

The Watchman Site (42WS126)

Zion National Park, Utah

By Kerry Varley

With contributions by Suzanne Eskenazi

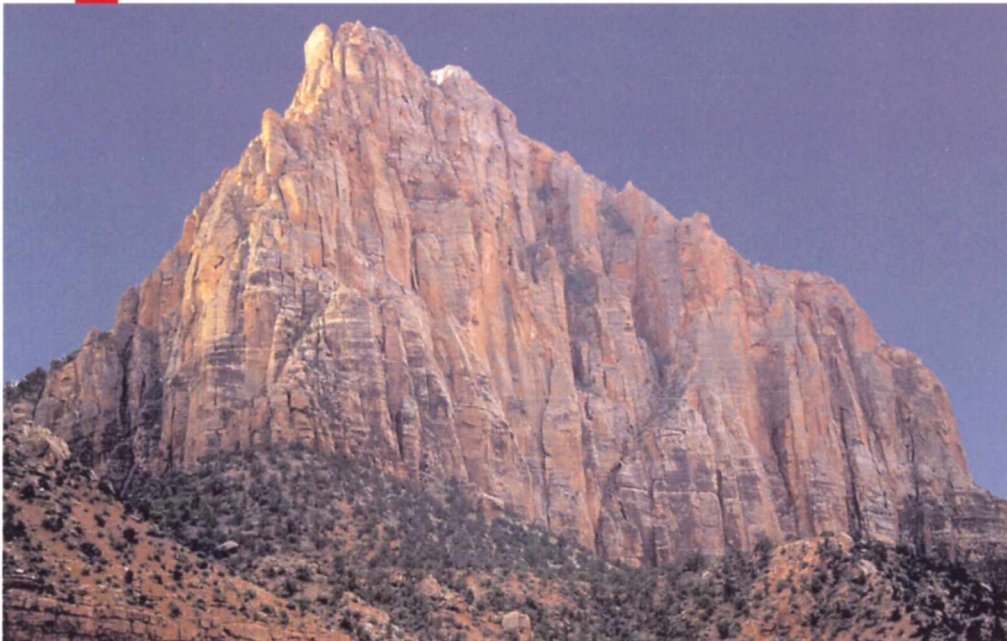


Photo of The Watchman

National Park Service and Desert Research Institute
Cooperative Agreement Number: CA-1590-9-0001

Desert Research Institute
Las Vegas, Nevada

December 2002

The Watchman Site (42WS126)
Zion National Park, Utah

by

Kerry Varley

Cooperative Agreement Number: CA-1590-9-0001

with contributions by

Suzanne Eskenazi, Scott Ferguson, David Page,
Stefanie Rowland-Fleischmann, and Cheryl Martin



Acknowledgments

Laureen Perry deserves my profound and extensive thanks for her ceramic analysis, her professional direction of the fieldwork, and her thoughtful and helpful comments about the site during the writing of this report. I would also like to thank Stefanie Rowland-Fleischmann, Scott Ferguson, Dave Page, and Cheryl Martin for their encouragement and support, as well as their invaluable assistance with portions of the report. Stefanie's untiring and enthusiastic efforts throughout a long history of working together, and particularly during preparation of this document, are a thing of wonder. The geology and ground stone analysis were certainly made more accessible by Scott's assistance. Scott also contributed invaluable knowledge and expertise preparing the graphics, especially of the trench profiles and ceramic photos and figure. Dave Page deserves extra recognition for creating the maps and for his willingness to modify them often and quickly. I would also like to thank my mother—just because I have always wanted to thank her publicly.

Suzanne Eskenazi wrote a large portion of the Methods chapter, and she contributed background research on previous Ancient Puebloan Virgin Branch sites. Suzy also prepared most of the tables and provided the databases.

We all owe our gratitude to Dr. Paul Buck for his vision in developing the N-Step program. His perseverance in making sure the program continued each year with exciting and challenging science opportunities can never be fully appreciated. I also want to thank Sarah Horton and Jack Burns at Zion National Park for their support as I prepared the manuscript. Although I was not involved in the fieldwork and original agreement to excavate the Watchman Site, I want to thank Dawna Ferris for providing this opportunity to add additional data to the body of knowledge about the Virgin Ancient Puebloan people.

Kerry Varley
Assistant Research Archaeologist,
Desert Research Institute
2002

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
LIST OF FIGURES	iv
LIST OF TABLES.....	iv
INTRODUCTION	1
CHAPTER 1: CULTURAL AND NATURAL CONTEXTS.....	6
Site History	6
Environmental Context	7
Ancestral Puebloan – Virgin Branch Background.....	10
Prehistoric Summary.....	12
Other Zion Canyon Sites.....	15
CHAPTER 2: PREVIOUS RESEARCH	19
Excavation and Research at Virgin Branch Sites	19
The Case for Dependence on Agriculture.....	21
Red Cliffs Site.....	21
Little Man Sites.....	23
The Case for a Mixed Economy	25
Pinenut Site	25
Diet – The Implications and Variations	27
CHAPTER 3: METHODS	36
Excavation Methods.....	36
Laboratory Analysis.....	37
Ground Stone	37
Ceramics	39
Lithics	41
Flotation Samples.....	42
Radiocarbon Dating	43
CHAPTER 4: DESCRIPTION OF SITE ASSEMBLAGE	44
Features	44
Ground Stone	57
Ceramics	62
Lithics	65
Macrobotanical and Faunal Remains.....	68
Radiocarbon Dates	69
CHAPTER 5: DISCUSSION	70
REFERENCES CITED.....	77

LIST OF FIGURES

Figure 1.	View of Zion Canyon looking north from The Watchman Site (42WS126).....	2
Figure 2.	N-STEP crew group photo at The Watchman Site (42WS126)	3
Figure 3.	N-STEP participants working at The Watchman Site (42WS126).....	3
Figure 4.	Major cultural traditions of the American Southwest and western sub-regions of the Ancestral Pueblo	11
Figure 5.	Location map of selected Virgin Ancestral Puebloan sites in relation to The Watchman Site (42WS126).....	21
Figure 6.	The Watchman Site (42WS126) plan view	45
Figure 7.	Rectangular room (Feature 1) looking southeast	47
Figure 8.	Storage cist (Feature 4) in foreground. View is northwest, with Features 3 and 1 (both rooms) extending from the storage cist	48
Figure 9.	Hearth (Feature 6) looking north	50
Figure 10.	Storage cist (Feature 8) looking southeast	51
Figure 11.	Storage cists (Feature 9 and Feature 12) looking north	52
Figure 12.	Grinding slick (Feature 2) looking north	54
Figure 13.	Trench (Feature 7) profile.....	55
Figure 14.	The Watchman Site (42WS126) ceramic sherds	64

LIST OF TABLES

Table 1.	Virgin Branch Ancient Puebloan Chronology and Associated Cultural Traits	14
Table 2.	Previously Recorded Prehistoric Sites in Zion Canyon.....	16
Table 3.	42WS126 Ground Stone Characteristics	58
Table 4.	42WS126 Pottery Types and Forms	63
Table 5.	42WS126 Surface Treatment.....	65
Table 6.	42WS126 Lithic Assemblage	66
Table 7.	42WS126 Radiocarbon Dates	69

INTRODUCTION

This publication is about excavation of The Watchman Site, 42WS126. Named after the Watchman Campground, this archaeological resource is located on a small knoll at the eastern edge of the campground. The North Fork of the Virgin River meanders through this popular National Park camping area, with a portion of the current river channel approximately one-half kilometer west of the archaeological site. The Watchman Site has two storage rooms and three storage cists, two hearths, grinding stones (metates) and handstones (manos), 11 different types of ceramics, and a small amount of stone tools and debris. The entire site assemblage is consistent with artifacts associated with the Virgin Branch Anasazi and, therefore, we infer no other prehistoric time periods to be represented. Occupation of the knoll is likely to have occurred during multiple periods of time, possibly as early as A.D. 700 and as late as A.D. 1300.

Since the site was first recorded in 1934, National Park Service (NPS) employees have frequently visited this location to assess the condition of the cultural resources. In 1943, 1949, and 1991, documentation included concerns about increasing site destruction and looting of artifacts. Zion National Park archaeologists buried portions of the site in 1994. This action was designed to slow erosion of the structural features resulting from foot traffic on the knoll and from unauthorized digging within the features. Regular monitoring by NPS staff and volunteers was also initiated. By 2000, it was apparent that greater casual use of the knoll for enhanced viewing of the spectacular Zion Canyon would likely occur (Figure 1). This increased activity was anticipated due to more visitors to the new Zion Visitor Center (several hundred meters southwest of the site) as well as from campers in the adjacent Watchman Campground. The NPS enlisted Desert Research Institute (DRI) to conduct data recovery and thereby salvage any remaining data from the site.

Desert Research Institute is a nonprofit research campus of the University and Community College System of Nevada. A Cooperative Agreement authorizes



Figure 1. View of Zion Canyon looking north from The Watchman Site (42WS126).

collaboration between the NPS, Zion National Park and DRI to conduct archaeological, historical and paleo-environmental research in Zion. The agreement further seeks to promote public education of those research efforts. DRI was particularly suited to accomplish both research and public education because of decades of environmental research in the western U.S. and because of DRI's Nevada Science Teacher Enhancement Program (N-STEP).

N-STEP is an innovative program initiated by Dr. Paul Buck. The program was created with partial funding from a National Science Foundation grant to provide a better understanding of the scientific experience among high school science teachers and students. Teachers and students participate in data collection in the field (Figures 2 and 3), develop their own research questions, and prepare reports and posters of their results. Teachers gain improved analytical skills and can more effectively communicate the scientific endeavor to their classes. Students learn actual applications of the science they are studying in their classroom environments. Such tangible experience provides a more meaningful context, and thus motivation, for their studies. During an N-STEP project,



Figure 2. N-STEP crew group photo at The Watchman Site (42WS126).



Figure 3. N-STEP participants working at The Watchman Site (42WS126).

professional scientists guide teams of teachers and students. An added benefit of the program is the frequent inspiration students gain to pursue careers in science. Students also broadcast the benefits of science to their classmates and the community at large. In keeping with the NPS directive to provide public education within the framework of sound archaeological research, excavation of The Watchman Site was partially funded through the NPS Fee Demonstration program.

Chapter 1, Cultural and Natural Contexts, provides a synthesis of the cultural tradition and natural environment for The Watchman Site. The people who created the site are the Ancestral Puebloan (previously known as the Anasazi). Ancestral Puebloan people practiced cultivation in the American Southwest region. As a result of agricultural activities, Ancestral Puebloans also become increasingly sedentary, investing time and energy to build gradually more substantial habitation structures and storage facilities for crops. Within this cultural tradition, archaeologists have recognized several branches. The Watchman Site is in the region called the Virgin Branch. The name refers to the Virgin River drainage system where Formative period sites were first found in abundance (Shutler 1961). Also in this chapter is a summary of the environment and the natural resources that were available.

Chapter 2 provides a discussion of previous research at Virgin Branch Anasazi sites. Inferences drawn from data recovery at other sites are clearly in conflict about the behaviors that characterized this region during this time period. Theoretically-driven arguments are examined for possible resolution of these conflicting notions.

Chapter 3 describes excavation methodology and subsequent laboratory analysis of the recovered assemblage. Fieldwork was completed in June of 2000. Laureen Perry analyzed the ceramic collection. Suzanne Eskenazi completed both the ground stone and lithic analyses, with assistance from Scott Ferguson and Dave Page. Soil samples were sent to the Paleoethnobotany Lab at the University of California, Los Angeles for recovery and analysis of macrobotanical remains. Beta Analytic Inc. completed radiocarbon dating of charcoal samples.

A description of the artifacts and features is provided in Chapter 4. As The Watchman Site was badly disturbed, much of the data we had hoped to recover was lost.

Therefore, Chapter 4 is primarily a physical description of the objects since patterns that were originally present have been seriously altered.

Chapter 5 is a summation of the prehistoric behavior that resulted in the creation of The Watchman Site. In order to make the inferences we present, we use the physical descriptions provided in Chapter 4 and the research direction provided through a study of previous research (Chapter 2). This final chapter is an integrated presentation of the information provided in earlier chapters.

In summary, we believe this site is a series of storage units, perhaps related to a habitation structure off the knoll and to the west. One storage cist was first built around A.D. 700-900, or Basketmaker III to Pueblo I period. Later, another cist was placed slightly south of the first cist during the Pueblo I period or in early Pueblo II. An arc of contiguous cists and rooms was built at the northeastern edge of the knoll during the Pueblo II to Pueblo III period (A.D. 1010-1300), perhaps through multiple building events. The site is a well-positioned pantry of the Ancient Pueblo people. By placing the storage facilities on the knoll, flooding along the Virgin River would be unlikely to affect the contents. Very little, if any, processing of food occurred here. No evidence of maize was found in the site, and only sparse fragments of naturally occurring plants were recovered.

Chapter One

CULTURAL AND NATURAL CONTEXTS

This chapter begins with a brief description of the history of archaeological work at The Watchman Site. An overview of the natural resources available to the people who built and used this location is then provided. Following this local background and environment, we provide a summary of the Ancestral Puebloan, Virgin Branch cultural tradition and a brief review of the prehistory of the region. Other sites of this tradition recorded within Zion Canyon are then examined for any additional information pertinent to interpretation of The Watchman Site.

Site History

The Watchman Site has a lengthy history of site documentation. Ben Wetherill, working for the Civil Works Administration, conducted the first archaeological survey of Zion National Park (ZNP) in 1934. The identification number he assigned the location we now call The Watchman Site was ZNP 73. Unfortunately, a fire later destroyed Wetherill's notes for all of the Zion sites he recorded (Schroeder 1955). R.K. Grater, a ZNP naturalist, prepared the first site record in 1943. Grater recorded the site as ZAS-25 (Zion Archaeological Survey), and even at this early date he noted extensive looting had already occurred. The present Smithsonian trinomial of 42WS126 was assigned in 1949.

Vandalism to the site continued. Schroeder (1955) described the location as "sherds and walls on a hill point, partially vandalized." Matters were further complicated when in 1963 the site was once more designated as ZNP 73 (Wetherill's original number), and then in 1978 a second Smithsonian label, 42WS1065, was assigned. Site records completed in 1991 again mentioned extensive looting, visitor trails, and an overall poor site condition. Exposed features were covered with soil in 1994 to prevent further erosion and to support the remaining walls. Despite Park Service efforts, continued visitor impacts remained a threat to the site's integrity. Excavations in June 2000 were conducted to salvage any remaining archaeological information.

Environmental Context

Zion National Park encompasses 147,000 acres of Washington County in southwestern Utah. Zion is located on the Markagunt Plateau at the western edge of the Colorado Plateau. To the west is an abrupt change in topography to the Basin and Range province. Thus the Park provides both high elevation and lower level basin environments in relatively short distances. The environments are often seen as harsh and excessively arid, but abundant resources are (and were) available. Floodplains along rivers provide arable lands which support plentiful plant life, and, in turn, animals that feed upon the plants. Although precipitation is variable, springs and other water sources are also available.

Over the past 250 million years, the environment of southern Utah has varied between shallow seas to vast deserts with an assortment of transitional depositional and erosional conditions in between. The stratigraphic layers deposited as a result of these environmental changes include hundreds of feet of sandstone, siltstone, mudstone, shale, and limestone. Along with the sedimentary processes, metamorphic and chemical processes created sections of quartzite from the sandstone and areas of chert within some of the limestone formations. Igneous processes occurring within the last 2 million years generated scattered layers of basalt. Also over the last few million years, uplift, faulting, gravity and erosion have allowed the North Fork of the Virgin River to cut through these multi-colored geological formations creating the crowd-pleasing beauty of Zion. Today, elevations in Zion range from 8,726 feet above mean sea level (amsl) at the summit of Horse Ranch Mountain to around 3,900 feet near the southern park entrance. The alluvial and colluvial material that is continuously being created from erosion contained the potpourri of raw materials that the Ancestral Puebloan used to fashion tools--from chert to make projectile points, drills, and knives, to cobbles and boulders of sandstone and limestone used as manos and metates. The similarity of chert colors described in records for other Zion Canyon sites suggest that there were relatively local sources for this important tool stone. One local chert (jasper) source is known to exist at Smithsonian Butte, approximately 4 miles south of the southwestern corner of ZNP. Obsidian was also an important raw material, however, a review of the site records does not indicate this resource was locally abundant.

Precipitation in the region varies both seasonally and annually. In average years, April to June marks a dry season, while winter months bring more moisture. Although spring and early summer are relatively dry, the infrequent thunderstorms that occur in the summer months often cause dangerous flash flooding. Moisture from these short, intense storms is mostly lost to runoff. As plants are generally dormant during the winter, summer thunderstorms would have been essential for cultivating plants, as well as for germination of native vegetation. Other sources of water in the area are relatively abundant. The North Fork of the Virgin River runs through Zion Canyon itself. At the southern end of the Park, the East Fork runs roughly east-to-west through Parunuweap Canyon. In addition, perennial and intermittent water sources such as North Creek, LaVerkin Creek, and other unnamed springs, seeps, and streams are distributed throughout the Park area.

Climatic conditions are typical of the arid and semi-arid deserts in the Southwest and the Great Basin (Burgett 1990:8). Temperature varies considerably by elevation. The frost-free season in Springdale, Utah, just outside the southern boundary of the Park, lasts from early May to early October. This period would have provided a sufficient growing season for maize (corn) agriculture (Burgett 1990:12). However, the combination of fluctuating temperatures and unpredictable rainfall surely would have made such cultivation challenging. In general, maize agriculture in the Zion area could not have been accomplished without some sort of irrigation (Stewart and Donnelly 1943).

Soil in the region is unevenly distributed and varies in depth and quality or nutrients (Gregory 1950:33). Most soils are the result of windblown or water borne deposits, or they have been carried down from higher elevations during weathering of mountain slopes. While such soil contains abundant minerals, it is often relatively infertile due to a scarcity of humus. The soil most suitable for agriculture is located along the river terraces, where water is available for irrigation. According to Gregory (1950:33), conditions for dry farming were best on the lower Kolob Terrace (at the west central boundary of ZNP) and the slopes at the base of the Vermilion Cliffs (south of Zion). However, climate and topography are the primary limiting factors for farming, and local conditions no doubt varied considerably during the Ancient Puebloan period.

Five different plant communities are found in Zion. Plant communities are simply plants that grow at similar elevations and have similar climatic requirements. Not all of the plants that are included in these generalized communities will necessarily be found growing together at every location within the elevation zone. “Communities” just refers to plants that can often be found co-habiting the same areas. The five communities in Zion are desert scrub, coniferous woodland, oak woodland, riparian forest, and aquatic (Connor and Vetter 1986:5). Desert scrub communities are widespread throughout the park, especially in the lower elevations. Blackbrush and yucca are commonly predominant in desert scrub. Coniferous woodland is the dominant plant community in Zion (Connor and Vetter 1986:5). Juniper and pinion pine are the most common trees, but stands of oak can also be found. Ponderosa pine and white fir are found at the highest park elevations. Slopes with northern exposures or protected areas often have oak woodland. Gambel’s oak is the dominant plant in this community. Riparian forest is found along river and stream banks. Common plants in this community include cottonwood, willow, box elder, and ash. Erosion and sedimentation along the floodplains cause significant instability of the riparian zones. Finally, riparian and marsh vegetation (the aquatic community) co-exist in scattered locations where streams merge with pools and ponds (Connor and Vetter 1986). Plants presently found at The Watchman Site are shrubs and succulents of the desert scrub community, including yuccas (*Yucca baccata*), four-wing saltbush (*Atriplex canescens*), blackbrush (*Coleogyne ramosissima*), Mormon tea (*Ephedra viridis*), and prickly pear cacti (*Opuntia* sp) (Ferris 2000). Most of the previously described plant communities are present within short distances of the site, thus providing an abundance and diversity of plants for food, fuel, and a multitude of implements.

