the 10-mile zone contains numerous clusters of sites, some of which form discrete spatially temporal communities that merit greater protection than currently exists under federal law. The project focused on locales in the north, northwest, and northeast portions of the 10-mile zone and identified six site clusters or communities, including Pierre's and Escavada (figure 16.4).

These areas represent just a sample of the site clusters and communities that exist in the 10-mile zone and for which adequate assessment of indirect and cumulative effects has not been completed. This leads logically, then, to the next point—the Agencies must choose planning Alternative B-1 in their final RMPA and EIS documents. B-1 is the only alternative that would provide the protection that sites, site clusters, and communities in the 10-mile zone merit. None of these site clusters or communities will be adequately protected if the 10-mile zone is reduced to 0, 2, or 4 miles (part of the range of options in the RMPA alternatives). Further, BLM lacks any ethnographic information about the importance of these site clusters and communities to modern-day Pueblos and Tribes—information that the ongoing ethnographic studies funded by BLM and DOI-BIA will provide.

Given this background, I make the following recommendations to preserve and protect cultural resources within the 10 mi. cultural protection zone:

- Close the 10 mi. zone to all new leasing across all land types, and, where closures are not possible, apply no surface occupancy (NSO) stipulations. This recommendation aligns best with Alternative B-1 in the RMPA document.

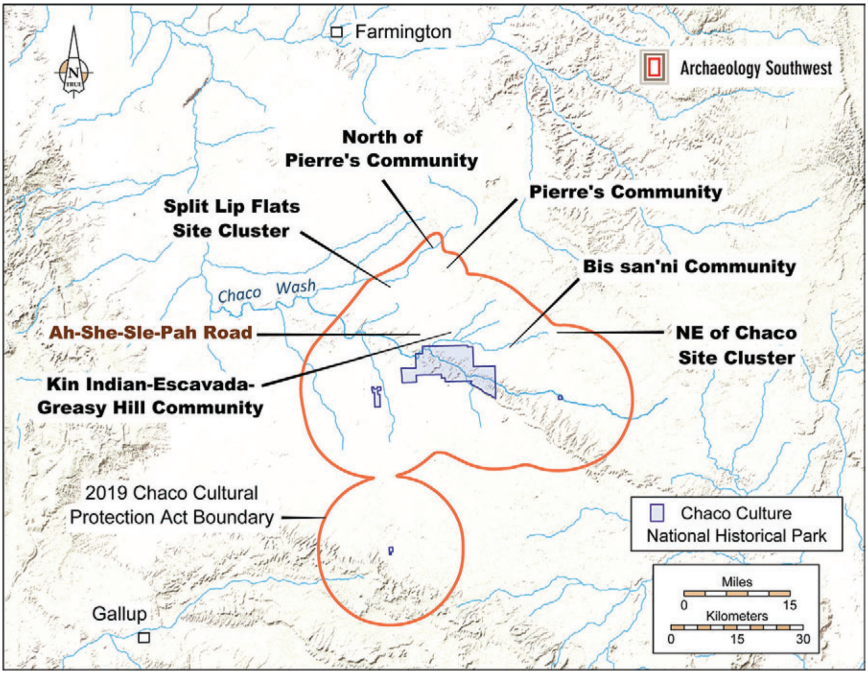


FIGURE 16.4. *Map showing 10-mile zone and six identified site clusters and communities around Chaco. Map by Catherine Gilman, for Archaeology Southwest.*

- Where cultural resources are present in lease areas, oil-gas operators should invite interested Tribes and Tribal members to conduct site visits; plan development to address Tribal concerns. Require that operators file viewshed and soundscape analyses with the Park Service, BLM, and BIA before conducting surface-disturbing activities and, in cooperation with those agencies, develop viewshed and soundscape protection plans.
- Require that BLM and BIA consult with the National Park Service before issuing new leases and drilling permits.
- To protect dark night skies, limit flaring and artificial lighting.
- Prioritize reclamation of well pads, access roads, and other oil and gas infrastructure to restore viewsheds from Chaco Culture NHP and nearby cultural sites.

- Prioritize new drilling within already-developed, less-sensitive areas using avoidance measures, such as siting, screening, and mandatory unitization.

4. The Great North Road Corridor requires special treatment under the BLM-BIA joint plan.

Another area that warrants a landscape-level management approach is the corridor of cultural and archaeological sites and great houses along the Great North Road (but beyond the 10 mi. protection zone around the park). This corridor has seen significantly more oil and gas leasing and development than the lands directly surrounding Chaco Culture NHP, but, like the lands around the park, it too contains a high density of connected cultural sites that would benefit from common lease stipulations and development guidelines. To protect this area, the plan should

- Create a single area of critical environmental concern (ACEC) along the entire Great North Road corridor and close it to future leasing.
- Prohibit new rights-of-way across the Great North Road and other identified Chacoan roads.
- Require phased leasing that prioritizes leases away from areas with low development potential and sensitive resources.
- Require that operators file viewshed and soundscape analyses with the Park Service, BLM, and BIA before conducting surface-disturbing activities and, in cooperation with those agencies, develop viewshed and soundscape protection plans.

For the Great North Road, then, the agencies should adopt consistent management decisions and resource protections at various landscape levels across federal, Tribal, and allotted lands and should coordinate these decisions with the state of New Mexico. The agencies should manage areas with connected resources and common resource management concerns under consistent stipulations and development conditions.

5. The agencies should conduct viewshed and soundscape analysis for Chacoan great house communities.

In addition to closer collaboration with the NPS, as discussed above, I encourage the agencies to support other efforts to protect Chacoan communities from indirect effects to viewsheds and soundscapes. The recent work by Van Dyke (2017; Van Dyke et al., chapter 11 in this volume) documents considerable indirect and cumulative effects to the viewshed and soundscape of the Pierre's Community (figure 16.5). Despite the ACEC established to protect the community, Van Dyke concludes that the encroachment of oil-gas facilities has compromised the integrity of the community and the ability of the archaeological community to fully understand and assess its role in the Greater Chaco Landscape. Thus, I feel strongly that viewshed and soundscape analysis must be completed for all Chacoan great house communities and protective measures put in place prior to allowing any additional leasing within the communities' boundaries.

Thus, working with NPS and archaeological groups, I urge BLM and BIA to conduct a comprehensive viewshed and soundscape analysis for all Chacoan great house communities across the Greater Chaco Landscape. The agencies should exclude known Chacoan communities from additional leasing until studies are complete. They should assign stipulations to protect Park Resources, including stipulations that require NPS consultation before development can proceed near the park. In the planning documents adopted by BLM and BIA, ensure that there is a robust, ongoing role for NPS in future oil and gas management decisions.

6. The agencies should suspend completion of the RMPA and EIS planning process until pending cultural-ethnographic data are available for the Greater Chaco Landscape.

