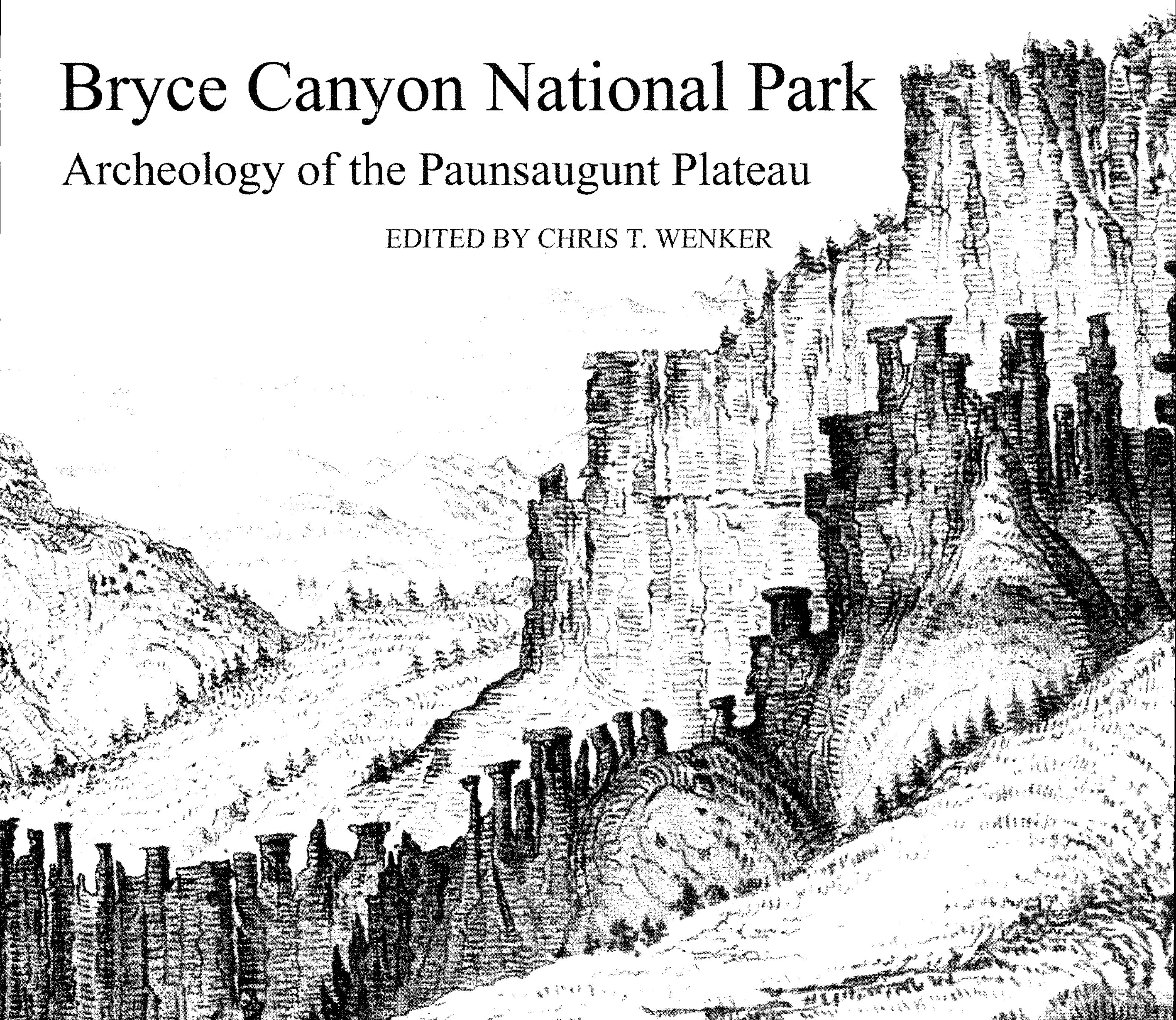
Intermountain Cultural Resources Management
Archeology Program

Bryce Canyon National Park

Archeology of the Paunsaugunt Plateau

EDITED BY CHRIS T. WENKER



Intermountain Cultural Resources Management
Professional Paper No. 69

Cover: *Headwaters of Paria Creek from Rim of the Basin – Southern Utah, 1872*, by John E. Weyss. Originally published in 1889 as Plate VI in *Report upon United States Geographical Surveys West of the 100th Meridian, in Charge of Capt. Geo. M. Wheeler. Volume 1, Geographical Report.*

United States Department of the Interior
NATIONAL PARK SERVICE
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In Reply Refer to:
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July 7, 2005

Memorandum

To: Director, Denver Service Center
Attention: Chief of Operations, Technical Information Center

From: Program Manager, Archeology Program, Intermountain Regional Office

Subject: Report Transmittal

In accordance with the Departmental Manual (481 DM 3b(3)), we are submitting two copies of the report entitled *Bryce Canyon National Park: Archeology of the Paunsaugunt Plateau,* edited by Chris T. Wenker.