The wildlife populations in Zion are very diverse. Animals generally found on high plateaus and those living in desert environments are common. Large mammals include deer, elk, bighorn sheep, and coyote; small mammals include bobcat, beaver, porcupine, skunk, squirrel, chipmunk, and gray fox (Connor and Vetter 1986). Bighorn sheep, rabbits, mule deer, and hares were likely important to the diets of prehistoric populations.

Ancestral Puebloan – Virgin Branch Background

The Virgin Branch of the Ancestral Puebloan region includes portions of southern Utah, southern Nevada, and northern Arizona (Figure 4). Other researchers have presented somewhat different boundaries. The boundaries shown in Figure 4 for the Virgin Branch area are the most commonly accepted among archaeologists who specialize in this cultural tradition (Lyneis 1995).

Virgin Branch boundaries are clearest to the west because the neighboring populations were very mobile and did not construct substantial habitation structures. Ancient Puebloan sites are found embracing the Virgin and Muddy River drainages, with little expansion further west into Nevada. Southern, northern and eastern boundaries are more difficult to define because groups along these borders shared characteristics found among the Virgin Branch Ancestral Puebloan.

The Colorado River forms the southern boundary of the Virgin Branch area. South of the river were the Patayan. To the north were the Fremont. The Fremont tradition covered the eastern part of the Great Basin and the northern part of the Colorado Plateau. Another Ancestral Puebloan group, the Kayenta Branch, were the neighbors to the east. The Virgin-Kayenta boundary is slightly east of Kanab Creek in south central Utah. The Patayan, Fremont, and Kayenta engaged in cultivation of maize, building increasingly substantial habitation and storage structures, and manufacturing ceramics at the same time as did the Virgin Branch Ancestral Puebloan. However, there are sufficient differences between these groups to support separate cultural designations.

Ancient Puebloan people may have migrated into the Virgin region from a “core” or origination point around the Four Corners area (the adjoining borders of Colorado, New Mexico, Arizona and Utah). Alternatively, folks in this core area may have interacted with their neighbors and shared knowledge of maize agriculture. Horticulture may have then spread across the Virgin Branch region through interaction. If the spread of maize across the southwest was due to people immigrating, they did not move into unoccupied landscapes.

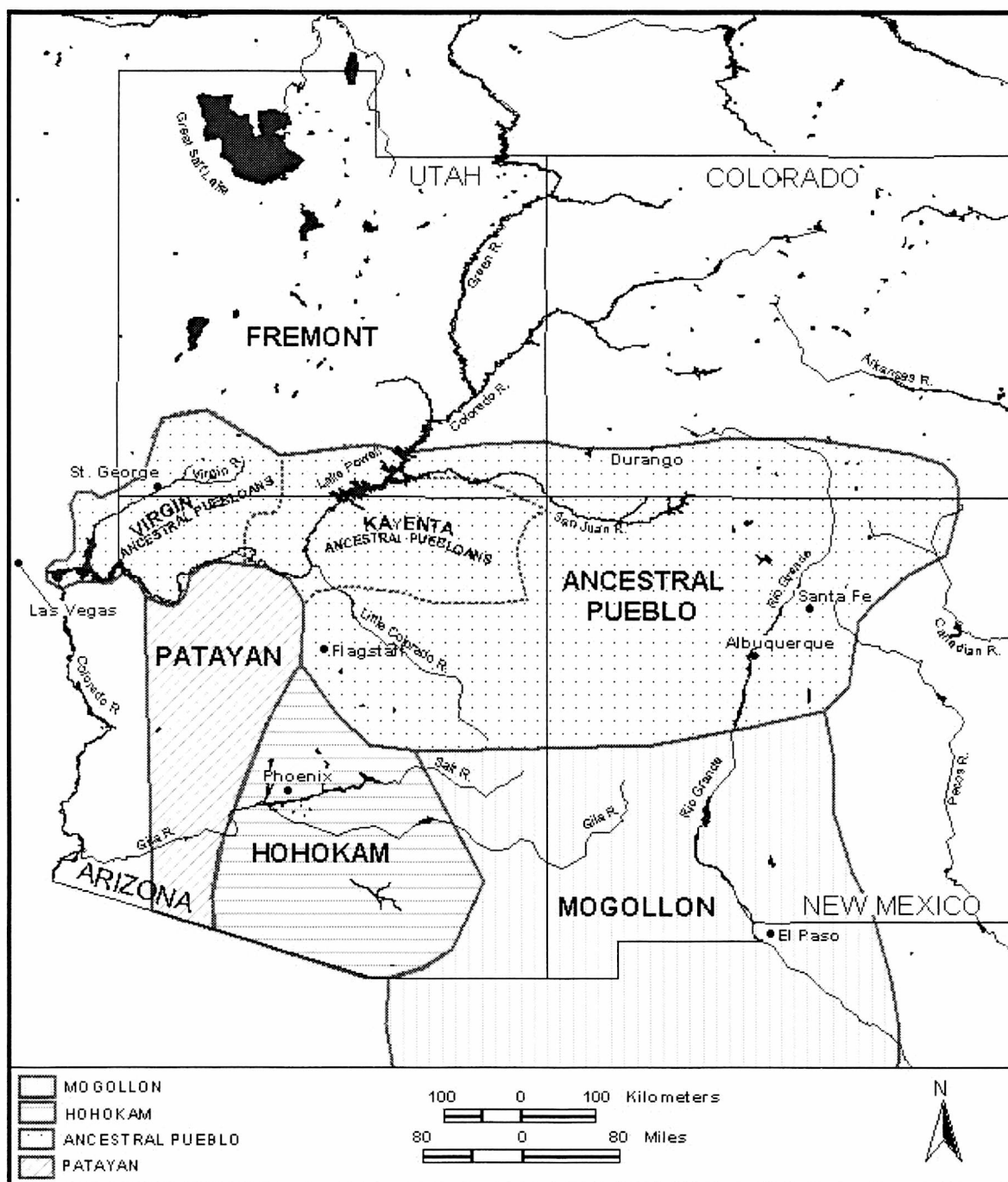


Figure 4. Major cultural traditions of the American Southwest and western sub-regions of the Ancestral Pueblo.

Prehistoric Summary

As with most of North America, there is evidence that people inhabited southwestern Utah since the end of the Pleistocene around 11,000 to 12,000 years ago (Walling et al., 1986). The earliest inhabitants, Paleoindians, are best known in the western U.S. for sites in the Great Plains and the Southwest. Stratified Paleoindian sites with associated datable materials have not been found in southwestern Utah (Canaday 2001). This period is popularly associated with the notion of a subsistence focus on Pleistocene megafauna such as mammoth and extinct bison. Most Paleoindian sites are associated with shallow water environments (Grayson 1993; Madsen 1982; Davis 1989). Large mammals may have been a primary subsistence focus, with marsh resources providing supplementary food.

Subsequent to or perhaps partially coeval with the Paleoindian period is the Western Stemmed Tradition (WST) (~ 10,000 to 7,500 B.P.) of the early Holocene. Grayson (1993) has suggested that subsistence during this period of time may have initially been focused on marsh environments, with a shift to alternative resources found in upland settings as increased aridity desiccated pluvial lakes. A small number of ground stone tools associated with sites of this period suggest at least some seed processing occurred. As seed processing is a more time- and calorie-consuming food resource than other types of vegetation gathered from marsh environments, the inference can be made that the rich ecosystems previously relied upon were becoming scarcer. Clearly adaptability of the subsistence regimen to use available and diverse natural resources, as well as seed processing, have great antiquity in western prehistoric economies.

The Archaic period lasts from around 7,500 to 2,500 years ago. Throughout the Archaic, the nomadic lifestyle of the previous periods continues. A new hunting technology, the atlatl and dart, marks the Archaic time frame and argues for continued importance of larger mammals in the diet. Nevertheless, the base of plant and animal resources included in Archaic diets continued to expand. Sites are found in both valley and upland settings indicating movement to seasonal resources. Once knowledge of alternative resources and resource areas was gained, inhabitants of the region no doubt incorporated and maintained flexibility in subsistence economies to accommodate

fluctuating availability of known foods. The Archaic cultural milieu can be summarized as a preservation of past knowledge coupled with subsistence innovations. As such, it provided an ideal context for an influx of even greater novelties.

From roughly 2,500 B.P. to 1,500 B.P. is a transitional period. Although this period is often considered Late Archaic by many archaeologists, Madsen and Simms (1998) have recently reviewed the prehistory of Utah and argue that innovations found at this time co-occur with evidence of continuing foraging economies. Prior chronologies that place this one thousand year period in the Archaic focus on the hunting technology (projectile points) that remains common in sites thought to date to this period (Aikens and Madsen 1986; Canaday 2001). That is, dart points continue in use until around 1,500 B.P. Around that time, the bow and arrow replaces darts and atlatls. However, as is shown in Table 1, dart technology is also known to be a trait associated with the Formative Basketmaker II period. This overlap in designating the time frame as both Late Archaic and early Formative is the result of new chronometric dates, and reassessments of earlier research. Acceptance and knowledge of new ideas about housing and storage structures, hunting technology, non-native plant cultivation, preparation, and consumption, and manufacture and use of ceramics would certainly be variable in where and when it occurred. As Madsen and Simms point out, lifestyles should be viewed as a mix of adaptation strategies dependent on local contexts and culture histories.

In summary, toward the end of the Archaic period, there is evidence of a more sedentary life. People were remaining, at least seasonally, in some areas, and they were building more substantial living quarters. Although Archaic people did process wild plant foods using grinding stones, these processing tools become a great deal more common toward the end of this period. Remains of maize (*Zea mays*) are found in sites dated to this transition from the Archaic lifestyle to the Formative period. It was also during this time that pottery was first used by Puebloan people living in the Great Basin (Yohe 1992; Warren and Crabtree 1986). Change from a nomadic way of life to more settled homes and increasing reliance on agriculture are the characteristics that define the Formative Period. In the southwest, sedentary agriculturalists of the Formative Period are called the Ancestral Puebloan (formerly Anasazi). As mentioned above, we do not

know whether groups of people who practiced this way of life moved into the area, or whether the knowledge of maize horticulture was transmitted west to Archaic people who became more sedentary as they began nurturing small crops of corn.

As people spent longer periods of time in one location, they created other changes in their culture. The system used to order Formative developments in the Southwest is called the Pecos Classification (shown in Table 1). This classification system was originally developed from studies conducted in the 1920s by archaeologists working in New Mexico, Arizona and Colorado. Although numerous characteristics, or traits, were found to be consistently associated, the primary diagnostics used to order changes were architecture and ceramics (Cordell 1984). Sub-regional modifications to the time ranges first established for the Pecos Classification have been made as a result of subsequent work within those areas. Indeed, archaeologists involved in the development of the classification at the Pecos Conferences expected that not all areas within the Ancestral Puebloan region would have the same developments at the same time. However, the names assigned to those time frames have remained with the exception of the Basketmaker I period, which is no longer used. The Basketmaker I period was intended to apply to pre-agricultural sites as the predecessors to later agricultural developments. Table 1 shows the current chronology for the Virgin Branch, which is based upon an overview by Lyneis (1995).

Table 1. Virgin Branch Ancient Puebloan Chronology and Associated Cultural Traits.

Time Range	Pecos Period	Diagnostic Traits
300 B.C. – A.D. 400	Basketmaker II	Maize, dart points and atlatls, slab-lined cists in rockshelters, pit houses
A.D. 400 – 800	Basketmaker III	Arrow points, pottery: grayware and some redwares and black-on-gray decoration
A.D. 800 – 1000	Pueblo I	Decorated and redware pottery more common, more elaborate pit structures, storage rooms and cists begin to form contiguous alignments
A.D. 1000 – 1150	Pueblo II	Corrugated pottery, non-local ceramics becoming common, curving alignments of storage facilities
A.D. 1150 – 1300	Pueblo III	Storage facilities and habitation structures are joined to form internal courtyards, occasional occurrences of small communities of people

Not all archaeologists would present a chronology that exactly coincides with the one presented above. The Pecos Conference period names refer to sets of artifacts and features that are meant to describe innovations or changes in Formative lifestyles. New research revises our understanding of where these changes occur and when they differ in the time they occur. Regardless of whether people or ideas moved across the landscape from the Four Corners area into the Virgin Branch area, we would expect that the sets of artifacts we have named Basketmaker II through Pueblo III should occur later in the Virgin Branch area. Testing this idea should lead to revisions and perhaps even new explanations of how cultures change.

Other Zion Canyon Sites

No research studies of sites in Zion Canyon had been undertaken prior to excavations at The Watchman Site. Only 36 sites had been recorded (Table 2) and only one intensive, systematic survey of the valley floor has been conducted (Connor and Vetter 1986). Limited information is available for these sites as many were recorded in earlier decades before specific documentation was required. More recent attempts to relocate the sites have met with varied success, and, occasionally, with greater descriptions of site assemblages (Conner & Vetter, 1986). The summary of information provided in this section examines the intensity of land use within the canyon at the time The Watchman Site was used.

Partially exposed portions of apparent structural walls were recorded at nine of the 35 sites. Five of those sites are located in rockshelters. Ancient Puebloan structures within rockshelters are most commonly storage facilities. However, the descriptions of the wall fragments for four of the sites do not allow any determination of what activities (living areas and/or storage) may have taken place. One of the sites, the Anglin site (42WS1595), had no associated ceramics, but corn cobs, a hearth, basketry, and two storage cists are part of the assemblage. These artifacts, and the lack of ceramics, are consistent with Basketmaker II cultural developments. A radiocarbon date of A.D. 285 that was obtained from the hearth is in agreement with this designation. The Anglin site was likely primarily a storage facility. The hearth may have been built during short-term,

Table 2. Previously Recorded Prehistoric Sites in Zion Canyon.

Site #	Architectural	Site Type
42WS105	Yes	Wall remnants under rock overhang; artifact scatter
42WS126	Yes	Storage cists & rooms, hearths, artifacts
42WS1167	Yes	2 Storage cists
42WS1168	Yes	Small cache of unworked sandstone blocks with red clay mortar
42WS1169	Yes	Rockshelter with wall fragments and ceramic sherds
42WS1595	Yes	Rock overhang with hearth, 2 cists, pictographs, artifacts
42WS1766	Yes	Historic sandstone block walls, with possible prehistoric structure
42WS1767	Yes	Rock shelter with 2 sandstone blocks forming a wall, artifacts
42WS2512	Yes	Small cave with wall remnant, blackening on roof of cave
42WS2699	Yes	Mortar remnants of 2 potential multiple story granaries; petroglyphs
42WS1064	Possibly	Dense ceramic & lithic concentration, 2 vague stone alignments
42WS1569	Possibly	Dense ceramic & lithic concentration, possible structural components
42WS103	No	Small ceramic & lithic scatter, 2 ground stone artifacts
42WS108	No	20 Arrow polishing grooves on rock wall
42WS110	No	Petroglyph panel
42WS154	No	Series of pictographs under rock overhang
42WS1066	No	Rockshelter; no longer exists
42WS1067	No	Ceramic, lithic, ground stone scatter
42WS1068	No	Rockshelter, limited artifact scatter
42WS1069	No	Ceramic scatter; cannot be relocated
42WS1764	No	Small ceramic & lithic scatter
42WS1765	No	Rockshelter
42WS1768	No	Sparse and diffuse lithic scatter
42WS1769	No	Petroglyph panel
42WS1770	No	Ceramic & lithic scatter
42WS1771	No	Sparse sherd & lithic scatter, 1 ground stone fragment
42WS1772	No	Prehistoric lithic scatter underneath historic corral
42WS1773	No	Ceramic & lithic scatter
42WS1774	No	Ceramic & lithic scatter; charcoal stain
42WS1775	No	2 Lithic reduction areas; found in association with modern trash
42WS1776	No	Pictograph panel
42WS2572	No	Lithic & ground stone scatter
42WS2591	No	Ground stone & lithic scatter
42WS2768	No	Petroglyph panel
42WS2864	No	Slab-lined roasting pit
42WS2896	No	Former Native American burial location; possible rock art

overnight stays. Sherds at three of the other four rockshelters suggest two were used in the Basketmaker III period and one in Pueblo II or III. Although the fourth rockshelter also had sherds, no diagnostic type was mentioned in the site record. Open-air sites with structural traits include one site described as two storage cists. The site had been vandalized and no other artifacts were mentioned. Very limited data are available for the other three open-air sites. Single sherds are associated with each feature, but insufficient information discourages making any assumptions about when or what activities occurred.

One site of particular importance is 42WS1064. Initially recorded in 1991, 42WS1064 is located on the eroded edge of the river terrace on the east side of the canyon, just downslope from The Watchman Site. In 1993, the Park Service recorded additional information and conducted limited testing of the features. After testing, sterile soil was placed across the remaining assemblage to protect artifacts from camping activities in the Watchman Campground. Test excavations uncovered shaped sandstone slabs and possible mortar. An additional alignment of rocks was recorded, but not excavated. A dense concentration of sherds and lithic debris suggests a possible midden, and testing in this concentration found artifacts at least 40 cm below the surface. Included in the assemblage are 36 stone tools, 511 sherds, one and two-hand manos, one piece of turquoise, burned bone, and a large quantity of debitage. Ceramic types are diagnostic of mid to late Pueblo II developments. Two small trade beads were collected that are likely associated with a later historic Paiute use of the location. Occupation is thought to have taken place when the river was periodically overflowing its banks and, thereby, laying down new sediments (Naylor 1995). Although such floodplains provide fresh nutrients for vegetation, there is also the potential for flooding to destroy crops or structures. The assemblage described suggests 42WS1064 was a habitation site, and occupation of 42WS1064 may have been coincident with the arc of storage rooms at the northeastern edge of The Watchman Site. The storage facilities of The Watchman Site are found on a knoll above the floodplain. This location would have placed stored food above flooding events of the North Fork of the Virgin River.

Sixteen non-structural prehistoric sites in Zion Canyon are limited activity areas, composed mainly of differing combinations of lithics, ceramics, and ground stone. Limited activity areas are simply locations resulting from single, specific tasks. For

example, a hunter might encounter a cobble of stone that is of good tool-making quality. The hunter would remove the generally poor quality outer mass to reduce the weight, and carry away only a core or perhaps a biface. Small scatters of sherds may be the result of pottery broken while gathering plants. Five petroglyph and pictograph panels have also been recorded, and four sites have only lithic artifacts. These rock art sites and the lithic scatters may pre or post-date Ancient Puebloan use of Zion Canyon.