Given the long timeframe under which this planning process has unfolded, from 2014 to 2020, over seven calendar years, and the importance of the Greater Chaco Landscape to many Pueblos and Tribes, it is unfathomable for the agencies to rush to complete this process in the absence of detailed ethnographic-cultural data. The Tribes have pushed for years to have the agencies complete a detailed study, and the funding was finally procured in 2018 by BLM. Unfortunately, as of late 2020 very little work had been completed with the project funds. Additional funding came through the 2019 Department of Interior appropriations bill, with \$1 million earmarked for Tribal cultural-ethnographic work. Because of the pandemic, however, nothing was completed with these funds in 2020. Because of this I am compelled to ask, why not wait to finish the current planning process until at least some preliminary results are available from these studies? Our work with the Pueblo of Acoma in 2018 revealed dozens of Acoma traditional cultural properties (TCPs) across different locales of Greater Chaco. It seems very likely that many additional cultural sites and

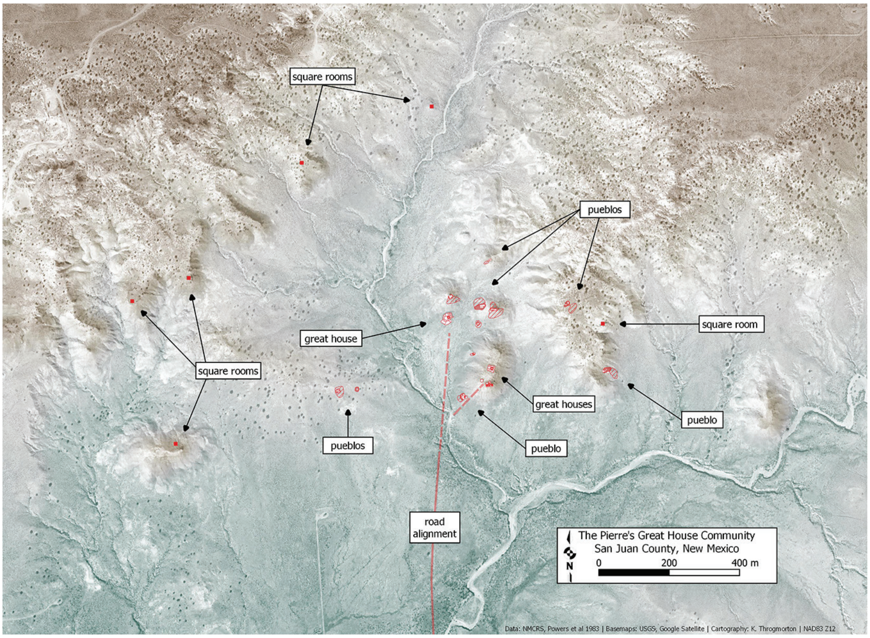


FIGURE 16.5. *Aerial view of the Pierre's Community, the largest Chacoan community along the Great North Road. View is to the north. Map by Kellam Throgmorton.*

TCPs of concern to Tribes will be identified over the next few months and years. These findings will undoubtedly impact oil-gas leasing patterns in the area.

DISCUSSION

The Greater Chaco Landscape includes Chaco Culture NHP and many cultural resources in the surrounding landscape that are affiliated with ancient Chaco, such as the Great North Road and Pierre's Site. Over the years, the BLM has leased more than 91 percent of its managed landscape for oil and gas development (see figure 16.2). Together with our partners, and until we have legislation in place, we have asked the BLM and BIA to put in place a moratorium on future oil-gas leasing in a 10 mi. protection zone around Chaco Culture National Historical Park and to also ensure the protection of significant sites in the broader landscape, including the Pierre's Community and other significant areas identified in Archaeology Southwest's 2020 study (Reed 2020).

The All Pueblo Council of Governors (APCG) has spoken out on several occasions, issuing several resolutions calling on the BLM and BIA to work closely with Pueblo people while preparing this new plan (APCG 2014, 2015, 2016, 2017, 2018). The Pueblo governors also endorsed a series of measures that would go a long way toward protecting the magnificent cultural resources and modern-day residents of the Chaco area from oil and gas development, including supporting the 10 mi. protection zone around the park that would be off-limits to oil and gas development. Most recently, the APCG has partnered with the Navajo Nation in 2017 and 2019 to press the agencies for additional protections across the Greater Chaco Landscape (APCG 2017, 2018).

The National Congress of American Indians (NCAI 2017) passed a resolution in October 2017 calling on the Department of the Interior to issue a moratorium on all oil and gas permitting and leasing in the Greater Chaco Canyon Region to protect traditional cultural properties and sacred sites in the region until the BLM and BIA initiate and complete an ethnographic study of cultural landscapes across the Greater Chaco region and finish the management plan and Environmental Impact Statement (EIS). I support the NCAI's resolution and amplify their call for a moratorium on new oil-gas development across Greater Chaco.

Many groups and individuals in New Mexico have worked tirelessly to support this process. US senators Udall and Heinrich and Congressman Ben Ray Lujan have played an instrumental role in working to find a solution to protect the Chaco Canyon area—recognizing that they must balance all of their constituents' diverse interests. Moving forward, we will continue to need strong leadership from our elected representatives to see this process through.

Archaeology Southwest has continued intensive dialogue with BLM and BIA as they finalize the draft RMP amendment and EIS for the Greater Chaco Landscape. I feel strongly that the standard approach to cultural resource protection, as prescribed by Section 106 of the National Historic Preservation Act (NHPA) and other laws, is not working in this highly sensitive area. The Section 106 approach calls for cultural resources (historic and archaeological sites, traditional cultural places, and sacred sites) to be identified and then either avoided by construction activities or to have adverse impacts on resources mitigated through various measures. This approach has resulted in a highly dissected landscape that is crisscrossed by oil-gas roads and pipelines and various wells pads and other facilities (figure 16.6). These activities have severely impacted the ancient Chacoan landscape.

In 2018, Archaeology Southwest engaged researchers Richard Friedman and Sean Field to conduct analysis of the BLM-procured LiDAR data (and other remote sensing data) from 2016 (Reed, Friedman, and Field 2019). This project was supported by the Conservation Lands Foundation and focused primarily

Figure 16.6. *Aerial photograph showing the crisscrossing roads and oil-gas facilities that are impacting the Greater Chaco Landscape. Photo by Paul Reed.*

on oil-gas lease parcels from the BLM's March 2018 sale, as well as the Bis sa'ani Chacoan Community located roughly 5 mi. northeast of Chaco. A variety of landscape features were identified by the analysts across the lease areas and in the Bis sa'ani Community area. Most were determined to be of modern or recent historic origin. Nonetheless, several features of possibly ancient, Chacoan origin were found (figure 16.7). Several landscape features were identified within the Bis sa'ani Community that line up with a road-related feature recorded during the late 1970s work (Breternitz et al. 1982). These features show evidence of relatively recent vehicular activity (used as a two-track road). However, given the match to the previously identified road segment, it seems likely they are part of a Chacoan road through the Bis sa'ani area. In several of the lease parcels, anomalous linear features were detected that do not appear to represent modern or historic phenomena. Additional fieldwork is necessary to confirm or refute the ancient origin of these features. Nevertheless, this limited LiDAR project makes clear the value of using these data to assess lease parcels across Greater Chaco (Reed, Friedman, and Field 2019).