A Report Certification for public access is also enclosed.

Jim Bradford

Enclosures

cc:
Superintendent, Bryce Canyon National Park, w/o encls.

Report Certification

I certify that *Bryce Canyon National Park: Archeology of the Paunsaugunt Plateau*, edited by Chris T. Wenker (2003) has been reviewed against the criteria contained in 43 CFR 7.18(a)(1) and upon the recommendation of Sarah L. Horton, Zion National Park Archaeologist (in support of BRCA Cultural Resources), has been classified as Available.

Craig C. Axtell
Superintendent

9 Dec. 03
Date

Classification Key Words:

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Bryce Canyon National Park

Archeology of the Paunsaugunt Plateau

Edited by

Chris T. Wenker

With Contributions by

Sue Eininger

Cynthia Herhahn

Donald Irwin

Chris T. Wenker

Archeology Program

Cultural Resources Management

Intermountain Region

National Park Service

Department of the Interior

2004

Foreword

The spectacular formations of Cretaceous age limestone, sandstone, and shale that form the rugged, eroded landscape preserved as Bryce Canyon National Park have always aroused strong interest and opinion. The Southern Paiute believed that the brilliantly colored cliffs and pinnacles were petrified supernaturals known as the Legend People who were punished for their bad behavior by being instantaneously turned into stone as they lay or sat, with paint still on their faces—a story that explains the place name, *Angka-ku-wass-a-wits*, red painted faces. Ebenezer Bryce, one of the early Mormon ranchers in the area, and a man clearly driven by the practicalities of making a living, is said to have described the canyon that would later bear his name as "a helluva place to lose a cow." He left soon after, in search of a climate more suited to his wife's uncertain health.

By the 1920s, Ebenezer Bryce's rocky hell was being described by a Utah college professor as "nature's most delicate jewel," a bit of hyperbole that was enthusiastically endorsed by state politicians, government officials, the Union Pacific Railroad, and local businessmen who were already staking their economic future on an increased flow of tourists to the region. Bryce's transformation from hell to paradise was nearly complete when President Warren G. Harding proclaimed Bryce a national monument on June 8, 1923. Utah's Senator Reed Smoot was unsatisfied, however, arguing that Bryce must be nothing less than a national park. As part of a shrewd political campaign orchestrated by Smoot, Louis B. Cramton, a Michigan congressman and chairman of the Department of the Interior appropriations subcommittee, gave a rapturous radio broadcast later that year describing the proposed park's scenic splendors. Likening the Pink Cliff formations to an ancient, abandoned city, he asked his listeners to:

> Sit with me here near the chasm's brink as the sun drops low. Before your fancy presents to you the city beautiful, the myriad forms left in the disorder of chance after centuries of erosion resolve themselves into something planned. . . . The architecture is all in harmony. Great buildings rising hundreds of feet, passageways, sometimes but a few feet wide, separating one structure from another, but the walls erect and accurate, story upon story. (Scrattish 1985:77)

Despite Congressman Cramton's overblown archeological metaphor, Utah National Park was established by Congress on June 27, 1924 (the name reverted to Bryce Canyon in 1928). It seems fair to say that no one, not even Congressman Cramton, recognized that preservation of Bryce's magnificent natural landscape would also save the material remains of its unique cultural history for future generations.

Indeed, recognition of Bryce's scientifically important, but admittedly unspectacular archeology has been slow in developing. In 1974, when National Park Service archeologists Francis A. Calabrese and Adrienne Anderson went to the park to inspect a sewer line, there was not a single documented archeological site in the park's 56 square miles. The sewer line produced no archeological remains, but Calabrese and Anderson recorded two lithic scatters in the northwest corner of the park. Since then, through a series of federally mandated environmental compliance investigations, National Park Service archeologists have gradually pieced together more and more of the park's prehistory and history. When the Bryce Canyon Archeological Inventory Survey, described in this volume, was initiated in 2000, a total of 4,206 acres had been surveyed, and 53 archeological sites were known.