Mormon settlers as well as more recent Park visitors have no doubt impacted sites in the canyon. Three Mormon sites attest to historic use of the area. Artifacts of a historic farmstead are mingled with prehistoric sherds at one location. At another, a confusing mix of sandstone slab walls and historic debris has been inferred to be the result of a Mormon festival. Debitage is found within an historic corral at the third site.

There are some noticeable patterns among known prehistoric sites in Zion Canyon. On the whole, the sites do not represent long-term habitation. They represent lithic reduction areas, storage areas, and plant and food processing locales for Virgin Puebloan people living elsewhere, perhaps in Parunuweap Canyon, along the East Fork of the Virgin River. Although site testing in the main canyon has been limited, patterns in the archaeological record presently indicate limited use. Further testing of architectural sites in Zion Canyon may help provide a clearer picture of prehistoric behavior along the North Fork of the Virgin River. Alternatively, extensive use of Zion Canyon by Mormon pioneers may have obliterated a significant portion of the archaeological record, thereby considerably impairing any comparative data from which to draw sound conclusions of the culture history here.

Chapter Two

PREVIOUS RESEARCH

This chapter first presents an overview of research conducted at several other sites within the Virgin Branch region. This overview provides direction for interpreting data from The Watchman Site. Science is a process of continuously building and refining ideas. Explanations proposed by scholars are tested against new facts. Differing explanations are examined with each new discovery. By reviewing previous arguments, we can then inspect the data collected from The Watchman Site to see if new information supports or refutes those ideas. Following the overview, theoretical perspectives are examined for additional insights into behavior that may account for the artifacts and features found at The Watchman Site.

Excavation and Research at Virgin Branch Sites

The degree of reliance upon agriculture by the Ancestral Puebloan is critical for understanding a host of other changes recorded in Formative period archaeological studies. Why should this be so? In a harsh desert environment, placing seeds in the ground and then leaving is a risky business. Water comes either in great abundance or not at all. Torrential downpours can turn dry washes into swiftly flowing rivers. Desert plants have adapted quite well to periods of drought, as well as to water channeling off the landscape before significant amounts can sink into the soil. Corn is not native to the southwest and requires a greater investment of time to nurture the plants to maturity and harvest. To be successful, people would have to stay in one place at least seasonally rather than move to patches of native plants. Increasing sedentism would result in part-time farmers building more substantial homes. In addition, basketry that was lightweight and durable would have been the best means to gather and transport food when people were moving around the landscape for their subsistence. By establishing more permanent homes, ceramics could replace some of the functions of basketry, and often more effectively.

The importance of wild or domesticated plants in the Formative diet remains a subject of controversy. Some archaeologists argue the Ancient Puebloan became virtually full time farmers quite early (Dalley and McFadden 1988, Martin 1996, McFadden 1996). Others think a mixed economy, combining agriculture with foraging for wild plants and animals, was the general practice throughout the Formative period (Janetski 1993, Westfall 1987, Lyneis 1995). If people were entirely dependent on the production and storage of maize and other cultigens, such choices likely required sedentary behavior as a direct result. However, if they relied on a mixed economy, they could have combined both sedentary and mobile lifestyles. Archaeological studies throughout the world have found that with increased sedentism comes an increased population. Nomadic folks lacked animals to transport people and their possessions, so even several small children would make moving over large distances a greater difficulty. Therefore, a mixed economy carries the assumption that people would have continued to have fewer children, while a full-time sedentary lifestyle increases the likelihood of more rapidly expanding populations.

Although there is also considerable debate about how significant animals were in the prehistoric diet, we do not join that discussion in this report. We consider animal protein to have remained in the diet throughout prehistory. Lacking any evidence of warfare in the Virgin Branch area, projectile points could only have served a hunting function. Projectile points are found in virtually every Virgin Branch Puebloan habitation site. Habitation or campsites are the locations where prehistoric people commonly manufactured projectile points. Hunting parties were unlikely to have carried ceramics on their forays, and we would then lack this important diagnostic to associate projectile points lost or discarded during Formative period hunts. Therefore, discarded or lost projectile points from campsites may be associated with the Formative period, with Archaic predecessors, or with Paiute hunters who lived in the area after Ancient Puebloan cultural traits disappear from the archaeological record.

The Case for Dependence on Agriculture

Red Cliffs Site

The Red Cliffs Site is located in the St. George Basin in southwestern Utah, about 13 miles northeast of the present city of St. George (Figure 5). Excavations at the site by Dalley and McFadden (1985) uncovered 27 storage units, two habitation structures, outdoor fire pits, and four large midden areas. Periodic site occupations spanned from Basketmaker III through Pueblo II. Radiocarbon dates from the site range from A.D. 470 to A.D. 1140 (Dalley and McFadden 1985:44-45).

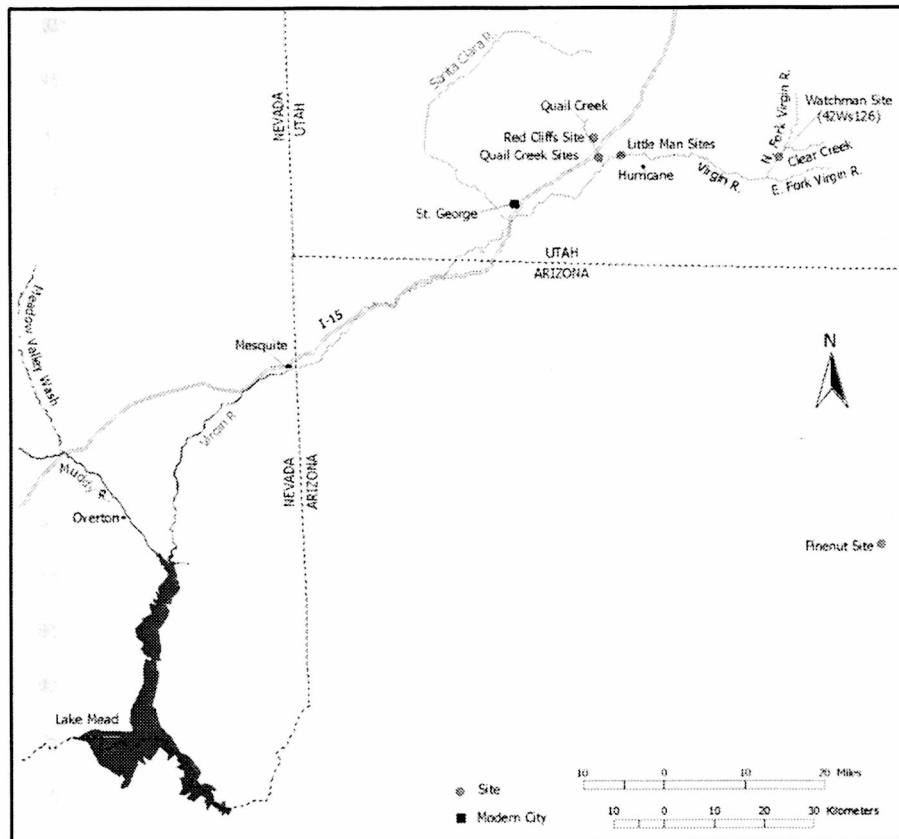


Figure 5. Location map of selected Virgin Ancestral Puebloan sites in relation to The Watchman Site (42WS126).

Portable artifacts recovered from the Red Cliffs site were diverse. Projectile points were predominantly of the arrow point types, including 24 small basal and corner-notched forms and five with no hafting notches. Four additional points are associated with dart technology, which spans the Archaic period and continues into the Basketmaker

II Formative period. Isolated storage cists are a defining trait of the early Formative periods and, therefore, the presence of dart points is not inconsistent with some of the architectural traits reported from the Red Cliffs site, or with the radiocarbon dates obtained. Additional stone tools include 68 biface forms, 14 chopping tools, 67 pecking and hammering stones, and numerous flakes with edge shaping and use wear. A sample of 205 pieces of the debitage was examined and 40% exhibited some form of use wear. Clearly tool production and a diversity of processing tasks were being performed at this site.

A surprisingly small number of ground stone implements were found. Only one trough metate and two grinding slabs were identified, and 18 manos and mano fragments were collected. Mano shapes and attributes vary considerably, however all of the complete forms and fragments had grinding use on a single face or surface with only one exception. Over half of the manos are sandstone, and the remainder is a combination of fine and coarse-grained stone. The trough metate is a fine-grained granite, while both of the grinding slabs are sandstone.

The ceramic assemblage totaled 5,521 sherds, the majority of which (4,804) were undecorated (Dalley and McFadden 1985:142). Only 14 sherds were identified as Moapa Gray Ware, which was manufactured in the Mt. Trumbull area of Arizona. A single sherd of Shinarump Gray Ware was collected. This ware is thought to originate from the area east of Kanab, Utah. Another 15 sherds were from the Kayenta Ancient Puebloan region. There were no red wares or corrugated types although the occupational span indicated by radiocarbon dates would lead to the expectation that both should be present.

Macrobotanical remains from the Red Cliffs site included goosefoot, corn, sunflower, and serviceberry (Heath 1988b). Corn was the only domesticate recovered, and it constituted only 19 percent of the total plant remains recovered (Heath 1988b). Nevertheless, Dalley and McFadden (1985, 1988) argue that people in the St. George Basin were heavily dependent on corn. This seems a curious position given that 81 percent of the botanical evidence is native species. The authors' notion of a reliance on agricultural is based largely upon where Ancient Puebloan sites are located. Virtually every site in the St. George Basin (except the Red Cliffs Site) is located close to the Virgin River, a live and dependable water source. Although high summer temperatures,

low amounts of rainfall, and a high evaporation rate characterize the St. George Basin, there are several perennial streams and numerous springs in addition to the Virgin River (Dalley and McFadden 1988). For these reasons, the authors argue that prehistoric settlers along the Virgin River could use arable land and rely heavily on agriculture.

Little Man Sites

Dalley and McFadden (1988) further pursue this argument during subsequent work at the Little Man Sites. Assuming a heavy dependence on agriculture, the authors further believe the sites indicate a full-time, year-round occupation. The Little Man Sites are also located in the St. George Basin in southwestern Utah, about three miles northwest of the present town of Hurricane (Figure 5). Four separate sites were recorded, each with a pit house and storage structures. Radiocarbon dates reported from charred material are A.D. 760 at Little Man 3 (Basketmaker III); A.D. 840 – 890 at Little Man 1 (Pueblo I); and A.D. 1000 and 1060 at Little Man 2 and 4, respectively (Pueblo II). Pecos Conference periods are not those used by Dalley and McFadden, but are designated by the chronology derived from Lyneis' overview (1995).

Combined ceramics at all four sites totaled 9,800 sherds, of which 8,372 were plain wares and only 1,428 were decorated (Thompson 1988). No red wares were reported and only one percent of the ceramic assemblage was corrugated types. Radiocarbon dates for the Little Man 2 and 4 sites indicate an early Pueblo II occupation. Although corrugated ceramics are a defining trait for the Pueblo II period, a small amount of this pottery style would be consistent for a frontier population where the innovation had not yet spread. What Thompson found most remarkable about this ceramic assemblage was the complete absence of wares from other areas within the Virgin Branch sub-region. That is, there were no Shinarump or Moapa series sherds despite the very large ceramic assemblage.

The lithic assemblage included 1,102 tools, and 2,086 pieces of debitage (Walling 1988). This is nearly a 2:1 ratio of debris to tools, which is a much higher number of tools than would be expected if tool production was a primary activity at the site. In other words, tool production generates a great deal of waste in relation to the final formed implement. Most of the tools were simple utilized flakes rather than shaped tools.

Apparently either the waste generated in tool production was pressed into service due to a distant toolstone source, or cores were transported to the site specifically to provide disposable flakes. Projectile points were predominantly of the arrow point types, including eight expanding stem and notched forms, and one with no hafting notches. Three additional points are associated with dart technology, which persisted into the Basketmaker II Formative period. Additional stone tools include 13 biface forms, 18 scrapers, 85 pecking and hammering stones, 6 choppers, and 707 flakes with edge shaping and use wear (Walling 1988). Tool production does not appear to have been a primary activity at the Little Man Sites, or a far greater quantity of unmodified debitage would have been generated.

Ground stone implements were abundant. The 15 metates include 3 complete basalt trough metates and 12 trough metate fragments made of sandstone, basalt, diorite and quartzite. There are 50 grinding slabs and slab fragments, 10 of which are complete. Sandstone was, by far, the most common material choice for both metates and grinding slabs. A bifacially used, basalt mortar and two limestone pestles were recovered from one of the sites. The collection of manos includes 131 specimens, 60 of which are complete. These implements were apparently used for a wide variety of tasks as the assemblage description includes seven categories based upon wear characteristics and modifications made to the original stone shape. Significantly, many of the manos display “end-to-end beveling” and an “oblique wear pattern” (Walling 1988) that is characteristic of maize processing. Five mauls and nine complete basalt axes were also recovered.

Despite this wealth of grinding implements commonly associated with maize processing, the authors focus upon an absence of macrobotanical data to continue to support their proposition that the Puebloan were agriculture-dependent. They point out that only small amounts of wild plant materials have been recovered at excavated sites, and that goosefoot is the most common native plant recovered. Dalley and McFadden (1988) note two important alternatives that could explain the presence of this plant in the archaeological record. Goosefoot could have been cultivated along with corn, or it could have grown as a weed and then have been harvested from farm plots. They also note that there are other abundant native plants that simply have not been found in archaeological sites. Charred native plant remains identified at the Little Man Sites included goosefoot,

spurge, mint, and cinquefoil, but Indian rice grass, Mormon tea, and mesquite are lacking (Heath 1988).

Viewed individually, the Little Man Sites are, nevertheless, consistent with arguments of increasing reliance on maize rather than with agriculture being the primary resource throughout the Formative period. A radiocarbon date from Little Man 3 indicates that the site was used during the Basketmaker III period, and goosefoot seeds are abundant, while no corn remains were found. Little Man 1 was dated to the Pueblo I period and eight corncob fragments were found, but only a single seed of goosefoot was present. Thirty-three cob fragments were recovered in Little Man 2 (Pueblo II), versus 19 goosefoot seeds. No macrobotanical remains were found in flotation samples from Little Man 4, also a Pueblo II site. The samples are quite small, and yet they do support a variation in the importance of maize as other archaeologists have argued, rather than viewing maize as the basic diet component.

The Case for a Mixed Economy

The Pinenut Site

The Pinenut Site is located on the Kanab Plateau of northwestern Arizona (Figure 5). Research at this site led Westfall (1987) to conclude the location was used during three separate occupations, each time by a small family group. The first habitation and construction was between A.D. 1050 – 1100 (Pueblo II). Subsequent occupations were between A.D. 1240 - 1290 (Pueblo III). Excavations revealed an isolated semi-subterranean pit structure, a room block, and two isolated storage cists. The room block consists of one living room, three storage rooms, one “activity” room and one structure that may have originally been a storage cist and was later used as a hearth or “heating” pit (Westfall 1987). The activity room had an abundance of stone tools and ground stone and may have had only a pole and brush roof. Westfall carefully reconstructed the occupation sequence from stratigraphy, radiocarbon dating, and diagnostic types of artifacts. She concluded that each use of the location included one of the dwellings, at least one storage room, the activity room adjacent to the storage room, and one of the slab-lined cists (Westfall 1987:181). The size of the dwelling and limited use of

constructed features suggests that the inhabitants were a small group, likely a single family.

Two shallow middens suggest brief periods of trash accumulation as well. This characteristic led Westfall to presume that The Pinenut Site likely served as a seasonal, summer habitation site. During the summer, a surplus of agricultural produce would have been stored, while the diet was supplemented with wild plant resources and small amounts of game. Stored foods would be available while awaiting new crops the following year, and likely served as a backup resource when crops or native plants were less productive. Westfall suggests that the interval when the site was not used (between A.D. 1100 and A.D. 1240) was due to declining environmental conditions. Gradually increasing water tables after this period may have supported reoccupation of the area.

Macrobotanical remains as well as the stone tool and ceramic assemblages were also interpreted as evidence of a mixed economy of both wild resources and agriculture. The lithic assemblage from the site was diverse, and included 30 projectile points, utilized flakes, drills, scrapers, cores, knives, hammerstones, digging implements, and debitage (Westfall 1987:116-144). Eleven of the complete points are clearly arrow tips, but a surprising number of dart tips ($n = 7$) were also collected.

Ceramics were typed as Virgin Series (Tusayan Gray and White Wares), Shinarump, Moapa, Kayenta, and San Juan Wares (Westfall 1987:102). A total of 1,054 sherds were collected. Virgin Series and Shinarump Wares account for 30.7% and 34% of the assemblage, respectively. Moapa Ware comprises 29.1 % of the sherds. Noting that Moapa Ware is associated with a particular temper from the Mt. Trumbull area (23 miles southwest of the Pinenut Site), and citing ceramic paste refiring analyses she performed, Westfall considers none of the ceramics to have been produced at the site. This assessment is in agreement with other research we have followed for the Virgin Branch sub-region. That is, Virgin Series Tusayan Wares are localized in the St. George Basin, Shinarump Wares appear to be from the Kanab, Utah area to the north, and, as Westfall notes, Moapa Wares bear a distinctive temper found further west of the Pinenut Site. Of the 716 sherds that could be determined to vessel shape, 527 are jar sherds, making the jar to bowl ration 2.7:1.

The ground stone artifacts recovered included six two-hand manos, three trough metates, and six grinding slabs. All of the trough metates are fine-grained sandstone. Grinding slabs are also all sandstone, but four of the slabs are fine-grained material and two are medium-grained.

Flotation samples from the Pinenut Site yielded only two charred corncob fragments. The majority of charred seeds (87%) were goosefoot. Other seeds included pigweed, sunflower, hedgehog cactus, groundcherry, and globemallow.

Diet – The Implications and Variations

The brief summaries of prior research we have presented make compelling, but alternative, arguments. In all cases, the structures described are modest compared to the very large communities that have been documented for the Ancient Puebloan in the Four Corners area. To date, the largest aggregations recorded for the Virgin Branch would likely have numbered no more than 50 people (Larson et al. 1996). Nevertheless, even the more modest habitations of The Pinenut, Red Cliffs, and Little Man sites, as well as the storage facilities of The Watchman Site, required sufficient energy to construct that we can confidently infer the people were sedentary at least portions of the year. In addition, increasing amounts of ceramics and elaboration of designs clearly show that people were increasingly sedentary through time. Maize has been recovered in sufficient quantities to also surmise that it was, at least, an increasingly important part of the diet. Must we view subsistence for the entire Virgin Branch area as an either/or decision?

Perhaps these sites are the result of differing strategies based upon more local environmental concerns. But what is striking about all three sites is the similarity of the site assemblages. We can make detailed comparisons of the sites to try to understand the conditions that may have structured economic decisions at each location. We can note the 2,000 ft. elevation difference between the “maize dependent sites” and the “mixed economy site” and make inferences about how successful maize agriculture might have been. We can describe the complex mix of conditions necessary for agricultural success such as soil quality, precipitation, and frost-free days. Finally, we can speculate about ways Ancient Puebloan folks may have solved problems through irrigation and/or

mobility. All of these sorts of discussions have been amply undertaken and provide persuasive points of view and important directions for research. At present, there is simply no means to rank the importance of differing types of data recorded that would allow a definitive resolution. We have chosen, instead, to present two types of data that may eventually provide the strongest link to resource importance, as well as some theoretical approaches that best summarize the data archaeologists have gathered.