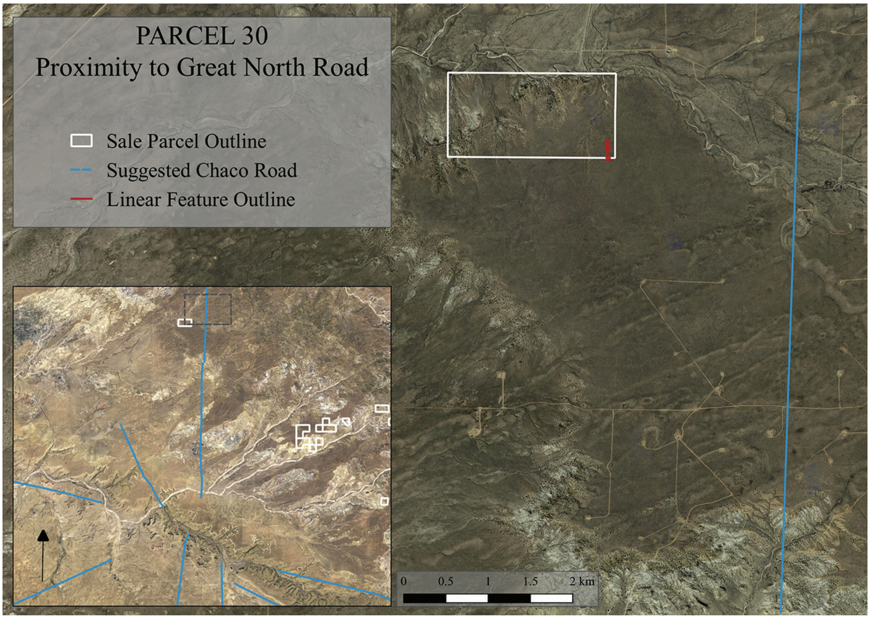


Figure 16.7. *Satellite image of Parcel 30 from BLM March 2018 oil-gas lease sale. This figure shows a possible Chacoan road alignment in southeast corner of Parcel 30. Note the proximity to the Great North Road, shown as a blue line roughly 1.5 km to the east. Figure created by Sean Field, 2018, for Archaeology Southwest.*

Finally, Archaeology Southwest worked with the Pueblo of Acoma to complete a limited ethnographic study of a portion of the Greater Chaco Landscape in 2018 (Anschuetz et al. 2019). The project involved visits to Fajada Butte in Chaco Canyon (figure 16.8), sites along the Great North Road including Twin Angel's Pueblo, Halfway House, and the Pierre's Community, the Bis sa'ani Community northeast of Pueblo Bonito, Pueblo Pintado, oil-gas lease areas within the 10 mi. protection zone, and additional areas. Goals of the Acoma Project included having the Acoma team visit the landscapes of Greater Chaco that are threatened by development and collecting appropriate data to help inform BLM and BIA as they continue managing oil-gas development across the GCL. Project findings indicate the presence of Acoma TCPs and cultural landscapes that have not been previously identified or discussed.

Adding to my list of recommendations above, then, I encourage BLM and BIA to require oil-gas lease holders to use LiDAR and other remote

Figure 16.8. *View of Fajada Butte, in Chaco Canyon, from the south. Fajada Butte is a very important landmark in Chaco and was the focus of important ceremonial activities. Photo by Paul Reed.*

sensing data that are currently available to assess tracts of land to be developed. This approach should complement more conventional archaeological work under Section 106 of the NHPA and reduce the risk of unidentified cultural resources being damaged or destroyed during oil-gas development. In addition, the preliminary findings of the Acoma Ethnographic Project make clear that the requirements of Section 106 of the NHPA and Bulletin 38 are not being adequately met with the standard, archaeological approach to fieldwork and reporting. It is critically important to get Native American teams into the field to document cultural resources prior to clearances being issued for oil-gas and other development across the Greater Chaco Landscape.

CONCLUSION

In summary, it is clear that the BLM and BIA should protect larger pieces of the remaining landscape, particularly areas surrounding Chacoan great house communities and areas identified by Native American Pueblos and Tribes as

TCPs or sacred sites. With the advances in various technologies, as described in this volume by Ruth Van Dyke, Anna Sofaer and her colleagues, Carrie Heitman and Sean Field, and others, it is abundantly clear that archaeologists completing survey work prior to oil-gas development are not identifying all of the archaeological and cultural resources and phenomena on the landscape and that continuing with the current approaches to resource protection will result in losses of additional, undocumented cultural resources and further impacts to the Greater Chaco Landscape. Moreover, consistent with obligations under NHPA, NEPA, and related laws, the agencies must incorporate and utilize the significant new information about the Greater Chaco Landscape that has been generated internally and provided to them by the Tribal and archaeological communities. The Acoma Ethnographic Project recently completed (Anschuetz et al. 2019) amply demonstrates the need for Native American experts to identify their own cultural resources in the field, prior to development. The use of LiDAR and other remote sensing data should be required of all oil-gas developers prior to any ground-disturbing activities. Lastly, with funding finally in place for two cultural-ethnographic studies by Tribes, we ask the agencies to delay finalization of the RMPA and EIS documents until preliminary results from this very important work can be incorporated into the planning documents.

ACKNOWLEDGMENTS

I would like to thank Ruth Van Dyke, Carrie Heitman, and Steve Lekson for organizing and convening the 2017 Chaco Landscapes meeting at Crow Canyon Archaeological Center. Ruth and Carrie also deserve thanks for working so hard to assemble this volume. I want to thank Archaeology Southwest's closest partners over the last six years: The Wilderness Society, the National Trust for Historic Preservation, National Parks and Conservation Association, and the New Mexico Wilderness Alliance, as well as more recent partners Conservation Lands Foundation and Pew Charitable Trusts. I want to acknowledge the expertise and efforts of the Pueblo of Acoma team and advisory board members who worked on the Acoma Ethnographic Project in 2018. The sustained efforts of the All-Pueblo Council of Governors over the last few years have helped bring national attention to the impacts faced by Greater Chaco, and I thank all the Pueblo governors and APCG staff. Last, I am gratified that the Navajo Nation has partnered with APCG to protect the Greater Chaco Landscape. The importance of Native American leadership in this process cannot be overstated.

REFERENCES

All Pueblo Council of Governors (APCG). 2014. "Support for the Protection of Chaco Canyon and All Traditional Cultural Properties and Sacred Sites Affiliated with Chaco Canyon." All Pueblo Council of Governors Resolution No. APCG 2016-1.

All Pueblo Council of Governors (APCG). 2015. "Companion Resolution for the Protection of Chaco Canyon and All Traditional Cultural Properties and Sacred Sites Affiliated with Chaco Canyon." All Pueblo Council of Governors Resolution No. APCG 2015-17.

All Pueblo Council of Governors (APCG). 2016. "Support for the Protection and Preservation of [*sic*] National Historic Park from Energy Development." All Pueblo Council of Governors Resolution No. APCG 2016-17.

All Pueblo Council of Governors (APCG). 2017. "Calling for a Moratorium on All Permitting and Leasing for Oil and Gas Development in Areas that Would Impact Traditional Cultural Properties and Sacred Sites in the Greater Chaco Region." All Pueblo Council of Governors Resolution No. APCG 2017-12.

All Pueblo Council of Governors (APCG). 2018. "Resolution Supporting Legislation Withdrawing Certain Federal Land in the State of New Mexico Surrounding Chaco Culture National Historic Park from All Forms of Mineral and Geothermal Leasing." All Pueblo Council of Governors Resolution No. APCG 2018-10.

Anschuetz, Kurt, Paul F. Reed, et al. 2019. "Pueblo of Acoma Advocacy and Preservation Study of a Portion of the Greater Chaco Landscape." Draft report to BLM, in progress. Archaeology Southwest Report 2019-103.

Archaeology Southwest. 2016. "Brochure on Protecting the Greater Chaco Landscape." Produced October 2016, Archaeology Southwest, Tucson, AZ.

Archaeology Southwest, Audubon New Mexico, Coalition to Protect America's Parks, Izaak Walton League, National Audubon Society, National Parks Conservation Association, National Trust for Historic Preservation, National Wildlife Federation, New Mexico Wilderness Alliance, New Mexico Wildlife Federation, The United States Committee for the International Council on Monuments and Sites, and The Wilderness Society. 2020. "Comments on the Farmington Mancos-Gallup Draft RMP Amendment and EIS." September 25, 2020.

Breternitz, Cory Dale, David E. Doyel, and Michael P. Marshall, eds. 1982. *Bis sa'ani: A Late Bonito Phase Community on Escavada Wash, Northwest New Mexico*. Navajo Nation Papers in Anthropology 14. Window Rock, AZ.

Heitman, Carrie C., and Stephen Plog. 2015. *Chaco Revisited: New Research on the Prehistory of Chaco Canyon, New Mexico*. University Press of Arizona, Tucson.

Lekson, Stephen H., ed. 2006. *The Archaeology of Chaco Canyon: An Eleventh-Century Pueblo Regional Center*. SAR Press, Santa Fe, NM.

National Congress of American Indians (NCAI). 2017. "To Support Moratorium on Leasing and Permitting in Greater Chaco Region." The National Congress of American Indians Resolution #MKE-17-008. https://www.ncai.org/attachments/Resolution_SGvlZYjvUQmweeepEwqebTauZbinLJMhbjqcDfUzLjmfkFOLxHI_MKE-17-008%20final.pdf.

Reed, Paul F. 2004. *The Puebloan Society of Chaco Canyon*. Greenwood Press, Westport, CT.

Reed, Paul F. 2020. "An Archaeological Reconnaissance of Chaco's 10-Mile Zone of Protection." Preliminary report. Archaeology Southwest Report 2020-102.

Reed, Paul F., Richard Friedman, and Sean Field. 2019. "Analysis of LiDAR and Remote Sensing Data from a Portion of the Greater Chaco Landscape." Report submitted to BLM-Farmington Field Office April 2019. Archaeology Southwest Report 2019-102.

Reed, Paul F., Anna Sofaer, Robert Weiner, Richard Friedman, G. B. Cornucopia, Carrie C. Heitman, Sean Field, and Ruth M. Van Dyke. 2017. "Recent Efforts to Research, Preserve, and Protect the Greater Chaco Landscape." Handout produced for press event, September 2017. Archaeology Southwest, Tucson, AZ.

State Land Office. 2019. "Moratorium on New Oil and Gas and Mineral Leasing in Greater Chaco Area." Executive Order No. 2019-002. State of New Mexico Commissioner of Public Lands, Santa Fe, NM.

United States Senate. 2018. "Senate Bill 2907—Chaco Cultural Heritage Area Protection Act of 2018." United States Senate, 115th Cong., 2D Sess., 2018.

Van Dyke, Ruth M. 2007. *The Chaco Experience: Landscape and Ideology at the Center Place*. SAR Press, Santa Fe, NM.

Van Dyke, Ruth M. 2017. "Impacts of Oil and Gas Drilling on Viewscapes and Soundscapes at the Chaco Outlier of Pierre's, San Juan County, New Mexico." Report submitted to BLM-Farmington Field Office and BIA-Navajo Area Office as part of Resource Management Plan amendment and draft EIS scoping, February 2017.

Vivian, R. Gwinn. 1990. *Chacoan Prehistory of the San Juan Basin*. Academic Press, San Diego.

VII

Conclusion

17

What Can Be Discovered from Chaco Archaeology?

Thomas R. Lincoln

The Chaco Culture and the Chaco Landscape are under siege. They are being squeezed by developmental pressures that have caused great harm to the Chaco Landscape and tens of thousands of Chacoan cultural features that populate New Mexico's San Juan Basin and parts of Utah, Colorado, Arizona, and western New Mexico. During my tenure as the assistant regional director for cultural resources, I shaped and led cultural programs policy for more than eighty national parks located within the Intermountain Region. This included some of America's most iconic archaeological properties including Chaco Culture National Historical Park, a World Heritage Site and International Dark Sky Park. I am drawn to Chaco by its natural grandeur as well as the spectacular prehistoric architecture and mystery of the Chaco Culture. Chaco resonates with my abiding curiosity and hunger for information about our world's history, both natural and cultural. Being a manager of federal resources comes with great responsibility to ensure their protection and preservation. I believe this is a reciprocal relationship between an individual and the resource, which if treated respectfully, will enrich our future generations.