Macrobotanical remains would be the best means to measure the degree of reliance on wild or cultivated foods. Unfortunately, in arid environments preservation is poor. Until archaeologists devise techniques to retrieve this type of direct evidence (if, indeed, this will ever be possible) another means of examining subsistence must be used.

Ethnographic and replication studies provide methods to make stronger inferences of what resources were being used by prehistoric people. Ethnographic analyses observe living groups of people who use simple tools and practice life ways from hunting and gathering to simple agriculture. The types of tools and resultant wear on those tools are analyzed for correlations with artifacts found in archaeological sites. Replication studies create the same tools and, as closely as possible, the conditions wherein those tools were used. Wear characteristics are carefully examined for comparison with prehistoric tools.

A number of ethnographic studies suggest that mano size may be one clue. Lancaster (1986) has found that one-hand manos are most commonly used with basin and slab grinding implements to process wild seeds, as well as for a variety of other tasks. Two-hand manos are most commonly used with trough metates to grind corn. In addition, Lancaster found that the choice of raw materials for metates, grinding slabs and manos was not simply based upon availability. Coarse textures were most efficient for grinding corn, while fine to medium-grained textures served best for small seed processing. Finally, Lancaster found that grinding efficiency increases with grinding area, leading to the correlation between greater reliance on plants and greater grinding areas. Schlanger (1991) found that one-hand manos, because they are used for generalized tasks, are most often employed in short, circular motions. Such motion would leave random striation patterns on the worn surface. Two-hand manos require frequent re-sharpening and will therefore have more frequent pecking on the worn surface than would be found on one-hand manos. Confirmation of these same wear

patterns was recorded by Stone (1994) during replication studies. Stone also found that the back-and-forth motion used to grind corn would result in striations perpendicular to the long axis of the stone, usually a long implement or two-hand mano. Clearly a careful study of the implements we find in sites can assist in making inferences about resource use when macrobotanical remains are not present.

Results of these studies has the potential to provide a new method to assess site assemblages in terms of what food processing occurred when macrobotanical remains are sparse to non-existent. The Red Cliffs site has a single trough metate of fine-grained granite and two coarse-grained grinding slabs. Based upon the studies cited above, these implements would not have been the most efficient for processing corn. Coarse-grained manos are present, but striation patterns and grinding areas were not reported to allow assessment of the expectations reported in the ethnographic and replication studies. Surfaces are described with various displays of smoothness and secondary pecking, but, again, not in sufficient detail to evaluate the extent of the ground area or texture of the surface. At the Little Man Sites, 15 trough metates and 50 grinding slabs, plus 131 manos and mano fragments and a mortar and pestle sufficiently sustain an inference of a considerable focus on seed processing. In addition, the relatively small number of projectile points (nine arrow and three dart points), and the macrobotanical remains all support an increasing reliance on corn, if not a primary focus. Yet both the Red Cliffs site and the Little Man Sites are interpreted as manifestations of economies primarily focused on maize agriculture. Conversely, the Pinenut Site, with a ground stone assemblage quite similar to that found in the Red Cliffs Site, is viewed as a small family group practicing a mixed economy. Ground stone at the Pinenut Site includes trough metates, grinding slabs, and manos made predominantly of fine-grained materials (60%); striation patterns and grinding areas are not reported. A mixture of coarse and fine-grained grinding tools does strengthen the argument for a mixed economy. Thirty projectile points also leads to an inference of hunting and seed processing. Yet the Red Cliffs Site yielded a similar number ($n = 33$) of projectile points, a similar ground stone assemblage, and similar macrobotanical remains. Clearly, detailed examinations and comparisons of separate site assemblages can lead to differing interpretations of the prehistoric economies.

Two very important points need to be considered when assessing economic systems. The first point is that people who hunt and gather wild plants often have a much more leisurely life than do agriculturalists. A common misconception of the general populace, as well as many archaeologists, is that hunting and gathering was a hard life spent primarily in finding food. According to Sahlins (1972) and many ethnographic studies:

“A good case can be made that hunters and gatherers work less than we do; and, rather than a continuous travail, the food quest is intermittent, leisure abundant, and there is a greater amount of sleep in the daytime per capita per year than in any other condition of society.” (Sahlins 1972:14)

The second point is that wild plants are not necessarily inferior to cultivated plants as a subsistence resource. Both points are meant to stress that we should not carry the bias that prehistoric folks would have happily given up a foraging lifestyle and had better nutrition as a result.

In a recent article, Barlow (2002) uses Optimal Foraging models to examine the question of the importance of maize during the Formative period. She builds on a large body of work by archaeologists employing evolutionary theory to develop predictions of how people are most likely to behave given certain available resources. The models are based upon both ethnographic and replication studies. Barlow uses data gathered from 29 Latin American groups who practice maize agriculture, and studies by Simms (1987) of caloric rankings for plants native to the Great Basin. In both studies, costs and benefits are measured and the results are presented as the “energetic gain.” Modern efforts to lose weight are a good illustration. If you burn more calories than you consume, you will have the net effect of losing weight. An energetic gain is the net effect of calories gained from a particular food minus the calories used to obtain and process it.

Research of Latin American agriculturalists produced some surprising results. The groups studied included high elevation, temperate and lowland environments. Although the yields did vary with better agricultural conditions (lowland areas), in no case was there a direct, increasing relationship between the amount of corn produced with the amount of energetic gain. In some cases, the energetic gain was the same for groups producing 10 bushels per acre as those who produced 50 bushels per acre. In other

words, there is a point where increasing efforts in the fields produce decreasing energy benefits. When processing time was added to the equation, energetic yields dropped significantly. Barlow then plots four differing farming strategies against the energetic gain from native resources found throughout Utah and the Great Basin. We present only two of those strategies:

- Plant and harvest maize. This involves minimal investment of time in growing maize. No field preparation is undertaken and kernels are simply planted with a digging stick. The Latin American groups did not practice this method, but such a method was reported in ethnographic studies of Southern Paiute in the early 1900s. Harvests are small, however energetic gains are the greatest (1,300 to 1,700 kcal/hr.). Ethnographic studies of the Southern Paiute also reported “wild foods and cultigens alike were cached in storage facilities near numerous collection areas and cultivation patches [Hitchcock and Ebert 1984; Kelly 1976]” (Barlow 2002).
- Intensive agriculture. “Intensive” in this case refers to maize agriculture as the primary food resource, not necessarily as the number of fields planted as is implied in much of the literature regarding Ancient Puebloan strategies. Native plants are not available or are not gathered. The bushels/acre return rate is lower than for other strategies. Low farming return rates are usually due to poor climatic conditions, and only a few high elevation groups used this strategy. In addition, extreme nutritional stress has been documented for groups eating a virtually exclusive corn-based diet (Martin 1996). Caloric return rates are a low 50 to 350 kcal for every hour invested.

Simms’s (1987) study of the caloric return rates for native plants of the Great Basin ranks the resources by the nutritional return per hour spent collecting and processing each plant. The rankings do not include time spent searching for the plants. Cattail pollen and roots provide greater caloric return rates (3,000 to 6,000 kcal/hr) than does the most productive farming strategy (see above). Pine nuts and bulrush seeds (1,200 to 1,700 kcal/hr) afford equal returns to the plant and harvest strategy. Wild rye and the *Atriplex* genus of plants have only slightly less energetic gains (900 to 1,300

kcal/hr) than the slash-and-burn strategy (1,100 to 1,500 kcal/hr). Acorns, poa, sunflower and Indian rice grass all provide better gains than the intensive agriculture strategy. Even some of the lowest ranked native plants exceed the return of intensive agriculture.

Goosefoot was not included in the study, but the widespread occurrence of this plant in archaeological sites attests to its food value.

Using these data, Barlow contends that people will only resort to agriculture when native plants of higher rank are scarce. When plants that rank higher in energetic gain are available, they will once again be included in the diet, and plants of lesser caloric return will be dropped from the diet. This model predicts that the presence of very low ranked resources in archaeological sites can be correlated with resource stress. Corn will enter the diet when plants of higher rank are not readily available.

Another approach to understanding how cultural change might have occurred is presented by Larson and Michaelsen (1990). The authors consider how climate changes and population growth may have affected the Ancient Puebloan in ways that were “irreversible.” Times of drought and conditions of relatively high precipitation for much of the Formative period are re-constructed using historic records of stream flow for the Virgin River correlated with tree ring growth. The Virgin River flow is reliant on spring snowmelt from the bordering mountains and plateaus, and thus should be a relatively reliable measure of snow and rainfall. Although there may have been some fluctuations within the general moisture regime presented, data seem to support four general major climatic changes:

- A.D. 966 – 1020 – Conditions were unusually dry. From A.D. 1000 – 1015, the model indicates conditions were extremely dry. During four of the 15 years, the Virgin River may have been completely dry for portions of the year.
- A.D. 1021 – 1060 – Precipitation increased and there was a reliable flow of water.
- A.D. 1061 – 1120 – Uniformly high stream flow. During ten years of this 60- year period, flow may have been three times as great as the average flow of the first serious drought period.
- A.D. 1120 – 1150 – Severe drought.

During the first drought, Larson and Michaelsen propose that people would begin to rely more heavily upon agriculture as foraged resources became less available. Rather than individual families dispersed across the landscape, people would have gathered at reliable water sources and stored harvests. Larger groups of people could also organize labor to intensify farming efforts. When precipitation increased, both native and agricultural plants would be more productive and, along with a sedentary lifestyle, populations would significantly increase. The second drought would not only cause severe stress on resources, but the greater number of people would make the situation even worse. This combination is proposed as the cause of complete abandonment of the region. The number of Puebloan habitation sites clearly increased through time, and clusters of sites have been recorded along perennial waterways such as the Muddy River and along Quail Creek (Larson and Michaelsen 1990; Walling et al. 1986). However, as Lyneis (1995) notes, few of these clusters have been researched adequately to determine how many sites were contemporary.

Funding for large-scale archaeological investigations to pursue this research is not likely to be forthcoming in the near future. Once again, we must use other methods to consider Larson and Michaelsen's hypothesis. One innovative means to infer resource stress and a change to agriculture is based upon social theory. Hegmon (1994) examines how people can structure space to signal social membership. Architecture can serve to welcome, or to present boundaries to "outsiders." Citing numerous ethnographic studies, Hegmon notes that foragers "share food widely." Conversely, ample ethnographic evidence shows that food sharing is limited among farmers. Farmers share food only among certain people and erect boundaries to control their resources. Using data from large archaeological project areas, Hegmon finds that small, dispersed pueblo site architecture signals greater privacy and restriction to storage areas.

The study areas Hegmon investigates are the Mesa Verde area and the Black Mesa Archaeological Project area of the Kayenta Ancient Puebloan. Extensive research in these areas has thoroughly documented increased populations and an associated heavy reliance on agriculture. Hegmon found that in the Basketmaker III period, storage was centrally located and isolated cists were common. By Pueblo I, storage facilities became part of room blocks and were often attached to habitation structures. Access to storage

required access to the dwelling. This was especially so in the Mesa Verde region where population density was greatest.

All of these studies have clear implications for research in the Virgin Branch Ancient Puebloan area. Barlow's approach provides clear predictions for the importance of corn in the diet of Formative populations. Although, as we have discussed, macrobotanical remains are scarce often due to poor preservation, we can investigate tools used to process seeds as a proxy measure of the kinds of vegetation included in the diet. Ground stone assemblages and relative numbers of hunting implements between sites can serve to infer diet proportions. Using the ground stone attributes previously described, we can better access relative amounts of small and large seeds and the intensity of use of the differing ground stone types. We would anticipate corn to be a greater part of the diet during times of environmental stress on higher ranked resources.

Larson and Michaelsen (1990) provide time frames for when we should find environmental stress and they provide a hypothesis of the behaviors that might result. Although Barlow's model does not consider social solutions that may not conform to a strictly cost/benefit response, we can modify the model somewhat to consider the group benefits and costs. That is, during the first drought that Larson and Michaelsen describe, people may well have gathered around reliable water sources and intensified efforts at agriculture. But rather than remain in these farming communities when precipitation increased, Barlow's analysis would predict that people would again disperse and resort to higher ranked resources as intensification of farming would not provide a higher energetic return. Lacking funding for region-wide assessments of populations densities and dating analyses to establish contemporaneity of clusters of sites found along major water courses, Hegmon's architectural data might serve as proxy for these types of data. Open, accessible, or isolated storage features would indicate at least a partial foraging economy and dispersed populations. Future research questions might use this proxy data, in concert with other types of site data, to answer such questions as: When do storage features signal protection of food resources in the Virgin Branch region? Does this occur throughout the region, or only in particular contexts?

Chapter Three

METHODS

(with Suzanne Eskenazi)

This chapter describes methods used in the field to collect data from The Watchman Site. Methods and typologies of artifacts used in laboratory analysis are then presented. Finally analyses performed outside of DRI laboratories are summarized.

Excavation Methods

Initial preparation of the site involved brush clearing, which was completed using shovels, clippers, and hoes to remove deeply rooted plants, while avoiding all visible structural walls on the surface. A grid system was then established using a point designated as 100N/100E as the site datum. The datum was placed down the southern slope of the knoll in a roughly centerline location. Stakes were placed every two meters from the datum on a true north-south baseline down the middle of the site. From the baseline, 4-x-4-m squares were then measured and further subdivided into 2-x-2-m units. Each unit was labeled on the NE corner stake, with the number being the distance and direction from the datum point. The area collected and/or excavated totaled 18 m by 18 m (324 m²). Strings were extended between stakes to provide clear visual reference for each of the units created.

Once the grid system was arranged, surface collection and mapping proceeded. All visible ground stone, lithics, and ceramics were collected from the surface of each unit. Once surface collection was completed, excavation began using arbitrary ten-centimeter increments. As no natural stratigraphic units were encountered anywhere in this site, the arbitrary increments were maintained to either feature floors or sterile sediments in the trench (described below). Artifacts were recovered from dirt sieved through 1/8-inch screens. Depths were taken from the center and at each corner of the units at the beginning and end of each excavated level. Upon completion of each level,

the excavator mapped the exposed surface on graph paper. A comprehensive site map was later constructed of the floor surfaces of all features.

Artifacts were collected in paper bags for each level within the units. A single reference number was used for all artifacts in each level. In the field lab, students and teachers separated the collected materials into artifact types, under the direction of professional archaeologists. The single level reference number was maintained for the separated artifact types. Artifacts were also washed in the field lab, using soft bristle brushes to remove hardened dirt. Lithics and ground stone were separated and bagged according to differing raw material types. Ceramics were separated by surface treatment - plain, painted, or corrugated.

Architecture was exposed using trowels and whiskbrooms. Upright slabs, when visible on the surface, initially were used to guide areas to be excavated. As individual features were exposed, soil color and composition were examined for any changes that may indicate specific use areas, such as floors and hearths. If artifacts were uncovered in direct association with a feature, the location was noted on the level map. Burnt adobe and charcoal samples were obtained whenever encountered within features. Bulk soil samples were also gathered for flotation analysis. After the information potential of each feature was exhausted through artifact collection, mapping, and photo documentation, features were covered with clear plastic in order to facilitate easier removal of backfill in the future. The entire site was then backfilled using sediments removed and screened through 1/8-in mesh during excavation.

Laboratory Analysis

Ground Stone

Ground stone artifacts were analyzed by Suzanne Eskenazi according to a typology used by the Desert Research Institute. Stones are typed as grinding slicks, metates (basin shape), grinding slabs (flat shape), manos, and other. Raw material was determined using DRI's laboratory type collection to aid in identification. Length, width, and thickness of ground stones were all measured to the nearest centimeter. Ground stones were considered complete if all margins of the stone were intact. Incomplete

stones were subjectively assessed as more, or less, than half of what was considered to be the original form.

Other ground stone characteristics examined included:

- Any shaping of the non-grinding surfaces
- Secondary battering on the edges of the stone
- The shape of the stone in cross-section and plan view
- The number of grinding faces.

Shaping of the non-grinding surfaces was determined by examining the artifact edges for cultural modification, such as grinding or flaking. Such modification, when found, was characterized as greater or less than one-half of the edges, or no modification. Secondary battering was determined using a rank scale of “light” to “extreme.” Light battering was defined as shallow, random impact indentations in small, localized portion(s) of the margin(s); moderate battering was considered to be more concentrated impacts to a greater area of the margin; and extreme battering would be evident by crushing of the impacted area and even removal of portions of the margin. Cross-sectional shape was a description of the grinding surface. For manos, the descriptors used were convex, beveled, flat, or irregular. The grinding surface configuration for grinding slabs and metates was described as convex, flat, slightly concave (< 0.5 cm), or basin (> 0.5 cm). The plan view describes the overall ground stone shape as circular, oval, rectangular, square, or irregular.

For both manos and grinding stones, the ground area was also analyzed for striation orientation, areal extent of use, battering or pecking on the grinding faces, and intensity of wear. Striation orientation was determined by holding the suspected ground area(s) of the stone angled to a high-powered light. This method allows macroscopic observation of small striae, or thin grooves or channels, which result from repetitious movements across the surface of the stone. Orientation was described in relation to the shape of the overall artifact; that is, along the longest axis, the shortest axis, both short and long axes, indeterminate/none, or random. The area of the stone where grinding use was evident was then measured along two perpendicular maximum dimensions and recorded to the nearest tenth of a centimeter. A general use area was calculated to the nearest square centimeter for each surface (face) of the stone that had been used for

grinding. Taking into account natural weathering processes and inherent characteristics of the raw materials, the amount of pecking or battering on the grinding surface was subjectively characterized as light, moderate, or heavy. This assessment is entirely relative within the assemblage of ground stone collected from this site. Pecking and battering of ground surfaces are a means of “resurfacing” grinding areas that have been smoothed to the point that the tool no longer functions efficiently to break apart the material being processed. That is, surfaces regain the coarse texture required to process those materials. Examination of surfaces for this type of modification was intended to provide another means of inference for the amount of processing that occurred on site based upon the grinding tools collected. Intensity of wear was characterized as light, moderate, or heavy using a combination of the attributes previously described.

Ceramics

Ceramics were separated in the field laboratory according to surface attributes: corrugated, plain, or painted wares. Laureen Perry further analyzed sherds in DRI’s archaeology laboratory. The complete ceramic analysis protocol is described below; however, portions of the analysis were undertaken to provide data for specialized ceramic studies. These studies will provide invaluable information about manufacturing techniques and stylistic designs. When compared with detailed analyses of ceramics from other Ancient Puebloan sites in the Virgin Branch region, these studies have the potential to identify where particular pottery was manufactured and the extent of distribution from that location, as well as any stylistic elements that may identify subregions within the area. Therefore, only those attributes that were deemed relevant to the research questions developed for The Watchman Site are presented in the Site Description (Chapter 3) and Discussion (Chapter 4). The complete ceramic database is available at Zion National Park.

Vessel form (i.e., bowls or jars) was determined through the identification of surface smoothing and curvature of the sherds. Vessel parts were separated into rims, bodies, and bases. Rim sherds were identified by a smooth rounded or flattened edge that is formed before firing occurs (Perry 1998:48). Body sherds were those that lacked finished edges and had exposed cores on all sides. No base sherds, the bottom portion of

the vessel, were found in the collection. Bases of vessels are often flat, but both jars and bowls can have a globular basal form making separation of this vessel part from body sherds difficult. Sherds were also examined for subsequent use or reworking of discarded pieces, typically from grinding or abrading edges.