My goal in promoting and securing funding for the symposium and publication of this book was to demonstrate that Chaco has a much larger story to tell beyond the monumental architecture located in Chaco Culture National Historical Park. It is a story that has an expansive geography and history. It is a story that

DOI: 10.5876/9781646421701.c017

needs nurturing and research and a human embrace in order to come alive and stay alive. This continuing story needs these things, in abundance, to assist federal, tribal, and state land managers; private development interests; Native American cultural practitioners; academics; residents of the four-corner states; and all other wanderers and spiritualists—all in making wise decisions on how best to preserve and protect the Chaco Landscape. It is a story that requires respect from those responsible and reciprocity from all to the land, its history, and the people who live there and utilize its resources.

As demonstrated from the chapters in this book, Chaco Culture occupies space beyond the boundaries of the national park, beyond the boundaries of the Chaco Protection Sites (many located on Navajo Nation and Bureau of Land Management lands), and beyond the boundaries of the great houses in the four-corner states. The Chaco Landscape incorporates the rock art, enigmatic rock features, datasets, natural features, night sky, irrigated agricultural fields, viewscapes, and soundscapes so critical to Chaco Culture 1,200 years ago. It is a landscape of occupied space—some densely populated spaces, and some places used intermittently. The Chaco world is a shared space worthy of our best effort to respect and preserve its heritage and wild beauty. All of the contributors to this volume have presented their stories about the incredible intellectual and emotional power that has driven their investigations into the Chaco Landscape. Many of these investigations are science-based archaeological endeavors; others are stories that teach and provide moral and ethical models for proper living. Collectively they provide insights on what has yet to be discovered and learned from the Chaco Landscape.

In this summation I place the assembled contributions within six common themes that best represent the authors' ideas.

THE CHACO LANDSCAPE IS REAL AND RELEVANT

The scholars gathered at the Crow Canyon symposium included Ernest M. Vallo Jr., Eagle Clan, elder and spiritual leader from Acoma Pueblo, and William B. Tsosie, Coyote Pass Clan, a spiritual leader and member of the Navajo Nation. Both men persuasively argue in their several videos that Chaco Landscape has existed for thousands of years and today continues to be an important place for ongoing ceremonial activities, educational lessons, cultural integration, and healing. The Chaco Landscape is integral to Pueblo and Navajo people, who still practice cultural rejuvenation with the Chaco Landscape and the spirits of ancestors and deities who continue to dwell there.

Steve Lekson, in chapter 2, provides a personal overview of his forty-plus years of Chaco archaeology. It is an important history that recalls the academic idea of Chaco as a Cultural Landscape, an idea emerging from the evolved thinking of archaeologists and anthropologists. That Chaco had such a broad sociopolitical reach throughout the southwest United States as well as ties to Mesoamerica has been repeatedly confirmed throughout the past century. We know that the expansive Chaco Landscape was as important to being Chacoan as are places on the landscape such as Fajada Butte and Pueblo Bonito. In 1992 Lekson and Stein labeled Chaco a ritual landscape—a "sacred landscape." The Chaco Landscape is a geographic projection of being Chacoan, and all in the vicinity knew that in the tenth through thirteenth centuries. Chaco's ties to Mesoamerica, northern Chihuahua, and southern Arizona confirm its cultural outreach. Chaco is more than a set of isolated communities. When they are collected together, Chaco great houses and villages represent a regional political system, a network connected by repetitive architecture, roads, iconography, and astronomical memes.

THE INDIGENOUS PERSPECTIVE

Indigenous colleagues in this volume make impassioned pleas for preservation of the Chaco Landscape, especially its natural resources that are so critical for cultural practices and human-environment continuity. They note the destructive force of oil and gas drilling, mining, and other insensitive extreme profit-driven practices that damage "Mother Earth" and "Father Sky" and denigrate our world. The information and insight they provide is in the form of stories, an effective way to convey information and a most effective way to convey sincerity, emotion, and wisdom. They remind us that stories of moral and ethical behavior are a continuum for a society as well the access point for an individual's education into cultural norms, history, and knowledge, both practical and spiritual.

It is significant that Navajo individuals who grew up with stories about Chaco, but had never been to the canyon prior to 2017, joined Mr. Tsosie in several of his videos, chapter 8. Two were young men, Eurick Yazzie and Tristan Joe, tribal youth who were moved by the experience of connecting the traditional education they received from stories directly to Chaco Canyon. The third, Denise Yazzie, is a high school teacher of science and tribal tradition. As with Eurick and Tristan, her experience is personal and moving and opens within her spirit the vision of how Chaco can further educate and inspire tribal youth. All three give powerful statements about their impression of Chaco and what it means to them. Their presentations are direct examples of cultural history in practice: seeing Chaco Canyon, experiencing it, and embracing it as a living means to further educate tribal members. These are refreshing and eye-opening testimonies.

Both Tsosie and Vallo note in chapter 7 that Indigenous people are corn: descendants of corn, products of corn. Also, they confirm that water is the life giver for corn, animals, humans. Mr. Vallo in particular expresses his concern that oil and gas drilling, and especially fracking technology, uses too much water and poisons it so that living beings cannot use it. Evidence from other areas inundated by fracking, especially water-scarce areas, has seen wasteful water consumption, contamination, and loss of productive habitat by tainted water. The Chaco Landscape could suffer mightily as its water resources are depleted and contaminated.

All Indigenous representatives note that improving communication among all parties is the most important step in preserving the Chaco Landscape. They remind us that the tribes, people, animals, birds, insects, plants, the First People, and the creators are all one in this world of earth and sky. As one they speak of the need for extractive industry to provide more protection for Chaco. Two critical points are that (1) Native people, like all Americans, depend on oil and gas and it is not going away, but drilling must be done safely so that the greatest protections for water and the Chaco Landscape are in place; and (2) Chaco Canyon and the Chaco Landscape are home to Acoma, Navajo, and other Native people and must be respected by those who are temporary visitors.

LANDSCAPE DIMENSIONS AND PRODUCTIVITY

The Chaco Landscape is a special place of great expanse containing a distinct human imprint as Windes and Van West demonstrate in chapter 3, on the potential and extent of horticulture and agriculture near Chaco Canyon. They explore four themes centered on early Chacoan community development: (1) Who were the founding settlers?, (2) what factors were used in siting a community?, (3) where and when were these communities settled?, and (4) why were they drawn to Chaco? Major occupations, with resident great houses, occur at the entry and exit points to Chaco Canyon. It is not difficult to extrapolate that these areas provided opportunity for surplus crop production and that the Chaco residents were knowledgeable about where ample rainfall, runoff, and groundwater occurred to produce surplus crops. The presence of groundwater resources sufficient to sustain agriculture and community residences is an insight brought out from their research. Because the San Juan Basin is an area of limited rainfall, it was necessary for the Chacoans to find local productive areas that could provide surplus. This appears to have happened in locating great house communities east, south, and west of Chaco Canyon in order to take advantage of higher elevations with greater annual rainfall, runoff flows, and areas of accessible groundwater. The Willow Canyon and Padilla communities demonstrate this as do Pueblo Pintado and Casa del Rio.

Windes and Van West argue that great house villages were not isolated farming communities but operated within a socioeconomic system seemingly centered on downtown Chaco. They demonstrate that two of the earliest Chaco great houses, Guadalupe Community to the east and Skunk Spring to the west, contain Basketmaker sites that developed their agricultural potential at the beginning of the Chaco phenomenon. These sites then grew to become major food production centers that sustained Chaco.

That the Chaco phenomenon had a broad dimension beyond downtown Chaco is also substantively argued by Tuwaletstiwa and Marshall in their documentation of what is a visual, yet ephemeral, road system extending forty-one miles from Kin Klizhin northwest to Skunk Spring on the eastern slope of the Chuska Mountains. This road connects the wood source in the Chuska Mountains to Chaco as well as surplus agricultural products produced at eight great house communities located along this road. These communities also provide a potential expression of alignment with the lunar standstill and likely other celestial events. The communities also represent likely communication nodes demonstrating connections, communication, and networks to Chaco and possibly the western portion of the greater Chaco Landscape.

Dennis Gilpin in chapter 5, detailing known rock art centers in Chaco Culture National Historical Park and west at the Waterflow Site, also demonstrates the dimensions of the Chaco Landscape. He presents an overview of rock art styles from the San Juan Basin and how they have changed over time from Archaic, Basketmaker, prehistoric Pueblo, and later Navajo presentations. Rock art as ubiquitous communication mnemonics are comments on historical events, the Gods, anthropomorphic spirits, animals, and the place of humans in the Universe. Rock art tell stories of migration and connection. It depicts an all-encompassing world perspective integrating land, people, cosmology, worldview, and the relationships among people, animals, plants, and the unknown. Gilpin underscores that despite many years of rock art study in Chaco Canyon, the very great majority of the Chaco Landscape has not been systematically surveyed for rock art, and much work in basic inventory of this important resource is yet to be done. A more detailed rock art record will expand the knowledge of archaeologists and anthropologists as they continue to connect and decipher what these renderings mean to the Chaco world.

Ruth Van Dyke in her chapter, 6, on other-than-habitation structures, discusses the many forms of structures that are spread across the Chaco Landscape. Shrines, circles, crescents, ovals, L- and C-shaped expressions, *herraduras*, *avanzadas*, *zambullidas*, *atalayas*, rock piles, cairns, eagle traps, gateway shrines, and slab boxes are all things she proposes archaeologists now label enigmatic rock features (ERF). The term ERF collects a history of labels into a common bucket from which more precisely defined terms can be pulled. At this point, ERF may be the best way to pause and consider the evidence and then begin to refine the definition of these types of structures by employing a strong integration of scientific inquiry with in-depth discussions with Indigenous folks who likely can shed some light on these features. And what might their function be? Van Dyke lists four discussion points for future ERF research: (1) markers of special locations, (2) creation of cosmological alignments, (3) viewpoints to and from other locations on the Chaco Landscape, and (4) specialized activities, for example, capturing eagles. More baseline data is necessary, including a complete inventory of ERFs on the Chaco Landscape. I think it will be very interesting to ask the local tribes if ERFs are linked to their societies as items of cultural patrimony and how they are used today.

GEOSPATIAL INVESTIGATIONS AND BIG DATA

In chapter 14, Carrie Heitman and Sean Field make a deep dive into the many Chaco databases and the world of high-tech machines and software now employed in understanding the Chaco Landscape. Heitman and Field demonstrate the powerful geospatial tools available and employ them expansively. Geographic information system (GIS) data collection and assessments are not new, and Heitman and Field use them to great effect with extant Chaco data. We now have detailed and accurate maps, the backbone of regional interpretations of prehistoric cultures, available to bring insight and meaning to the Chaco Landscape. Maps detail the connections, and connections lead to assessments of integration and interaction among ancient people. A landscape interpretation cannot be possible without massive amounts of data that are manipulated in pursuing the metrics about commonality, associations, and rare events.

To paraphrase Stewart Brand (1999), the technologies Heitman and Field employ provide a Chaco version of a Long-View Library. Meaningful assessment and interpretation of Chaco are not static; they are broad in space and time. Preservation and telling the Chaco story require space and time as paramount considerations that are coequal to the monumental artifacts—great houses, kivas, roads, and residential room blocks—and the pictographs, petroglyphs, source material locations, and viewpoints scattered throughout the Chaco Landscape. A "site" only conveys a small part of the patterned and complex occupation across time and space that we know as Chaco. There is much more to come from the common use of these tools to refine big data.

High-tech remote sensing instrumentation also allows for relative predictive certainty for certain types of features, as demonstrated by our colleagues at NASA. The NASA team used satellite imagery to identify sensitive sites (outlier great houses and their communities) that would be adversely affected by oil and gas development—well pads, storage areas, access roads, and pipelines. This publicly available satellite imagery is an incredible tool from which to make accurate management decisions centered on preservation. Another NASA-inspired tool is Hyperspectral Thermal Emission Spectrometer (HYTES) imagery. This technology was used to address the presence of road signatures across the Chaco in the San Juan Basin. HYTES seems very effective at finding road signatures that are otherwise not observable, and it is a relatively inexpensive tool. I look forward to NASA's further refinement of HYTES and its continued use over the Chaco Landscape and NASAs continued collaboration with Dr. Heitman and the National Park Service.

In chapter 13, Friedman, Sofaer, and Weiner continue the reporting of emerging technologies used to record the prehistoric material constructs of events witnessed in the night sky. Some of these constructs are the purposeful layouts of buildings and structures and special places and alignments within structures that are used to orient occupants with the powerful natural phenomena associated with the movements of the sun, moon, and other celestial bodies. Why are the sun and moon so important? Why does Chaco seem to be the place of convergence of powerful natural phenomena with cultural expression, that is, Chacoan architecture? These researchers show that Chaco Canyon is a natural predictor of celestial events and that Chaco architecture is a constructed mirror to this natural order. The canyon and the cultural expression within the canyon are one gigantic clock! A clock used to predict events important to the maintenance of Chacoan society on a scale of 100,000 sq. mi. This is a new conceptual framework for Chaco's sacred geography.

Friedman, Sofaer, and Weiner are conducting interesting and intriguing research of the Chaco world. The technological tools they use create results that bring their ideas forward in affirming that prehistoric Chacoans thought about their extraterrestrial world and created a sophisticated temporal monitoring device: a clock. This clock measures how the world moves and when certain events that are of critical importance to these people should be acted upon—such as planting, harvesting, and conducting world and cultural renewal ceremonies at the appropriate times. I look forward to more insights from the exciting research from this team, especially when their results are coupled with Indigenous knowledge. These insights could be fruitful indeed.