Rim sherds were examined for eversion or curvature away from the neck of the vessel. Eversion was categorized as no eversion, slightly everted, more everted, perpendicular to wall, curved beyond perpendicular, and indeterminate. To make this determination, the sherd was viewed in profile with the exterior surface on the right side and the rim up (Perry 1998:48). Categories of eversion were based upon Colton's "lip direction" types (Colton and Hargrave 1937:11). The amount of temper used in ceramic manufacture was estimated as a relative proportion to the amount of clay. Angularity of the temper medium was separated into the following categories: well rounded, rounded, sub-rounded, sub-angular, and angular. These categories were combined when multiple temper mediums were apparent. Temper sorting was characterized as very well, well, moderately, and poorly. The degree of temper sorting as related to the temper angularity was then compared to a chart provided in Pettijohn et al. (1972:585-586). A measurement of temper size was recorded as the diameter of the largest grains identified and measured to the nearest millimeter. This measurement was taken using a clear ruler placed directly over the grains while viewed microscopically. Tempers consisted of quartz, basalt, an unidentified gray colored rock, sherd, olivine, and combinations of these types. Mineralogy was based on previously identified tempers in Virgin Anasazi sites.

Size grades for sherds were: 1) up to 5 cm²; 2) 6-15 cm²; 3) 16-50 cm²; 4) 51-100 cm²; 5) >101 cm². Painted design elements were described as narrow, medium, or wide lines, rim lines, and diagonal or parallel lines. Other design components identified were connecting triangles along a row, partial designs, and pendant dots. Finally, ceramic types were based on Colton (1952), Thompson (1988), Lyneis et al. (1989), and Lyneis (1992).

Lithics

Suzanne Eskenazi and Dave Page conducted the lithic analysis at DRI's lab. Debitage (stone tool manufacturing debris—individually called flakes) was separated from tools. The following flake types were used:

- Decortication: a flake having 40 percent or more cortex;
- Core reduction: a relatively thick flake with a flat or cortical platform; flake scars on the dorsal surface are randomly oriented;
- Biface thinning: excurve, longitudinal cross-section; dorsal flake scars from opposing edge flake removals;
- Pressure: generally the smallest flakes having distinctive lanceolate or expanding leaf shape and extremely narrow platforms;
- Shatter: angular, blocky debris with no identifiable flake attributes;
- Indeterminate types: flake fragments with at least one attribute, but lacking patterned attributes that would allow type designation into a stage of the reduction sequence.

Rather than measuring flake dimensions, a size grade scale was used which measures the maximum linear dimension. Size grades were a series of concentric circles increasing by 5 mm increments from < 5 mm to 30 mm, by 10 mm increments from 31 to 60 mm, and by 20 mm increments to > 100 mm. Size grading is a more efficient method to examine debitage size than the labor-intensive measurement of length, width and thickness of each artifact. Flakes generally become smaller as a stone is being reduced to form a tool. Therefore, size grade can be used to infer production activities accomplished at the site. Large numbers of broken flakes, however, can give the appearance of the final stages of tool production if size is the only consideration. For this reason, both defining attributes (described above) and size were used to evaluate stone reduction activities.

A lithic type collection was used to assign raw material types. Predominant material types in this collection are chert and limestone, with small numbers of basalt, quartzite, sandstone, and siltstone artifacts.

Tool types were determined using an extensive list of known tools previously described by lithic analysts. A descriptive classification of cores was made on the basis

of flaking patterns. Modified (or assayed) cobbles were stones having three or fewer flake removals randomly occurring on the cobble. Flakes with three or more contiguous scars along one or more margins were typed as utilized flakes. Flake scars on utilized flakes were considered to be the result of repeated use of the edge in some task that caused the edge to be damaged. Edge-modified flakes were those flakes with patterned flake scars along one or more margins. In this case, intentional shaping of the edge is considered to be the reason for alteration. Hammerstones are those cobbles with patterned or localized damage, usually in the form of battering, resulting from impact during use. Tools that appeared to have edge modification and/or evidence of use wear were examined using a Nikon binocular microscope equipped with adjustable fiber-optic lighting. This microscope allows a variable magnification from 10x to 40x.

Bifaces were “staged” as Stage I through Stage IV:

- Stage I bifaces are generally thick and irregular in form; edges are sinuous but patterned (alternating) flake removals can be discerned.
- Stage II bifaces are thick in cross-section with a prominent mid-line ridge. A tip and base of the form is distinguishable.
- Stage III bifaces are thinner than the previous stage, with flake removals extending across the face, thus removing the mid-line ridge seen in Stage II forms. Cross-sections of edges show a generally straight line. The final stage of biface manufacture is often called a “perform”.
- Stage IV bifaces are complete except for the formation of a hafting element. Projectile points are hafted bifaces.

Flotation Samples

Flotation samples were collected for macrobotanical analysis. Sediments were collected in half-gallon milk containers from features and from a sample of other excavated units. Samples were removed using a clean trowel and were labeled with provenience information. Those samples collected from the two hearths (Features 6 and 10), and from the ash layer (Feature 5) in Feature 3, were sent to the Paleoethnobotany Lab at the University of California, Los Angeles (UCLA) for analysis. Soil samples were manually floated following methods outlined by Pearsall (1989). As unburned plant

remains usually decompose rapidly, their presence in archaeological sites is most likely due to recent deposition. For this reason, only burned materials were considered to be of cultural origin. Following the flotation process, recovered plant parts were identified using comparative modern samples.

Radiocarbon Dating

Charcoal was collected whenever encountered in features, and placed in aluminum foil to avoid contamination. Samples removed from Features 8 and 9 (storage cists), Feature 6 (a disturbed hearth), and Feature 5 (an ash layer within Feature 3, the rectangular storage room) were sent to Beta Analytic Inc. for Accelerated Mass Spectroscopy (AMS) and standard radiocarbon dating.

Chapter Four

DESCRIPTION OF SITE ASSEMBLAGE

This chapter provides the results of analysis of data collected in the field as well as technical analyses completed at DRI, the University of California, Los Angeles (UCLA), and Beta Analytic, Inc. Chapter sections include Features, Ground stone, Ceramics, Lithics, Macrobotanical Remains, and Radiocarbon Samples. Each section begins with an overview of the features or artifact types, followed by a more detailed description of the different types within these broad categories, and finally a summation of the data at the end of each section.

Any patterns of work or activity areas that might have been present on the surface were completely disturbed due to modern foot traffic. All portable artifacts were randomly distributed across the site. Three ground stones were found down the northern slope of the knoll. Additional ground stones remaining at features appear to have been used in structural walls of the storage units. With few exceptions, sherds found subsurface exhibited no clear associations that would allow discrimination of activity areas. Subsurface lithic artifacts were also randomly distributed with no associations by material type or flaking stages.

Features

Excavation of The Watchman Site revealed 12 features (Figure 6). Structural features with relatively clear wall definition include:

- Three circular storage cists (Features 4, 8 and 9),
- Two rectangular storage rooms (Features 1 and 3), and
- Two hearths (Feature 6 and 13).

The remaining five features (Features 2, 5, 10, 11, and 12) are:

- A grinding slick on a large boulder at the central eastern edge of the site (Feature 2).

- Two large rocks (Feature 12) forming an extension from the southeastern edge of Feature 9. These rocks have been designated as a cist, but the feature had no subsurface component of artifacts.

A trench was excavated in the central portion of the knoll. This trench was designated as Feature 7 for record keeping during fieldwork. The trench was placed at this location in an effort to locate a buried habitation structure.

An arc of two contiguous rectangular storage rooms and a circular cist are found at the northeastern edge of the knoll. West of the arc are two hearths, one of which was found to be badly disturbed. West of the hearths are fragments of a wall that was built on the northwestern edge of the knoll. To the south of these wall fragments, and on the western side of the site, is a rock-encircled hearth. Southwest of this western hearth are two well-defined storage cists and two vertical slabs which may have been part of one of the completed cists. Finally, a grinding slick exists on a large boulder at the east central portion of the site. The following descriptions begin at the northeastern block of features and move west to the two northern hearth features. Following the two hearth feature descriptions, we present a summary of the disturbed feature located west of the two hearths (on the northwestern edge of the knoll). Descriptions move counter-clockwise around the knoll, ending with the grinding slick on the eastern side of the site.

- Feature 1 is the northern-most storage room of the contiguous room block. The room is roughly square in shape with a length of 2.8 m and a width of 2.4 m (Figures 6 and 7). At the northwestern end of this feature is a huge boulder. A large sandstone grinding slab was collected from the surface at the northeastern corner of the room. Also found on the surface was a circular, flat sandstone object which is believed to be a jar lid. Walls consist of very large tabular blocks of rock placed on end, with occasional horizontally placed rocks atop the vertical slabs. The floor of the storage room is composed of rock slabs, cobbles, and clay. A mere 28 cm of soil was removed in order to reach the floor surface. A .22 cartridge and opalescent pieces of glass were recovered only 7 cm above the floor. These historic artifacts indicate that modern activities have seriously impacted any provenience information of prehistoric artifacts removed from



Figure 7. Rectangular room (Feature 1) looking southeast.

this feature. In addition to these clear signs of modern disturbances virtually on the floor of the feature, the NPS buried portions of the site in 1994 in order to retard erosion of structural features. The northern walls of Feature 1, as well as the attached storage features described below, had sustained substantial damage due to their position at the edge of the small knoll where The Watchman Site was constructed. Soil removed from these features surely included a portion of the protective mantle deposited by the NPS, casting further doubt on artifact proveniences within these features.

- Feature 3 is a storage room adjacent (southeast) to Feature 1 (Figures 6 and 8). The rectangular room is 3.25 m long and roughly 2 m wide. Collapse of the eastern wall of the feature had occurred, so the dimensions are based upon the rock slab-and-cobble flooring. No clay was observed in either the walls or floor. The floor was covered by only 30 cm of soil. As small amounts of grayish sand and charcoal were found along the western wall of Feature 3, excavators assigned that location a separate feature number (5) in expectations of finding a hearth.



Figure 8. Storage cist (Feature 4) in foreground. View is northwest, with Features 3 and 1 (both rooms) extending from the storage cist.

- Feature 5 is located primarily in Feature 3, but also extends into the southern portion of Feature 1 (Figure 6). This feature is a one cm thick ashy layer or charcoal stain. A small trench was excavated along the western wall of Feature 3 to determine if the charcoal originated from a buried hearth. Charcoal samples from this feature were submitted for radiocarbon dating and the burn event was determined to be modern. As this lens of charcoal was only 10 cm above the floor of Feature 3,

proveniences of prehistoric artifacts recovered from Feature 3 are clearly not in original contexts.

- Feature 4 is an ovoid cist at the end of the room block (Figures 6 and 8). Diameter is roughly 2 m and depth to the floor was only 20 cm. Walls are composed of vertically oriented rock slabs. The floor incorporates both horizontally laid slabs and cobbles. An adobe wash was noted as possibly covering the stone flooring. A huge boulder abuts the southern wall of this feature.

West of the arc of storage facilities on the flatter central portion of the knoll, two hearth features were recorded:

- Feature 6 is a largely intact hearth approximately 2.5 m west of Feature 3. The feature consists of three vertical slabs on the north side of the hearth, with additional slabs collapsed outward from the southern perimeter. Originally, the hearth was approximately 0.5 m in diameter. Maximum depth to the bottom of the hearth was 20 cm. Four sherds and a mano fragment were collected from the hearth. The sherds included one North Creek Corrugated, one North Creek Gray, and two Shinarump Plain types. A ring of six blackened cobbles and rock slabs form the hearth floor, with a single cobble located in the center of the ring (Figure 9). Charred material collected from the hearth was radiocarbon dated to A.D. 1010 – 1300 (Pueblo II to Pueblo III).

Feature 10 is a disturbed hearth (Figure 6). The area designated as Feature 10 is immediately adjacent to the southwestern wall of Feature 1 (a storage room). Large rocks with blackened surfaces were identified on the surface, along with charcoal flecks and gray staining. No subsurface structural elements or concentration of artifacts were found. This burn area is likely related to the modern event documented as Feature 5. Fire-blackened rocks indicate this was a modern hearth from which the fire appears to have spread across the exposed surfaces of the prehistoric features to the east and north.

West of the two hearths, and on the northwestern edge of the knoll, is a badly disturbed feature:

- The collapsed wall feature (Feature 11) indicated possible remains of more damaged rooms (Figure 6). Excavation uncovered additional vertical slabs, but a floor could not be defined. Charred roots were encountered, but no ash layer was identified.



Figure 9. Hearth (Feature 6) looking north.

The poor condition at this location does not allow any determination of the original configuration or function for the feature. Only seven North Creek Gray and three Shinarump Corrugated sherds were collected from the surface and to a depth of 30 cm. Excavation continued to approximately 55 cm below the surface.

South-southwest of disturbed Feature 11 is:

- Feature 13, a circle of rocks, none of which were placed vertically (Figure 6).

Excavation within the circle uncovered a roughly 70 cm oval of ash and gray-stained sediments with a large amount of fire-cracked rock. This hearth reaches a maximum depth of 40 cm. Only ten sherds were collected, and these were recovered in the first 20 cm of excavated soil. Sherds include six North Creek Gray and four Shinarump Plain types.

Again moving south-southwest, two isolated circular storage cists are located in the southwestern portion of the site, along with a portion of a wall that may have been a cist or a small cache:

- Feature 8 is a circular storage cist, roughly one meter in diameter and 60 cm deep (Figure 6 and 10). The southwestern wall has partially collapsed, likely due to erosion as the cist is on a southwesterly slope of the knoll. Two mano fragments were collected, one from the surface and the second from a depth of 40 to 50 cm. Two large sherds of Washington Black-on-gray pottery were found on the floor of the feature at the northern wall. Two chert flakes and a complete mano were also found on the floor. A radiocarbon date obtained from charred material collected from this feature indicates the cist was constructed between A.D. 700 – 900 (Basketmaker III to Pueblo I). This date is consistent with dating of the Washington Black-on-Gray sherds found in other contexts (Walling et al, 1986:355). Sixteen North Creek Gray Ware sherds were found in the upper fill of this feature, perhaps due to re-use of the cist post-dating the earlier construction period.



Figure 10. Storage cist (Feature 8) looking southeast.

- Feature 9 is a circular storage cist located approximately 1.5 m southeast of Feature 8 (Figure 6). Vertical slabs form a double wall along the northeastern perimeter (Figure 11). Most of the wall has collapsed at the southwestern extent of the feature.



Figure 11. Storage cists (Feature 9 and Feature 12) looking north.

As with Feature 8, wall collapse is probably due to erosion down the southwesterly slope. The cist measures 1.9 m x 1.75 m, or a roughly 2 m diameter. Depth of sediments (79 cm) within the cist was the greatest found in any feature of the site. A large quantity of sherds ($n = 64$) was collected from within the feature, primarily North Creek types. In the lowest levels (60 to 79 cm), 18 pieces of a single globular jar of North Creek Gray Ware were recovered. A radiocarbon date obtained from charred material collected from this feature indicates a use period of between A.D. 870 – 1010 (Pueblo I to early Pueblo II). A single sherd of Toquerville Black-on-white was collected from a depth of 20 to 40 cm. The Toquerville type has been dated from the Late Pueblo II to Early Pueblo III periods (Westfall 1987:111). According to Thompson (1986:355), the North Creek Gray type of the Virgin Series is a poor time marker, spanning Basketmaker III to Pueblo III

(A.D. 650 to 1250). The broken jar of North Creek Gray Ware at the bottom of the cist is not inconsistent with the Toquerville Black-on-white sherd at a superposition in the cist. Additionally, the radiocarbon date is likely associated with the earlier construction of the cist, and discard of the North Creek ceramic jar. The presence of North Creek and Shinarump corrugated sherds at the bottom of the cist, as well as throughout all excavated levels, indicates a very early date for this manufacturing technique. However, it is consistent with dates reported by Thompson (1986) for corrugated ceramics.

- Feature 12 consists of two vertical rocks extending from the southeastern perimeter of Feature 9 (Figure 11). Nineteen sherds were collected from the surface, however, no artifacts were found below 10 cm and excavation was not continued. The feature was designated as a cist as the exposed slabs suggested there was an additional storage unit added to Feature 9. No further structural elements were found and, therefore, the actual function of the two vertical rocks is unknown. Sherds from this feature include 13 North Creek Gray, 5 Shinarump Corrugated, and 1 North Creek Corrugated.

Northeast of Features 9 and 12, and at the southern end of the L-shaped trench excavated centrally on the knoll, is a large boulder with a grinding slick on the lower margin of the sloping face of the rock:

- Feature 2 is a grinding slick on a 1.08-x-0.63-m sandstone boulder (Figure 12). The boulder is approximately 4 m south-southwest of the contiguous storage rooms, and at the southern end of the north-south trench arm. A 4,131 cm² surface of the boulder has heavy use wear. Striations exist along the long axis of the boulder. Battering and pecking of this surface is also evident. There is a significant tilt to the ground face of the boulder, which would make it difficult for small seeds or plant parts to remain in place during grinding. Therefore, materials other than food may have been processed on this stone.

An L-shaped trench was excavated in the central portion of the site (Figure 6). One arm of the trench extends east to west, with an additional arm placed at the eastern end and excavated north to south. Designated as Feature 7 for record keeping, the trench was positioned to locate any subsurface features that may have had greater protection than was evident on the perimeter of the knoll. In addition, excavations at other Virgin Branch Ancient Puebloan sites had previously revealed a tendency for habitation



Figure 12. Grinding slick (Feature 2) looking north.

structures or additional walls to be attached to arcs of contiguous storage features (Buck and Perry, 1999), thereby creating an interior small plaza area. No evidence of buried features was uncovered. At the northeastern corner of the ell, a one-meter deep irregularly shaped area of sterile soil was evident (Figure 13). This “hole” extended north and east from the trench walls, and is thought to be the result of illegal digging and backfilling in previous years. Gravels and rocks seen in the remainder of the stratigraphic profiles of the trench are absent in this area. A burnt corrugated sherd was found at the bottom of the north wall of the trench under this looter’s hole. Laureen Perry

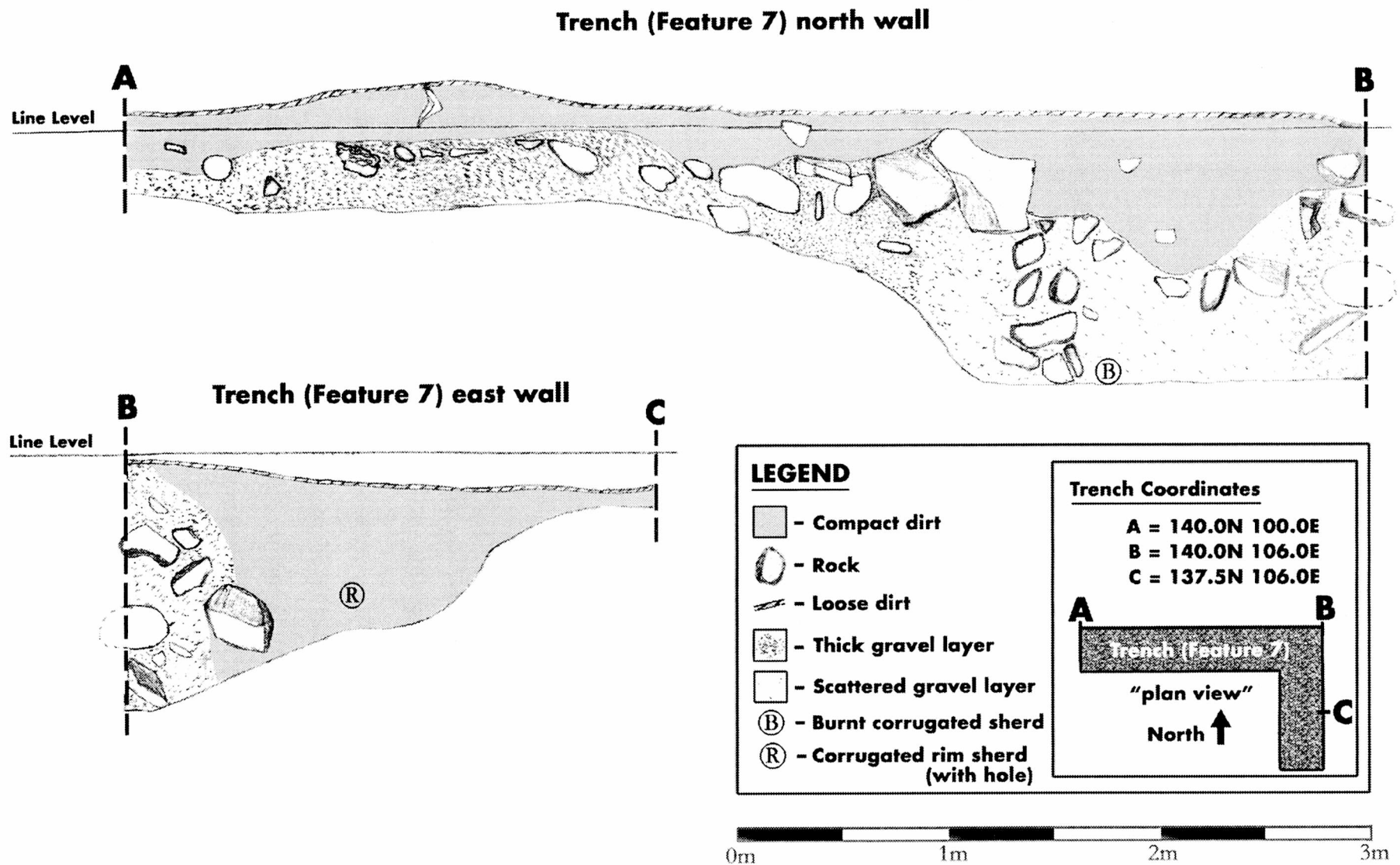


Figure 13. Trench (Feature 7) profile.

(personal communication 2002) believes this isolated sherd was inadvertently kicked into the trench during excavation of adjacent units. A corrugated rim sherd was found at the bottom of the sterile soil in the east wall. This provenience is clearly due to backfilling of the looter's digging. Not surprisingly, the greatest number of sherds ($n = 209$) was collected from this large excavation area. Sherd types include primarily Shinarump and Virgin series with plain, decorated and corrugated surface treatments. Corrugated types were found at the lowest excavation levels, as well as to the maximum depth of excavation (1 m below datum at the northeast corner of the trench). Clearly temporal types were not stratigraphically positioned and proveniences had been altered by prehistoric and modern activities on the small knoll.

Features at the northern end of the site had been significantly impacted by modern activities and erosion down the slopes of the knoll. The attached storage rooms and cist at the northeastern edge had only a maximum of 28 cm of sediments covering the floors. Modern artifacts lying in close proximity to floor surfaces leave little doubt that prehistoric proveniences are unreliable. In addition, a modern burn event extended across one of the storage rooms and part of the adjacent room to the north. This fire was within 10 cm of the floor surfaces, again indicating prehistoric discard patterns were no longer present. The fire likely resulted from a modern hearth outside the western walls of the attached storage units where fire blackened rocks were found. Further complicating provenience data for the contiguous storage units was the protective soil cover placed to prevent further structural deterioration of The Watchman Site. Structural walls were simple vertical slabs, and floors combined flat slabs and cobbles with little adobe found to further seal the floors. More labor-intensive construction may not have been necessary on this very rocky knoll; however, the heavy effects of modern use that were found throughout this site undoubtedly destroyed some of the original construction methods. At the northwestern edge of the knoll, damage was so extensive that configuration or function of the feature could not be determined.

At the western and southwestern margins of the site, features fared somewhat better. Although the hearth on the western slopes is well-defined, no radiocarbon date was obtained and only ten sherds were collected in the shallow soils. Association of the sherds with the hearth is as likely the result of modern looting and use of the knoll, and

thus redistribution of surface artifacts, as to any prehistoric use. The two storage cists at the southwestern slope retain the greatest integrity. Radiocarbon dates are consistent with sherds found in the excavated soils and structural elements remain in place with the exception of some erosional movement downslope.

Likewise, the centrally located hearth at the northern portion of the site returned a radiocarbon date that is supported by the ceramic types found in the hearth. Although depth to the bottom of the hearth was only 20 cm, the rocky surface where the hearth was constructed appears to have protected the feature from significant disturbance.

Ground Stone

Fifteen ground stone artifacts were collected and one grinding slick (Feature 2) was recorded in the field. The ground stone assemblage is composed of one bifacial mano and ten unifacial manos, one bifacial grinding slab, two unifacial grinding slabs, one jar lid, and the grinding slick. Only three of the eleven manos are complete, while all of the grinding slabs are fragments. Sandstone is the dominant material, accounting for all of the grinding slabs and the grinding slick, the jar lid and over one-third of the manos. In order of abundance, the remaining manos were produced from: volcanic (basalt & dacite), sedimentary (limestone) and metamorphic (quartzite) materials. A summary of the characteristics of the ground stone assemblage is presented in Table 3.

Manos

Eleven manos were found and collected. Four of these were found within features. A unifacial sandstone mano fragment (catalog no. 14399) was recovered from Feature 6. This feature was a surprisingly undisturbed hearth, with only 20 cm of soil removed before the blackened rocks of the basal surface were encountered. A radiocarbon date was obtained from charred material (A.D. 1010 – 1300; Pueblo II to Pueblo III). This preservation seems extraordinary given the disturbance to the attached features found roughly 2 to 3 m northeast of this hearth. Only a very small portion of one surface of this mano fragment exhibits grinding use. The stone may have been intended

Table 3. 42WS126 Ground Stone Characteristics.

Type and Location	Catalog No.	Material Type	Plan View/ Cross Section	Striation Axis (Face 1/ 2)	Worn Area (Face 1/ 2)
Manos					
→ Fragment - Feature 8	14391	Limestone	Rectangle/Flat	*Short/Short	42cm²/37cm²
→ Fragment - Northeast slope	14374	Limestone	Rectangle/Flat	*Long	10cm ²
→ Fragment - Feature 8	14378	Metavolcanic	Square/Convex	*Indeterminate	30cm ²
→ Complete - Feature 8	14381	Quartzite	Circular/Flat	Long	70cm ²
→ Fragment - South surface	14393	Basalt	Circular/Convex	Indeterminate	68cm ²
→ Fragment - South surface	14394	Basalt	Oval/Irregular	Short/Random	58cm²/44cm²
→ Fragment - Western trench	14395	Sandstone	Irregular/Flat	*Indeterminate	12cm ²
→ Fragment - South surface	14397	Dacite	Irregular/Irregular	Short & Long	29cm ²
→ Fragment - Feature 6	14399	Sandstone	Oval/Flat	Short	10cm ²
↔ Complete - North slope	14401	Sandstone	Oval/Convex	*Long	106cm ²
→ Complete - North slope	14463	Sandstone	Circular/Convex	*Indeterminate /*Long	53cm²/25cm²
Grinding Slabs					
Fragment	14396	Sandstone	Square/Concave	Long	63cm ²
Fragment	14400	Sandstone	Rectangle/Flat	*Indeterminate Indeterminate	82cm²/49cm²
Fragment	14402	Sandstone	Irregular/Flat	*Long	122cm ²
Grinding Slick					
Complete	N/A	Sandstone	N/A	*Long/Indet	2550cm ²
Jar Lid					
Fragment	14392	Sandstone	Circular/Flat	Random	60cm ²

Descriptions: → = One-hand mano; ↔ = Two-hand mano; * = Light to moderate battering; Bifacially ground = **Bold**

for use as a “boiling stone” for cooking food. Hot rocks are well documented ethnographically for various cooking techniques (Jensen et al. 1999).

One complete mano and two mano fragments were recovered from Feature 8, an isolated circular storage cist. Preservation appears to be relatively good at this feature as well. A fragment of a unifacial mano fragment (catalog no. 14378) was found on the surface of the feature. Only a 30 cm² area is ground and the striation axis could not be determined on this metavolcanic rock. The second mano fragment (catalog no. 14391) was found between 40 to 50 cm depth, and it is bifacially worn. Although this specimen is typed as a one-hand mano, the maximum length is 10.1 cm and the analyst considered the discard condition to be less than half of the original form. If this assumption is correct, the mano would have been in the size range recorded for two-hand manos. In addition, striations are along the short axes on both faces, which suggest that this may have been a maize processing tool. At the bottom of the feature (50 – 60 cm depth), a complete quartzite unifacial mano (catalog no. 14381) was found in association with two sherds and two flakes. Striations on this mano are along the long axis. A radiocarbon date was obtained from charred material (A.D. 700 – 900; Basketmaker III to Pueblo I) at the same level as this mano.

The remaining seven manos were not associated with features. Two of these manos (catalog nos. 14401 and 14463) were found down the north slope of the small hill, and outside the collection grid. These two manos are complete and both are sandstone. The two manos were not associated with any other artifacts. Catalog no. 14401 is a two-hand mano, and this specimen has the greatest area of use wear (106 cm²) of the entire mano collection. Striations are along the long axis, suggesting processing of materials other than maize. The second mano (catalog no. 14463) found outside the collection grid is bifacially worn. Striation patterning could not be determined for the face with the greater worn area (53 cm²), while the opposing face had striations along the long axis but in an area roughly half that size. Both of the manos manifest attributes expected for generalized tasks or non-intensive processing of small seeds.

Three other manos (catalog nos. 14393, 14394, and 14397) were collected during the 2-x-2-m grid surface collection in the southern third of the site. All of these manos are fragments with moderate wear. Striations and areas of wear for these three manos are summarized in Table 3. Only one face of one of the manos (catalog no. 14394) combines short axis striations with a moderately large area of wear (58 cm²). However, this fragment is 10.2-x-10.2 cm and the

discard condition was inferred to be greater than half of the original artifact. Therefore, the designation of a short axis striation orientation may be misleading if the original artifact was basically oval. In addition, the striation pattern of the opposing face is described as random which is consistent with generalized tasks (Schlanger 1991) rather than with maize processing.

The remaining two mano fragments (catalog nos. 14374 and 14395) that were not associated with a feature are equally non-descript. Catalog no. 14374 has a miniscule 10 cm² of wear, with striations along the long axis. This fragment was found down the northeastern slope of the hill and it may have been used in construction of a feature in the contiguous rooms. Wear on the fragment clearly is not consistent with substantial plant processing. Striation patterning could not be determined on catalog no. 14395, and the area of wear was only slightly larger (12 cm²) than that recorded for catalog no. 14374. Catalog no. 14395 was found at a depth of 0 and 20 cm in the western end of the trench.

To summarize the mano assemblage, only three of the eleven manos were complete, including the sandstone two-hand mano, and one sandstone and one quartzite one-hand manos. The other eight manos are midsection or edge fragments. The amount of wear on the mano assemblage was considered to be light to moderate. None of the manos exhibited heavy use wear. Battering ranged from none to moderate, with some showing small areas of heavy battering on the margin. Heavy edge battering on these implements supports an inference of generalized or multi-task tools rather than processing of plant materials. The striation patterns were generally along the long axis, as was the case for the three complete manos and two of the mano fragments. The rest of the fragmented manos were recorded with short axis, random and indeterminate striation patterns; however, due to the fragmented nature of the specimens these determinations may not be accurate. Examination of the wear characteristics of this assemblage does not support a significant amount of plant processing at this location. Referring to these specimens as “manos” may be misleading if that term carries the assumption of plant processing. In addition, given the ample evidence of modern disturbances to this site, any plant processing tools with significant wear may have been removed. However, we cannot base our inferences on conjecture. The data presented here supports generalized tasks performed with the objects rather than substantial preparation of plant resources.

Grinding Slabs

The only bifacial grinding slab (catalog no. 14400) was found on the surface of Feature 1. Provenience for the implement cannot be associated with activities in this feature due to the presence of historic artifacts found just above the floor surface of the storage room (see Feature 1 above). One face of the slab had a substantial use area (roughly 60% of the surface), but striation axes could not be determined for either face of this sandstone utensil. One grinding slab fragment, catalog no. 14396, was found in the first 20 cm of excavation in the central portion of the east-west trench. The worn area is only 63 cm² and the specimen is only slightly larger than the mano fragments. The largest grinding slab (catalog no. 14402) was found at the eastern end of Feature 11, the collapsed wall of unknown function. This specimen may have been part of the collapsed structure. All of the grinding slabs are relatively flat, rectangular to irregular in shape, with moderate wear. The low incidence of secondary battering on any of the stones indicates a lack of heavy re-pecking to resurface the grinding areas.

Other Ground Stone

One of the ground stone artifacts was identified as a possible jar lid (catalog no. 14392). This flat, circular stone was ground and abraded around the perimeter perhaps to serve as a vessel cap. However, there is no evidence of an adhesive material such as clay to substantiate this typology. Although this specimen was collected from Feature 1, a storage room, excavation revealed historic artifacts subsurface. Therefore, we cannot associate this artifact specifically with activities of the storage room.

The grinding slick was found on a large boulder located near the southeastern boundary of the site (Figures 6 and 12). This grinding slick was called Feature 2 and is described in the Feature section above.

Grinding stones at The Watchman Site strongly suggest that little food processing occurred at this location. Both manos and grinding slabs are most remarkable for their modest wear patterns. Secondary battering to resurface worn grinding areas is quite rare. Fragmentation and end battering of the manos indicate the stones served other purposes besides a grinding function. One mano found in the central hearth feature may have been destined to serve as a boiling rock. Although striations found along the short axis of manos has been experimentally shown to correlate with two-hand manos and maize processing, the collected specimens bearing

this trait are fragments, making the original shape essentially a guess. A lack of any trough metates, the reciprocal implement for maize processing, provides further evidence that the manos with short axis striations cannot be inferred to have been used in this capacity.

Ceramics

A total of 1,167 sherds were collected. Six wares were present in the assemblage, including Tusayan Gray Ware and White Ware, Shinarump Gray Ware, White Ware, and Red Ware, and Moapa Gray Ware. At present, Tusayan Wares are believed to be ceramics produced in the St. George Basin. In the present analysis, Perry follows Thompson (1986) in his revisions of Colton's (1952) landmark ceramic typology for the Virgin Branch Ancient Puebloan area. That is, rather than presenting the local ceramics as a separate Ware, the Tusayan Wares (known from the Kayenta Branch region) are subdivided into a Virgin series that parallels the developments of the Kayenta ceramics. Discrimination of types among the Tusayan Wares is based upon differing tempers and clays. Shinarump Wares may also have been produced in the St. George Basin, although Dalley and McFadden (1986) consider these Wares to be restricted to the higher elevations of the Kanab, Utah area. Although Thompson (1986) anticipated that the Shinarump ceramics would also be a series of the Tusayan Wares, subsequent work resulted in Perry using a separate Ware typology. Moapa Gray Ware is distinctive to the Mt. Trumbull area in Arizona, and its occurrence at The Watchman Site was likely the result of trade between people of the St. George Basin and the higher plateaus of the Arizona Strip. In addition, three pieces of fired mud with quartz inclusions were collected.

The ceramic assemblage included sherds from painted bowls, and plain and corrugated jars. Quantities and percentages of each ceramic Ware and type, along with their respective vessel forms, are shown in Table 4. Photographs of a sample of the ceramic types are shown in Figure 14. Jar sherds were more abundant than bowl sherds. Eighty percent of the ceramic assemblage is jars, or a 4.1:1 jar/bowl ratio. Such a ratio supports an inference that this site was primarily a storage facility.

Two Washington Black-on-gray bowl sherds that fit together (Figure 14a and a') were collected from the floor of Feature 8, a circular storage cist on the southwestern edge of the site. Walling et. al. (1986) found Washington Black-on-gray in a context dated to approximately A.D. 700 to A.D. 900 at the Quail Creek sites. The Washington Black-on-gray type is generally

Table 4. 42WS126 Pottery Types and Forms.

WARE	TYPE	QUANTITY	% OF TOTAL	JARS	BOWLS
Tusayan	North Creek Gray	575	49.3	445	130
Gray Ware	North Creek Corrugated	236	20.2	236	---
	Washington Black-on-gray	2	0.2	---	2
White Ware	St. George Black-on-gray	2	0.2	---	2
	North Creek Black-on-gray	2	0.2	---	2
	Hurricane Black-on-gray (corrugated)	1	0.1	---	1
	Pipe Spring Black-on-gray (corrugated)	1	0.1	---	1
	Black-on-gray, Virgin Series	20	1.7	---	20
Shinarump	Shinarump Plain	26	2.2	19	7
Gray Ware	Shinarump Corrugated	212	18.2	211	1
	Virgin Black-on-white	2	0.2	---	2
White Ware	Toquerville Black-on-white (corrugated)	19	1.6	1	18
	Unnamed Black-on-gray	23	1.9	---	23
	Unnamed Black-on-gray (corrugated)	16	1.3	---	16
Red Ware	Kanab Red	2	0.2	---	2
Moapa	Moapa Corrugated	24	2.1	24	---
Gray Ware	Slide Mountain Black-on-gray	1	0.1	---	1
Fired mud with quartz inclusions		3	0.2	---	---
TOTAL		1167	100	936	231

considered a stylistic transition from Mesquite Black-on-gray to St. George Black-on-gray (Buck and Perry 1999). However, Buck and Perry (1999) report the three Black-on-gray types (Washington, Mesquite and St. George) co-occur at Hurricane Ridge, a Basketmaker III site where a suite of dates center around A.D. 650. A Basketmaker III period is consistent with a radiocarbon date obtained from Feature 8 (A.D. 700 - 900). With the exception of these Washington Black-on-gray bowl sherds and the 18 pieces of a globular jar recovered from the bottom of Feature 9, no spatial clusters of particular ceramic types could be identified. The largest quantity of sherds ($n = 209$) came from the trench. Unfortunately, over half of these sherds (55%) were from the northeast corner where the roughly one meter deep hole had been dug and refilled. Only three contexts can confidently be ascribed as the locations where sherds were discarded prehistorically rather than due to modern disturbances within the site.