EXPERIENCING THE LANDSCAPE

Continuing along the lines of "Big Data" and emerging technologies, Van Dyke, De Smet, and Bocinsky, in chapter 11, provide a test of geospatial software for new data collection and assessments of the Chaco viewscape and soundscape. They unequivocally demonstrate the visual connections between and among many Chaco great houses and other structures, for instance, shrines (or ERFs). Clearly, Chaco citizens were communicating with each other over great distances. But, who was communicating with whom? And why? Was the communication constant or only at special times—times of ceremony or times of other need? These are questions the team asks from a realization that understanding Chaco proceeds from understanding sense of place. One important way to achieve this understanding is to ask the Indigenous population about place and their connection with it. Combining this information with the archaeological data will be very enlightening.

Chaco soundscapes are underresearched. These authors modeled for sound at a couple of test great houses: Bis sa'ani and Pierre's. They found that blasts from a conch shell trumpet are heard throughout a community to distances of up to 3,000 m. Soundscape research has important implications for a landscape because it is a legitimate culturally derived component and thus eligible for preservation management decisions. Such consideration could limit the adverse noise reaching the pristine wilderness often associated with Chaco great houses. Van Dyke used her smartphone to document visual and sound intrusion caused by an oil pump jack. Noise within a protected landscape is annoying to the residents and visitors and can be mitigated, but only if sound is valued as a resource and researched and then the results applied to land leasing and management decisions.

And, what better way to experience the Chaco Landscape than through the observations and insights of one so learned and wise as G. B. Cornucopia, senior interpretive ranger at Chaco Culture National Historical Park (chapter 12 in this volume). G. B. has worked at Chaco for thirty-five years. He knows the park and its resources; he knows the visitors and their need to experience and understand Chaco; and he has listened and learned from the local

Indigenous residents much of what makes the Chaco Landscape so critically important to their social fabric and their maintenance of cultural history and ceremonies. It is so powerful when G. B. reminds us that it is only in the past 200 years that the night sky has disappeared from the daily experience for most of humanity. Prior to that, for many millennia the dark night sky was a daily reminder that the celestial bodies were an active part of the human experience. The night sky was, and still is, a critical story that changes on a daily basis. This story continues to be told and recalled by all cultures. Sadly, in a short 200 years most people have forgotten the dark sky exists, except for the dominant moon. Gone are the Milky Way and many star constellations, a disappearance caused by light pollution and the fouling of our atmosphere by industrialization. The Chaco Landscape is a direct link between the night sky, the ancient world, and people today. Beyond the pollution the night sky has changed little and still provides this link. Chaco Canyon has an incredible night sky, it has night sky programs for visitors, it has telescopes that contribute to astronomical research, and it has tribal stories about the relationship between humans and the millions of visible celestial bodies. The sky is a resource of critical importance to the Chaco Landscape and must be recognized, respected, and honored for what it continues to mean and evoke within human ceremony and emotion. Cornucopia eloquently states, "I think Chaco can save our lives." I suspect he may be right.

MANAGEMENT OF THE CHACO LANDSCAPE

Because Chaco Culture National Historical Park along with nearby Aztec Ruins National Historic Monument and Mesa Verde National Park are designated World Heritage Sites by UNESCO, it was appropriate and insightful to invite Julian Thomas to the symposium. Thomas provides a history on Great Britain's struggles to develop a national preservation program that incorporated the needs of preserving structures, monuments, and landscapes while being cognizant of private property rights and development needs and requirements. This is a historical reality all too relevant for the United States, and it mirrors struggles for the preservation of America's important places. Thomas reminds us that preservation is a common theme, an important theme, yet one that competes against very powerful economic and political interests that arrogantly believe they should dominate and rule all discussions and decisions. Federal statutes in the United States do allow for the protection of "historic properties." They are powerful laws that, coupled with the National Environmental Policy Act, provide ample legal authority to preserve and protect significant archaeological sites and landscapes—two resource types that densely populate the San Juan Basin. Collectively, the chapters herein argue that the Chaco Landscape located within portions of the four-corner states is an important place that warrants better management practices.

Chaco's World Heritage designation identifies an important relationship between Native American cultures and the land that is palpable and significant. That connection is important as a means to substantiate preservation of the landscape and its natural and constructed features as sacred, as well as for their educational importance. Deep history and human relationships with it are important to note, develop, and maintain. Deep history studies the beginnings of cultures and creates a common narrative about their relationships with each other and with the natural and spiritual worlds. Deep history verifies who we are, our moral and ethical values, our responsibility to our world, and our reciprocal relationship with the natural environment.

The Chaco Landscape is about American heritage and our identity with American history. It's about America's identity with the continent's deep history; it is much more than America's Euro-American history. Chaco history can best be classified as environmental history, an academic subfield recognized in the twentieth century. Modern America, especially its younger citizens, identifies with this kind of intensive dive into an area's ecology, natural history, and cultural history, which extends in time for millennia. Environmental history resonates in the American West because it helps identify clues as to where Chaco fits into American identity as (1) direct association with extant tribes, (2) access to the spiritual realm, (3) its deep history, (4) ecology, (5) the conscience of a collective cosmology, (6) an economic engine, and (7) a homeland for tribes and non-Indians alike.

Paul Reed gets the last word in his chapter, 16, "Protecting the Greater Chaco Landscape." No one may be better positioned than Paul to offer the status of issues involving the Chaco Landscape and practical recommendations to promote and ensure preservation of this valuable landscape. Paul has worked tirelessly for the past decade on these efforts, and both Paul and Steve Lekson in his introduction (chapter 2) remind us that the Chaco Landscape has been the center of energy development proposals and ongoing extractive practices since before the 1970s. Reckless development, developments not thoughtfully considered, must be stopped. Reed lists five recommendations, with rationales that, if implemented, will improve preservation of the Chaco Landscape and its extensive archaeological resources. These are approaches that can work to the benefit of all—preservation of resources, the continuance of traditional cultures, and the extractive industries.

1. The Bureau of Land Management and Bureau of Indian Affairs must include a robust role for the National Park Service in oil and gas development decisions—I would add the Advisory Council on Historic Preservation as another equal partner.
2. Tribal consultation and coordination must improve, as well as public outreach.
3. A 10 mi. protection zone around Chaco Culture NHP should be designated and managed as a true protection zone.
4. Enhanced protection should be given to the Great North Road corridor.
5. Viewshed and soundscape inventory and analysis must be completed for all Chacoan great houses and their communities.

Reed's recommendations are intended to improve the ongoing preservation actions by federal agencies by reminding them that federal law and regulation already require some of these actions. For me, at issue is the fortitude of federal land managers to make well-considered decisions in a manner that does not pit constituencies against each other but rather welcomes, as a neutral government, the input from all parties. Paul's recommendations are an appeal for better government—one that supports "we the people . . ." rather than a very limited subset of the American experience.