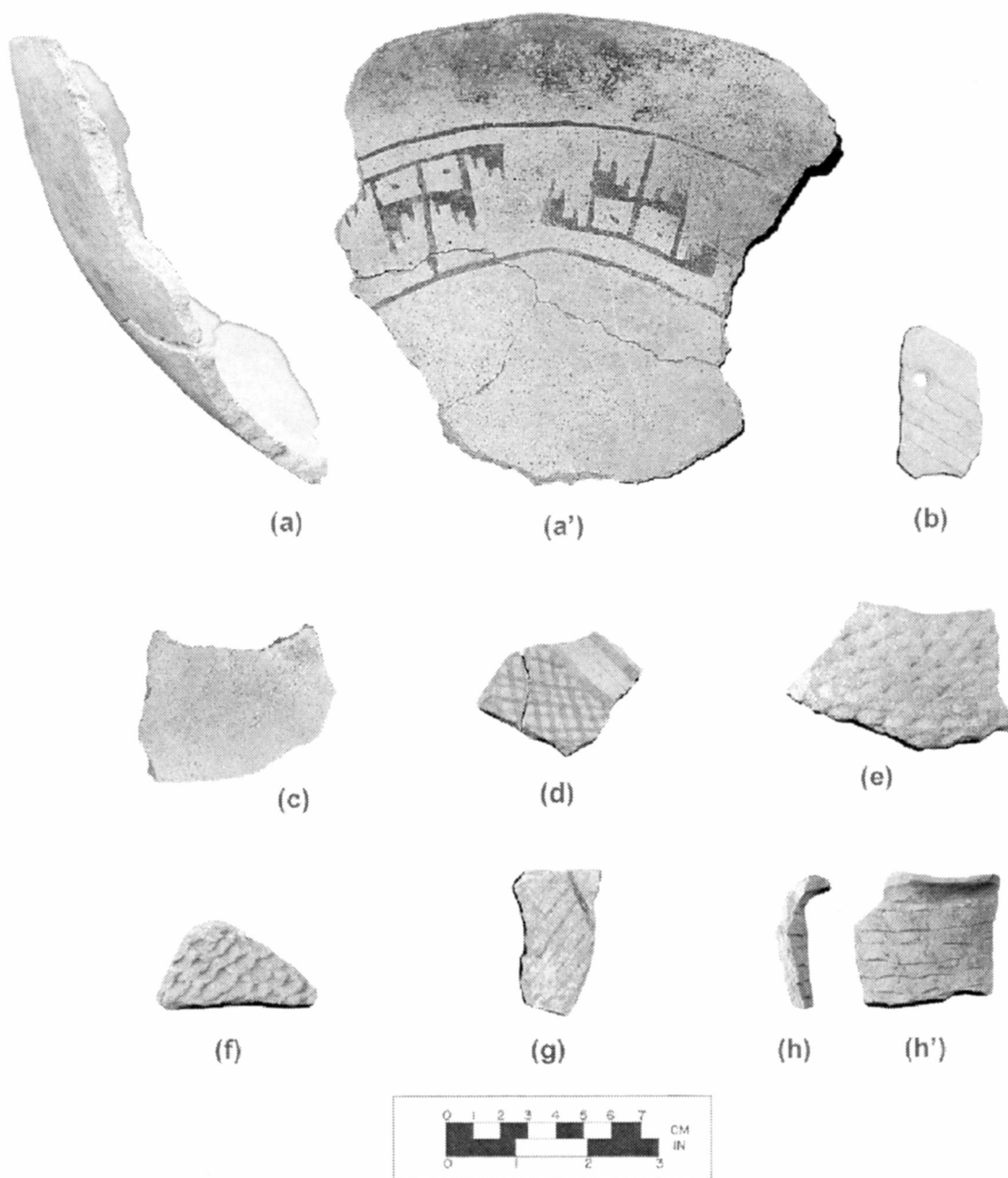


Figure 14. The Watchman Site (42WS126) ceramic sherds.

- (a) #14000 – Washington black on gray (edge view), (a') #14000 – WBG (interior);
- (b) #14013 – Hurricane black on gray (corrugated);
- (c) #14017 – North Creek Gray;
- (d) #14025 – Indeterminate black-on-gray, Virgin Series;
- (e) #14033 – North Creek Corrugated;
- (f) #14034 – Moapa Corrugated;
- (g) #14135 – Toquerville black-on-white;
- (h) #14200 – Shinarump Corrugated (edge view), (h') #14200 – SHC (exterior).

Feature 6, the hearth, had only four sherds, all of which were at the lowest level (only 20 cm). A radiocarbon date of A.D. 1010 - 1300 from the same level is not inconsistent with the sherd types (North Creek Series). In Feature 8, a radiocarbon date indicating a Basketmaker III to Pueblo I construction period for the cist was obtained from the bottom of the cist, along with the Washington Black-on-gray sherds described above. The 16 North Creek Series sherds in the soils above this context may be the result of Pueblo II midden deposits. Feature 9 contained 64 sherds of Tusayan and Shinarump Wares. A radiocarbon date from the cist suggests construction occurred during the Pueblo I to early Pueblo II time period. Sherds of corrugated types were found throughout the excavated levels, including the lowest level. The cist may have been used as a midden during later occupations, but the association of corrugated sherds with the late Pueblo I radiocarbon date shows this surface treatment was present at that time which is consistent with the earliest dates reported by Thompson (1986).

An examination of surface treatment shows plain wares (51.5%) and corrugated wares (40.4%) account for 91.9% of the ceramic assemblage. Table 5 summarizes the quantities and percentages of ceramic surface treatments. These results are not surprising for a site having storage only structural features.

Table 5. 42WS126 Surface Treatment.

Surface Treatment	Quantity	Percentage
Plain	601	51.5
Corrugated	472	40.4
Painted	89	7.6
Red	2	0.2
Undetermined	3	0.3
Total	1167	100

Lithics

A total of 414 lithic artifacts were recovered. The modest formed tool assemblage consists of only one indeterminate type projectile point fragment and eight bifaces. Expedient tools include one utilized flake, one edge-modified flake, a chopper and a hammerstone. Four cobbles were typed as assayed cobbles, defined here as less than three flakes removed in order to determine the quality of the stone for flaking. Four cores were also collected. Table 6 shows the overall lithic assemblage.

Table 6. 42WS126 Lithic Assemblage.

Chipped Stone Type		Quantity	Percentage of Total
Tools	Bifaces	8	36.4
	Projectile Point	1	5.4
	Edge-Modified Flake	1	5.4
	Utilized Flake	1	5.4
	Hammerstone	1	5.4
	Assayed Cobble/Pebbles	4	18.2
	Chopper	1	5.4
	Core	4	18.2
	Total	22	100
Debitage	Decortication Flakes	73	18.6
	Core Reduction Flakes	198	50.5
	Pressure Flakes	6	1.5
	Bifacial Thinning Flakes	27	6.9
	Shatter	81	20.7
	Indeterminate	7	1.8
	Total	392	100

Tools

The projectile point fragment (catalog no. 14389) is a proximal segment with one of the shoulders and the most proximal portion of the haft element missing.

Approximately half of the blade is estimated to remain. The material is a pale reddish chert matrix mottled with brown and white color variations. A lustrous texture indicates the material has been heat treated. The point is too fragmented to assign a type; however it is a corner-notched form and the small size indicates it was affixed to an arrow rather than a dart shaft.

Two of the biface fragments (catalog nos. 14369 and 14375) are made of a similar red chert material as was used to fashion the projectile point. Both of the bifaces may have been fragments of finished projectile points or they may have broken prior to completion of the hafting segment. Both of these specimens also exhibit the glossy texture consistent with heating of chert that is evident on the projectile point material. The material is generally of good quality but minor inclusions have resulted in manufacturing failures. Catalog no. 14365, a Stage IV medial biface fragment, is a beige coarse-grained chert with a slight luster. The artifact is likely the medial section of a

projectile point blade, however, it lacks any haft element. Likewise, catalog no. 14362 is a Stage IV fragment that may have been modified from a broken projectile point. Two lateral margins converge to a fracture plane that has been further modified. At the proximal portion, there is no hafting element yet the margins constrict into a point. The material used to manufacture this artifact is a gold chert matrix with linear black and red color variations. Three of the bifaces are Stage III fragments (catalog nos. 14266, 14293, and 14371). Raw material for these bifaces ranges from a red chert, to a mottled red, white and black chert, to a poor quality white to gray chert, respectively. The red chert material is likely from the same parent stone or source as the projectile point and two of the earlier stage bifaces described above. Finally, a Stage I biface fragment (catalog no. 14367) is made from a poor quality light to dark gray chert. The biface has approximately one third of one face covered in cortex or an internal pseudo-cortex.

A white chert core reduction flake (catalog no. 14387) has two small portions of opposing lateral edges modified by microflaking. Both of the modifications occur near the striking platform, and one of the segments is overlain with stepped damage resulting from use wear. The chert does not appear to have been heated, as the texture is matte. Microflaking edge modification is also apparent on the distal margin of a dark brown quartzite core reduction flake. No use wear is evident on the edge.

The brown welded tuff chopper (catalog no. 14380) has only slight modification to one edge of a smooth, roughly rectangular cobble. A large flake was removed from one face and smaller flake scars overlay the initial removal scar. Additional flaking on the margin of the opposing face has created a wedge shaped tool with a somewhat blunt margin. The hammerstone (catalog no. 14388) is a small limestone cobble with extensive battering on one side. On the opposing side, a smaller battered segment is also apparent.

Assayed pebbles include two gray-to-white chert specimens, one of dark red and black chert, and one of a smooth, round ignimbrite type material. None of the four cores are of the same material as the formed tools.

Debitage

Debitage from the site totaled 392 flakes, or 94.6% of the total lithic assemblage.

Chert (60%) and limestone (37%) are almost exclusively the raw materials reduced at The Watchman Site. The remaining four percent of the debitage is sandstone, quartzite and basalt. Core reduction flakes are the predominant flaking stage (32%) and 126 of these are various colored cherts. Approximately half of the chert debitage is of colors similar to the formed tools, indicating reduction occurred at the site. Nevertheless, tool production was a minor activity here. No concentrations of debitage were found, and the distribution of tools and debitage indicates random proveniences. Modern activities and bio-turbation have clearly impacted the lithic assemblage as also was found with the majority of sherds.

In summary, the projectile point, eight bifaces, and the utilized flake are all made of chert. Sixty percent of these tools and roughly half of the debitage may be of the same source material, allowing for color and texture variations often expressed within chert source areas. The remainder of the manufactured tools is a disparate collection that provides little insight beyond inferences of limited tool manufacture, retooling and/or use at this location. Likewise, the assayed stones, cores, chopper and hammerstone provide only modest suggestions of unknown tasks performed beyond the primary site function of food storage. The very limited modifications to these stones indicates they were likely acquired locally and discarded when the quality was found lacking, or an expedient function was fulfilled. The small chert assemblage is consistent with tools and debris found in temporary camps where retooling or the manufacture of one or two projectile points or bifacial knives is undertaken. Assayed stones, debitage of various other materials, the chopper and the hammerstone may not be associated with the chert assemblage at all, but with tasks associated with food storage. Unfortunately the toolstone materials could not be geographically limited to activity areas and, thus, correlation of tasks with occupational events cannot confidently inferred.

Macrobotanical and Faunal Remains

Soil samples were sent to the Paleoethnobotany Laboratory at UCLA for analysis (Martin and Popper 2000). Two of these samples were collected from hearth features (Features 6 and 10), and one was removed from the ash layer (Feature 5) distributed across Feature 3.

None of the analyzed samples contained carbonized domesticated plants. The sample from Feature 5 contained two Indian ricegrass seeds and five pine needle fragments. Feature 5 was a modern burn event so these carbonized samples cannot provide data on prehistoric diet. All other samples were wood charcoal from saltbrush, juniper, pine, and poplar/willow, all of which grow in close proximity to the site. Feature 10 was recorded as a disturbed hearth, and it is located within a half meter of the modern burn ash layer found in Feature 3. Because of this proximity, Feature 10 may simply be a portion of that modern burn. Although Feature 6 was a contained hearth, the sediments in the feature were quite shallow. Nevertheless, only fuel remains were identified.

Five faunal specimens were recovered, but the fragmentary nature of the bones does not allow identification to species. Four of the bones are apparently bird, and one fragment is from a medium to large mammal. Unfortunately, all of the specimens were from the surface or disturbed contexts and are likely of modern origin.

Extremely sparse faunal and macrobotanical specimens were found in this site. All of the specimens are modern in origin. No data regarding prehistoric diet could be obtained from this analysis.

Radiocarbon Dates

Four charcoal samples from The Watchman Site were submitted to Beta Analytic, Inc. for analysis (Table 7). The dates from Features 6 (hearth) and 5 (ash layer) were obtained through standard radiometric dating techniques, while the samples from Features 8 and 9 were obtained from Accelerated Mass Spectrometer (AMS). Data from these analyses is summarized in Table 7.

Table 7. 42WS126 Radiocarbon Dates.

Lab Sample	Material	Provenienc	Uncalibrated	Calibrated Age (2 sig.)
120 (Beta-147322)	Charred mat.	Feature 6	840 $\pm$ 90 B.P	A.D. 1010-1300
132 (Beta-147323)	Charred mat.	Feature 8	1210 $\pm$ 40 B.P.	A.D. 700-900
149 (Beta-147324)	Charred mat.	Feature 9	1110 $\pm$ 40 B.P.	A.D. 870-1010
186 (Beta-147325)	Charred mat.	Feature 5	20 $\pm$ 50 B.P.	Outside of calib. range

Chapter Five

DISCUSSION

The Watchman Site is a small Virgin Branch Ancestral Puebloan storage site. Storage structures include two isolated cists and an arc-shaped arrangement of attached storage facilities. The site is located on a small knoll east of the floodplain of North Fork of the Virgin River. No pithouse was found on the knoll. As discussed in Chapter 1, site 42WS1064 is likely to have been a habitation associated with the use of these storage facilities, but, at present, no analysis has been undertaken to establish links between the two sites. Integrity of The Watchman Site had been badly compromised by modern activities as well as erosion. Artifacts associated with the northern features of the site were clearly not in primary contexts thus allowing no definition of activity areas. Fewer impacts had occurred at the two cists on the southwestern slope of the knoll where the features had been affected primarily by erosion of the downslope walls. Radiocarbon dates obtained from the two cists are consistent with isolated storage features reported for other Virgin Branch Ancestral Puebloan sites (Lyneis 1995; Walling et al. 1986). Sherds found in the upper levels of the cists suggest the structures were also used as middens by more recent Formative period peoples.

Substantial impacts to features and movement of artifacts, including illegal digging, seriously limit any inferences we can make about the data collected from The Watchman Site. With few exceptions, distributions of both ceramic and lithic artifacts show no patterning by type or material. All of the structures found at the northern margins of the knoll had significant loss of wall segments. Shallow soils covering the floors of the attached storage features (Features 1, 3, and 4) on the northeastern edge of the site included historic artifacts and modern burn events. However, an intact hearth (Feature 6) was found only four meters west of the attached features. A radiocarbon date (A.D. 1010 – 1300) from wood charcoal suggests the hearth is associated with the northeastern features. This inference is based upon previous research at Virgin Branch sites where curving alignments of storage facilities are characteristic of the Pueblo II to Pueblo III period (Lyneis 1995). The trenches placed in east-west and north-south

transects across the central portion of the site revealed a roughly one-meter deep irregularly shaped area where it is presumed looters had excavated. This hole had been dug in very close proximity to the northeastern features and it had been backfilled prior to data recovery efforts. Both of the isolated storage cists (Features 8 and 9) at the southwestern edge of the site had erosional impacts to the walls. However, sufficient fill remained intact to preserve burned material and a substantial number of sherds. Radiocarbon dates (A.D. 700 – 900 and A.D. 870 – 1010, respectively) obtained from deposits in the bottom of these cists are consistent with Basketmaker III to early Pueblo I Formative periods when unattached cists are defining architectural characteristics of Ancestral Puebloan sites. In addition, pottery types found in the cists correlate well with the radiocarbon dates. Sherds recovered from the upper excavation levels suggest the cists may have been used subsequently as prehistoric trash deposits.

Radiocarbon dates as well as pottery types clearly show the site was re-used on several occasions. Although some of the lithic debris may have been generated after the Formative period, no artifact types are present that would strongly support such an inference. The earliest radiocarbon date indicates initial construction was an isolated cist (Feature 8) during the Basketmaker III period. A second cist (Feature 9) was likely constructed in the Pueblo I or early Pueblo II period. The northeastern part of the site has attached storage units that are consistent with changes in architecture recorded in other sites dated to the Pueblo II period (Lyneis 1995; Walling et al. 1986). A radiocarbon date for the Pueblo II period was obtained from the centrally located hearth suggesting the hearth is associated with the contiguous storage rooms and cist. No artifacts that clearly pre-date or post-date the Ancestral Puebloan cultural tradition were found during surface collection or excavation, with the exception of a historic .22 cartridge and modern glass fragments.

Artifacts recovered indicate the site was used almost exclusively for storage, with minimal processing tasks also performed. The ceramic jar to bowl ratio (4.1:1) supports this inference. It is surprising that there was such a large number of bowls (231) in the ceramic assemblage. However, only 68 of the bowl sherds had painted designs, and the remainder was corrugated types. Current research suggests corrugation of ceramic surfaces make the vessel less likely to break during heating. The corrugated bowls may

have been used in that capacity, but further study of the bowl sherds would be necessary to make any conclusion on use characteristics. Utilitarian wares such as North Creek Gray were the most abundant (49.3%), with corrugated sherds composing a large percentage (40.4%) as well. The higher rates of plain sherds versus painted sherds (51.5% vs 7.6%) and jar sherds versus bowl sherds (80% vs 20%) also indicate utilitarian use of the site.

All of the structures with intact floors show that the rooms were used for storage. No interior fire hearths, or features expected for a dwelling structure, were found in the rectangular rooms. At the northwest margin, a badly disturbed feature was excavated to determine if there was a subsurface floor and no evidence of such a surface was found. Trenching in the central portion of the site also found no indication of a buried structure or floor.

Only two charred Indian rice grass seeds and a single charred pine needle were found in the macrobotanical samples. All of the floral remains were associated with the modern burn event in Feature 3 and cannot be considered prehistoric. Wood charcoal in the centrally located hearth was the only other plant material found in flotation samples. Tiny fragments of uncharred bone were recovered. The specimens are too fragmentary to make a determination of species. Four of the fragments are from birds and one piece is from a large mammal. All bone fragments were from the surface and are likely modern.

Although the number of tools typed as grinding implements would appear to indicate a substantial plant processing tool kit, the attributes of the individual ground stones do not support this inference. Perhaps using the traditional “mano” typological name is misleading if the type designation is assumed to directly correlate with plant processing. Experimental and ethnographic studies have shown that many generalized processing tasks, other than plant processing, result in ground surfaces on stones. For this reason, we examined the wear characteristics of the ground stone to see if there was sufficient evidence that the tools had been used to process seeds or grains.

Ground stones from The Watchman Site are mostly fragmentary, and grinding areas are quite small. Ethnographic and replication studies have shown that small grinding areas are unlikely to be the result of processing large amounts of food for storage (Lancaster 1986). Additionally, analysts described the intensity of grinding use

on all of the portable ground stone artifacts as low to moderate. After repeated food processing with a grinding stone, the working surface becomes too smooth to break down the seeds or grains being processed. The implement can be resurfaced to a sufficiently coarse texture by battering or pecking the ground area. Such pecking was found to be light to moderate on the ground surfaces in this assemblage; however, battering was more commonly identified on the margins of the implements and this edge modification was frequently described as “heavy.” The high incidence of battering on the ends of the mano fragments strongly suggests these specimens were multi-task tools. Only one two-hand mano was collected. Striations on this larger mano are inconsistent with studies of the effects of corn processing on these tools, i.e., striations are along the long axis of the stone rather than perpendicular to that axis. Finally, no trough metates were recovered from the site.

Other activities that can result in ground surfaces on artifacts include grinding sherds for temper in clays used to produce ceramics, and processing wood, bone, hide and shell. Considering the fragmented nature of the hand-held ground stone assemblage, people may have been crushing small fragments of stone for use as ceramic temper, and the pounding effects eventually resulted in failure of the stone. Additionally, twenty percent of the debitage collection is shatter, or blocky pieces of stone that can result from tool manufacture as well as from using a stone as a pounding implement. Tempers recorded for the ceramics include quartzite, basalt, limestone, and sandstone, which are the material types of 9 of the 11 manos. However, we cannot confidently correlate the shattered stone with the temper at this point, and there were no features or artifacts that support ceramic production. Nevertheless, striations on the “mano” stones, relatively small surface areas showing grinding wear, and the mano sizes strongly suggest that processing corn was not among the activities performed with these tools.

The grinding slick did have intensive use wear. Due to the canted surface of the boulder where the grinding slick is found, it is unlikely that this surface was used for processing seeds or grain. That is, it is sufficiently slanted that it would not provide a level surface where small seeds or grains of corn would not simply roll to the ground. No attributes of the grinding slick were identified that would allow a determination of what activity resulted in the use area found on the boulder. Given the significant disturbances

to The Watchman site, additional analyses that might yield organic residues from the ground surfaces of the artifacts appear to be unwarranted. This is especially true as the attributes recorded and presented in this report do not support intensive plant processing with these tools. Rather, all available evidence indicates that processing likely occurred at the habitation site (42WS1064) downslope, and the processed food was carried on to the knoll for storage. A single jar lid was found which is consistent with the location functioning as a storage facility.

A small amount of debitage was collected, along with a projectile point. The debitage included flakes that appear to be of the same material as the projectile point so it may have been fashioned at this location and discarded when it broke during manufacture. Six bifaces of materials similar to the debitage also supports the notion that some manufacturing of tools occurred here. The small amount of pressure flakes argues against tool manufacture, but these tiniest of flakes are notoriously hard to recover in sites. We have no information on potential sources for the chert tools or debitage found in the site. A review of other sites in Zion Canyon describes white and red chert tools and debitage. These were also the most common colors of chert found at The Watchman Site. All other toolstones are available on the knoll or immediately adjacent areas.

No clear midden areas were identified. The upper levels of the two unattached cists contained deposits that may be the result of discarding broken ceramics in the cists during the more recent prehistoric occupations. If so, the debris was very limited and indicates very brief stays on the knoll.

Only 2.1 percent of the ceramic assemblage is Moapa Wares, manufactured in the Mt. Trumbull area in Arizona. Of that percentage, 24 sherds were typed as Moapa Corrugated, all of which are jar fragments. Although the pieces were not refit, this small collection may represent a single jar. Shinarump Wares comprise 25.4 percent of the sherds recovered. If Dalley and McFadden (1988) are correct that Shinarump ceramics were produced around Kanab, Utah, these sherds may attest to trade or contacts with groups to the east. No other non-local artifacts were collected from the site.

Conclusions based upon data collected at The Watchman Site are clearly tenuous. Associations of artifacts with features cannot, in most cases, be assumed to be the result of prehistoric behaviors. Construction characteristics of the northern features have been

seriously altered by exposure, erosion, and foot traffic. The two largely intact cists and the centrally located hearth can provide only limited information about activities that occurred at The Watchman Site.

Site 42WS1064 is a habitation site located downslope from The Watchman Site knoll, and it is clearly the best candidate to be associated with at least some of the storage facilities described in this report. Ceramics recovered during testing of 42WS1064 are diagnostic of mid to late Pueblo II developments. Attached storage features found at the northeastern edge of The Watchman Site are also consistent with Pueblo II architectural developments. A radiocarbon date from the hearth in close proximity to these contiguous storage features also supports use of the knoll during the Pueblo II period. Abundant ground stone, 36 stone tools, and a large quantity of debitage were recovered during testing of 42WS1064, which would partially explain the meager amounts of these artifact types recovered from The Watchman Site. Although only limited testing of 42WS1064 was undertaken, 511 sherds were collected, which is 44 percent of the total of sherds recovered from complete data recovery at The Watchman Site. In order to protect site 42WS1064 from modern activities in the Watchman campground, sterile soil was placed across the assemblage after testing some of the features. Future research at 42WS1064 would likely provide a better comparative context from which to draw conclusions about the prehistoric activities that occurred at The Watchman Site.

Macrobotanical and faunal remains were nonexistent at The Watchman Site precluding those data sets from which to draw subsistence inferences. The ground stone assemblage does not meet expectations for processing corn, or even extensive processing of smaller seeds. As noted above, food processing may have occurred at 42WS1064 and The Watchman Site would then have served as a pantry. If Larson and Michaelson (1990) are correct in their climatic reconstruction, floods may have been a significant threat during some periods. Positioning storage facilities on the knoll would then protect the resources from floodwaters of the North Fork of the Virgin River.

The Watchman Site is located close to a tributary of the Virgin River as are virtually all Virgin Ancestral Puebloan sites in the St. George Basin. Dalley and McFadden (1988) consider this positioning of sites to argue for a heavy reliance upon corn throughout most of the Formative period. However, a greater diversity and

abundance of native plants is also coincident to dependable water sources. Barlow's research (2002) indicates that foragers are most likely to maintain knowledge and use of native plants despite the addition of cultivation to the subsistence regimen. Fluctuations in precipitation described by Larson and Michaelsen (1990) would likely lead to flexible strategies wherein native and cultivated plants were used in accordance with local environmental conditions and coincident resource availabilities.

If we then consider Hegmon's research (1994) and the derived expectations, architecture at The Watchman Site indicates that the storage facilities were not constructed to limit access. That is, the lack of barriers to the storage rooms and cists suggests at least a partially foraging economy and dispersed populations in Zion Canyon throughout the Formative period. The limited number of sites having structures that have been recorded in Zion Canyon supports this inference. Only nine of 36 sites report structural walls. One of the sites bears traits associated with Basketmaker II, two sites are thought to be associated with Basketmaker III, and one site is reported to have Pueblo II or III diagnostic artifacts. A time frame could not be determined for the remaining sites having structural features. No sites recorded to date in Zion Canyon indicate long-term habitation. Apparently populations were sufficiently sparse that limitations on access to stored foods were not warranted. With so few sites in Zion Canyon, and no clear habitation sites, the canyon may have served primarily for foraging where wild resources were stored and small plots of cultivated plants were also used.

References Cited

Adams, Jenny L.

- 1989 Methods for Improving Ground Stone Artifact Analysis: Experiments in Mano Wear Patterns. In *Experiments in Lithic Technology*, edited by D.S. Amick and R.P. Mauldin, pp. 259-276. BAR International Series No. 528, Oxford.

Aikens, C. and D. Madsen

- 1986 Prehistory of the Eastern Area. In *Great Basin*, edited by W. L. D'Azevedo, pp. 149-160. Handbook of North American Indians, vol. 11, W.C. Sturtevant, general editor, Smithsonian Institution, Washington, D.C.

Barlow, K. Renee.

- 2002 Predicting Maize Agriculture Among the Fremont: An Economic Comparison of Farming and Foraging in the American Southwest. *American Antiquity* 67(1):65-68.

Beck, C. and G.T. Jones

- 1988 Western Pluvial Lakes Tradition Occupation of Butte Valley, Eastern Nevada. In *Early Human Occupations in Far Western North America: The Clovis Archaic Interface*, edited by J.A. Willig, C.M. Aikens and J.L. Fagan, pp. 273-302. Nevada State Museum Anthropological Papers No. 21.
- 1990 The Late Pleistocene/Early Holocene Archaeology of Butte Valley, Nevada: Three Seasons' Work. *Journal of California and Great Basin Anthropology* 12(2):231-261.

Bedwell, S.F.

- 1973 *Fort Rock Basin: Prehistory and Environment*. University of Oregon Books, Eugene.

Buck, Paul E. and Laureen Perry

- 1999 A Late Basketmaker III Storage and Habitation Site Near Hurricane, Utah. *Kiva* 64(4):471-494.

Burgett, Gaylen R.

- 1990 *Aboriginal Hunter-Gatherer Adaptations of Zion National Park, Utah*. Midwest Archaeological Center Technical Report No. 1. Midwest Archaeological Center, National Park Service, U.S. Department of Interior, Lincoln, Nebraska.

Canaday, Timothy W.

- 2001 *High-altitude Archaeological Investigations at Cedar Breaks National Monument, Utah*. Cultural Resources Selections No. 17, Intermountain Region, National Park Service, Denver.

Colton, Harold S.

- 1952 *Pottery Types of the Arizona Strip and Adjacent Areas in Utah and Nevada*. Museum of Northern Arizona Ceramic Series No. 1, Flagstaff.

Colton, Harold S., and Lyndon Lane Hargrave

- 1937 *Handbook of Northern Arizona Pottery Wares*. Museum of Northern Arizona Bulletin No. 11, Flagstaff.

Conner, Melissa, and Susan M. Vetter

- 1986 *Archaeological Investigations in Zion National Park*. Midwest Archaeological Center. Occasional Studies in Anthropology No. 19. National Park Service, Lincoln, Nebraska.

Cordell, Linda S.

- 1984 *Prehistory of the Southwest*. Academic Press, Inc., Orlando.

Dalley, Gardiner F., and Douglas A. McFadden

- 1985 *The Archaeology of the Red Cliffs Site*. Bureau of Land Management Cultural Resource Series No. 17, Salt Lake City.

- 1988 *The Little Man Archaeological Sites: Excavations on the Virgin River Near Hurricane, Utah*. Bureau of Land Management Cultural Resource Series No. 23, Salt Lake City.

Davis, W.

- 1989 The Lime Ridge Clovis Site. *Utah Archaeology* 2:66-76.

Elston, R.G.

- 1986 Prehistory of the Western Area. In *Great Basin*, edited by Warren d'Azevedo, pp. 135-148. Handbook of North American Indians. Smithsonian Institute, Washington, D.C.

Ferris, Dawna

- 2000 *Research Design for Data Recovery and Stabilization of an Ancestral Puebloan Site (42Ws126) in Zion National Park, Washington County, Utah*. Presented to Zion National Park, Springdale, Utah.

Grayson, Donald K.

- 1993 *The Desert's Past: A Natural Prehistory of the Great Basin*. Smithsonian Institution, Washington, D.C.

Gregory, Herbert E.

- 1950 *Geology and Geography of the Zion Park Region Utah and Arizona*. Geological Survey Professional Paper 220. United States Government Printing Office, Washington D.C.

Heath, Kathleen M.

- 1988a Appendix I: Macrofossils and Micro-Refuse Analysis From the Little Man Sites. In *The Little Man Archaeological Sites: Excavations on the Virgin River Near Hurricane, Utah*, ed. By Gardiner F. Dalley and Douglas A. McFadden, pp. 303-319. Bureau of Land Management Cultural Resource Series No. 23, Salt Lake City.
- 1988b Appendix II: The Red Cliffs Flotation Analysis. In *The Little Man Archaeological Sites: Excavations on the Virgin River Near Hurricane, Utah*, ed. by Gardiner F. Dalley and Douglas A. McFadden, pp. 320-328. Bureau of Land Management Cultural Resource Series No. 23, Salt Lake City.

Hegmon, Michelle

- 1994 Boundary-Making Strategies in Early Pueblo Societies: Style and Architecture in the Kayenta and Mesa Verde Regions. In *The Ancient Southwestern Community*, ed. W.H. Wills and R.D. Leonard, pp. 171-190.

Janetski, Joel C.

- 1993 Variability in Virgin Anasazi Subsistence Strategies: The Faunal Record. Paper Presented at UPAC Meetings, Cedar City, Utah.

Jensen, Kristen, Jill Jensen, and Celeste Clegg

- 1999 Inferring Intensity of Site Use from the Breakdown Rate and Discard Patterns of Fire-Cracked Rock at Playa View Dune. *Utah Archaeology* 12:51-64.

Kiver, Eugene P., and David V. Harris

- 1999 *Geology of U.S. Parklands*. John Wiley and Sons, Inc. New York.

Lancaster, James W.

- 1986 Ground Stone. In *Short-term Sedentism in the American Southwest: The Mimbres Valley Saldoa*, ed. by B. A. Nelson and S. A. LeBlanc, pp. 177-790. University of New Mexico Press, Albuquerque.

Larson, Daniel O. and Joel Michaelsen

- 1990 Impacts of Climatic Variability and Population Growth on Virgin Branch Anasazi Cultural Developments. *American Antiquity* 55(2): 227-249.

Larson, Daniel O., Hector Neff, Donald A. Graybill, Joel Michaelsen, and Elizabeth Ambos.

- 1996 Risk, Climatic Variability, and the Study of Southwestern Prehistory: An Evolutionary Perspective. *American Antiquity* 61: 217-241.

Lyneis, Margaret M.

- 1982 Prehistory in the Southern Great Basin. *Man and Environment in the Great Basin*. SAA Papers No. 2. Society for American Archaeology, Washington D.C.

Lyneis, Margaret M.

1992 *The Main Ridge Community at Lost City: Virgin Anasazi Architecture, Ceramics, and Burials*. University of Utah Anthropological Papers No. 117. Salt Lake City.

1995 The Virgin Anasazi: Far Western Puebloans. *Journal of Prehistory* 9(2): 199-241.

Lyneis, Margaret M., Mary K. Rusco, and Keith Myhrer

1989 *Investigations at Adam 2 (26Ck2059): A Mesa House Phase Site in the Moapa Valley, Nevada*. Nevada State Museum Anthropological Papers No. 22. Carson City, Nevada.

Madsen, David

1982 Get it Where the Gettin's Good: A Variable Model of Great Basin Subsistence and Settlement Based on Data From the Eastern Great Basin. In *Man and Environment in the Great Basin*, edited by David B. Madsen and James F. O'Connell, pp. 207-226. Society for American Archaeology Papers 2.

1989 *Exploring the Fremont*. Utah Museum of Natural History, University of Utah Occasional Publication Number Eight, Salt Lake City.

Madsen, D. and S. Simms

1998 The Fremont Complex: A Behavioral Perspective. *Journal of World Prehistory* 12(3):255-336.

Martin, Steve Lynn

1996 *A Dietary Reconstruction for the Virgin River Branch Anasazi: Subsistence in a Marginal Environment*. Ph.D. Dissertation, University of California, Los Angeles. University Microfilms, Ann Arbor.

McFadden, Douglas, A.

1996 Virgin Anasazi Settlement and Adaptation on the Grand Staircase. *Utah Archaeology* 9(1): 1-34.

Pearsall, Deborah M.

1989 *Paleoethnobotany: A Handbook of Procedures*. Academic Press, New York.

Perry, Laureen M.

1998 *A Comparison of Temper Characteristics Between Virgin Anasazi Black-on-Gray Bowl Rim Sherds and Plain Gray Jar Rim Sherds from Yama-2 and Yama-3*. Unpublished Master's Thesis, Department of Anthropology and Ethnic Studies, University of Nevada, Las Vegas.

Pettijohn, F.J., P. E. Potter, and R. Siever

1972 *Sand and Sandstone*. Springer-Verlag, Berlin.

Price, B.A. and S.E. Johnston

- 1988 A Model of Late Pleistocene and Early Holocene Adaptation in Eastern Nevada. In *Early Human Occupations in Far Western North America: The Clovis-Archaic Interface*, edited by J.A. Willig, C.M. Aikens, and J.L. Fagan, pp. 231-250. Nevada State Museum Anthropological Papers No. 21.

Schlanger, Sarah

- 1991 On Manos, Metates and the History of Site Occupations. *American Antiquity* 56(3): 460-471.

Schroeder, Albert H.

- 1955 *Archeology of Zion Park*. University of Utah Anthropological Papers No. 22. Salt Lake City.

Shutler, Richard, Jr.

- 1961 Lost City: Pueblo Grande de Nevada. *Nevada State Museum Anthropological Papers* 5. Carson City.

Simms, S.R.

- 1987 *Behavioral Ecology and Hunter-Gatherer Foraging*. BAR International Series, 381, Oxford.

Stewart Guy R., and Maurice Donnelly

- 1943 Soil and Water Economy in the Pueblo Southwest. *Scientific Monthly* 56:31-44.

Stone, Tammy

- 1994 The Impact of Raw Material Scarcity on Ground-stone Manufacture and Use: An Example from the Phoenix Basin Hohokam. *American Antiquity* 59(4): 680-694.

Thompson, Richard A.

- 1988 The Ceramics of the Little Man Sites. In *The Little Man Archaeological Sites: Excavations on the Virgin River Near Hurricane, Utah*, ed. Gardiner F. Dalley and Douglas A. McFadden, pp. 226-241. Bureau of Land Management Cultural Resource Series No. 23, Salt Lake City.

- 1986 Material Culture: Ceramics. In *Excavations at Quail Creek*. Bureau of Land Management Cultural Resource Series, No. 20, Salt Lake City.

Wallace, W.J.

- 1962 Prehistoric Cultural Development in the Southern California Deserts. *American Antiquity* 28(2):172-180.

Walling, Barbara A.

- 1988 *Worked Stone and Debitage*. In *The Little Man Archaeological Sites: Excavations on the Virgin River Near Hurricane, Utah*, ed. Gardiner F. Dalley and Douglas A. McFadden, pp. 242-274. Bureau of Land Management Cultural Resource Series No. 23, Salt Lake City.

Walling, Barbara A., Richard A. Thompson, Gardiner F. Dalley, Dennis G. Weder

- 1986 *Excavations at Quail Creek*. Utah Bureau of Land Management Cultural Resource Series, No. 20, Salt Lake City.

Warren, Claude N.

- 1967 San Dieguito Complex: A Review and Hypothesis. *American Antiquity* 32(2):168-185.

Warren, Claude N., and Robert H. Crabtree

- 1986 Prehistory of the Southwestern Area. In *Great Basin*, edited by Warren d'Azevedo, pp. 183-93. Handbook of North American Indians, Volume 11. Smithsonian Institution, Washington, D.C.

Westfall, Deborah

- 1987 *The Pinenut Site: Virgin Anasazi Archaeology on the Kanab Plateau of Northwestern Arizona*. Bureau of Land Management, Arizona Cultural Resource Series No. 4, Phoenix.

Yohe, R.

- 1992 *A Reevaluation of western great basin cultural chronology and evidence for the timing of the introduction of the bow and arrow to eastern California based on new excavations at the Rose Spring site (CA-INY-372)*. Ph.D. dissertation, University of California, Riverside.