CONCLUDING REMARKS

One hundred fifty years of archaeological investigation in the Chaco Landscape is defined by an internationally recognized and significant American cultural system, and more defining insights are yet to come. The fact that Chaco is a prehistoric culture that captures human sensitivity and awe is testimony to the many decades of government, academic, and private initiatives to save, preserve, and protect the Chaco Cultural Landscape. These measures have protected much of Chaco's significant architecture. The protective measures also have heightened the educational experience of Chaco to hundreds of thousands of American citizens, international travelers, and scientists. The symposium and this book's publication expand what we know about Chaco. Chaco was, and is, a human participatory system that interacts with the natural world, the physical world, the spiritual world, and historical events—events described and told in stories. Some stories are produced as visual snippets on the sandstone walls throughout the Chaco Landscape, and some are told through enigmatic rock structures and their surrounding places.

That the Chaco Landscape is real is without question. Chaco, as we have read in these pages, is much more than great house points on a map. It is a place where human spirit created stories. Stories where the Chaco Culture interacted with a much larger world occupied by many other people. The natural world in its form and function is the author of the Chaco Landscape, and humans are its editors. A human presence gave the Chaco Landscape definition and then meaning to its sacred places. The Chaco Landscape is a dynamic spatial/temporal component of the Chaco cultural systems. The landscape's present context, and its relationships that we experience today, are rooted in the past.

This project began with the question, "What new can we learn from Chaco?" The chapters in the volume demonstrate that much more is yet to be researched, described, and known. These discussions of science, history, and archaeology identify some of the goals that continuing research can achieve into topics of intervisibility among Chacoan structures and natural features located on the landscape. They include the transportation of sound among and within communities, movement of people, materials, and ideas across the Chaco Landscape, the interpretation of iconic symbology, consistency of great house community organization, the external relations among those who occupied the great houses and downtown Chaco, and identity and sense of place for those who inhabit this dynamic landscape.

There is much to discover about Chaco, and the development of knowledge continues only with more data. The physical data of great houses, other structures, roads, kivas, pottery, turquoise, shell, petroglyphs, pictographs, and many other types of material items must continue to be inventoried and described. As equally important are the stories, lessons, history, and wisdom of extant Native American communities who have a clear path connecting them to Chaco's history. The people of Acoma Pueblo, Hopi Tribe, Navajo Nation, and Pueblo of Zuni have direct ties to the Chaco Landscape. Some of this land association is by deed and some by congressional decree, but equally important to government pronouncements of ownership are the narratives of Chaco history shared with this landscape. Equally important are the contexts of these narratives with neighboring landscapes and Indigenous Puebloan, Apache, and Ute residents who also share stories and history with the Chaco Landscape.

Chaco is a place for all ideas—Indigenous use, preservation, visitation, wildlife, plants, geography, education, the sky and atmosphere, the planets and stars, and development of resources. The Chaco Landscape is a university of knowledge and ideas that is living—past, present, and future. Because Chaco gives so much, it requires humans to implement reciprocal tasks that complement the gifts given by Chaco: infinite gratitude for the past, infinite service to the present, and infinite responsibility to the future (Brand 1999).

All inhabitants of the Chaco Landscape have a necessary role in being responsible for and to the Chaco Landscape. These are active roles based on the natural laws of respect and reciprocity. We are given gifts from this landscape—water, nutrients, minerals, and oil; it is best to respond with gifts of gratitude, care, and wisdom for the land, especially by those who take the most (Kimmerer 2013).

I would like to see a reimaging of the landscape by industry, from the idea that it is a place only to be exploited for maximum profit. The Chaco Landscape is an idea where we engage with—that is, experience—and listen to the voices of the past and to the wildness of the place. By interacting with the sacred Chaco Landscape we can learn, and with learning we can teach and become wise in our relationship with the world. The Chaco Landscape is the physical representation of the continuity between hundreds, if not thousands, of generations of human beings and their responsibility to the maintenance of relations with plants, animals, geology, soil, water, and the sun and night sky. These nonhuman elements are essential to the making of humanity, so critical to moral and ethical behavior that we humans strive for.

Paul Reed has given a road map to improve human interaction with this land. I would add a few items to his list as my closing thoughts.

1. Existing federal statutes require all critical resources to be considered when making land management decisions. By law, oil, gas, and other development are not given greater status than people, land, animals, plans, or historic places. It is time for federal agencies to act in the interest of all, and all should be considered and treated equally when making land management decisions.
2. Federal statutes require public participation and transparency. It is past time for federal agencies to meet this responsibility and obligation and take the time to engage and listen to all voices. All affected parties must be treated with respect and be afforded every opportunity to participate in the decision-making process.
3. Development should only occur after all critical issues are explored in great detail, including information "owned" by the extractive industries. All effects to water must be studied and published, the same for air and soil. Too much is at stake for the safety of the inhabitants and users of the Chaco Landscape to have it otherwise.
4. All federal decisions must be based on an analysis of impacts to the Chaco Landscape as defined herein, per the National Environmental Policy Act. No Federal action for oil and gas leasing or development should be made to isolated or fractured areas of the Chaco Landscape.

5. A 100 percent inventory of all cultural resources eligible for inclusion on the National Register of Historic Places must be completed for the Chaco Landscape as defined herein, before any future resource extraction leases are approved. This is the law that federal agencies must comply with.

The practices of extractive development industry alter the landscape and are destructive to historic properties. Even so, the implementation of mitigative actions can avoid or reduce impacts to the point where development can occur and the interests of tribes, the American public, and resources can meet. Respect, responsibility, and reciprocity are actions a competent person, government, or corporation must take in order to ensure a lasting relationship with the world. How could it be otherwise?

REFERENCES

Brand, Stewart. 1999. *The Clock of the Long Now: Time and Responsibility*. Basic Books, New York.

Kimmerer, Robin Wall. 2013. *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*. Milkweed Editors, Minneapolis.

APPENDIX A

Access the white paper report submitted as partial fulfillment of CESU Master Agreement P14AC00979, Project Number: UCOB-109 to Chaco Culture National Historical Park, New Mexico by the University of Colorado, Boulder, Colorado, February 26, 2016

https://doi.org/10.5876/9781646421701.c018 v000

Chaco Landscapes

Data, Theory, and Management

White Paper prepared for the USDI National Park Service, Denver, Colorado

Ruth M. Van Dyke,
Stephen H. Lekson,
and Carrie Heitman,
with a contribution by
Julian Thomas

DOI: 10.5876/9781646421701.c018

Index

Key: Page numbers in italics indicate illustrations.

wp *indicates page numbers in the White Paper (Appendix A).*

video chp *indicates topic contained in videos associated with chapters.*