This volume, edited by Chris T. Wenker, with contributions by Wenker, Sue Eininger, Cynthia Herhahn, and Donald Irwin, reports on the archeological remains found within a 10,799 acre inventory survey conducted between 2000 and 2002 by the Anthropology Program of the National Park Service's Intermountain Support Office. The survey, which identified a total of 194 sites, was performed primarily to document and protect archeological sites within the densely wooded areas of the Paunsaugunt Plateau slated for prescribed burning. After nearly a century of strict fire suppression, most areas of the Paunsaugunt, which caps the Pink Cliffs, are heavily timbered, with deep accumulations of deadfall and duff. Because any fire will destroy perishable structures and artifacts and because most fires, even tightly controlled ones, generate temperatures capable of permanently altering stone, ceramic, glass, and metal artifacts, identifying archeological sites within burn areas is a necessary prerequisite to reestablishing a healthy forest ecosystem.

Because of the longstanding perception that Bryce has few archeological resources, it is fortunate that fire management provided the impetus for the present study. Had it not, it seems likely that misperceptions about the park's archeology would have continued unchecked. But, as readers of this monograph will learn, Bryce does have a substantial number of significant archeological sites. They span much of the human career in the New World, including late Paleoindian, Archaic, Puebloan, Paiute, and Historic Euro-American materials. Moreover, many have the potential to provide highly significant scientific data about human behavior and adaptation in this moist, highland environment.

The Bryce Canyon Archeological Inventory Survey was directed in its entirety by Chris Wenker. Chris's leadership, hard work, and enthusiasm for the park's archeology have resulted in the timely completion of a large and complex project in a professional manner that has exceeded everyone's expectations. In addition to a number of in-house survey products, Chris and his team have produced several companion reports to this volume. Chris and Cynthia Herhahn are the co-authors of *Bryce Canyon National Park: Management Planning Guide and Monitoring Plan for Archeological Resources*, a detailed guide to management of the park's archeological resources. The manual provides detailed guidance needed by park managers to eliminate or minimize fire impacts at archeological sites during future prescribed burns and wildfires. Unfortunately, because of the detailed proprietary information included in the report, it is not available to the public.

A third report, *Bryce Canyon National Park: Historic Aspen Dendroglyph Documentation Project*, is co-authored by Sue Eininger and Chris Wenker. It provides detailed documentation on 1,075 historic inscriptions found carved on park aspens. These inscriptions or dendroglyphs range in date from 1893 to 1948 and record the names, dates, and musings of three generations of local ranchers and sheepherders. In addition to being Bryce's most numerous and most fragile cultural resource, the inscriptions were also its most unexpected. Although some dendroglyphs were known prior to the survey, the large numbers of carvings encountered during the first season of work prompted Chris to request funding from the Utah Division of State History to support detailed recording and photography of the glyphs. The funding was granted, and with the kind assistance of Gayle Pollock, Executive Director of the Bryce Canyon Natural History Association, the funding has been used for this purpose. The Bryce Canyon Natural History Association hopes to produce a compact disk, for sale in the Bryce Visitors Center, illustrating the more decipherable and artistic glyphs.

Although over 12,000 acres, or about one-third of Bryce's land area has now been investigated, and 233 archeological sites are known, much remains to be learned about Bryce's human past. The immeasurably rugged two-thirds of the park below the Pink Cliffs, the very same terrain that may have helped convince Ebenezer Bryce to pursue ranching elsewhere, remains almost completely unsurveyed. Once intimately known by the Southern Paiute and Mormon pioneers like Bryce, this portion of the park remains undeveloped and largely unvisited today. Archeological exploration here will be fundamental to developing a balanced understanding of the human history of the region, and future archeologists who investigate this portion of the park will have the pleasure of revealing another piece of Bryce's rich history.

Robert P. Powers
Supervisory Archeologist
Archeology Program
February 2003

Acknowledgments

When one reminisces at the end of a long project, it sometimes becomes difficult to believe that so many helping hands pitched in. My greatest debt of gratitude goes to Sue Eininger, who, as crew chief and field assistant, patiently helped me work through many logistical hurdles during the entire duration of the survey. After the fieldwork, Sue worked diligently on all the routine database tasks, such as site-form production, but most importantly she contributed substantial portions of this report. Robert Powers, past Program Manager of the now-defunct Anthropology Projects program at the National Park Service Intermountain Support Office, originally invited me to take part in this project and provided wise guidance and enthusiastic support throughout the years. The entire contingent of the old Anthropology Projects staff also contributed too many hours of administrative, material, logistical, and emotional support to count.

Fred Fagergren, then-superintendent of Bryce Canyon National Park, welcomed the Support Office archeological crews to the park. Rick Wallen, who was then the Bryce Canyon National Park Chief of Resource Management, and the entire Resource Management team, especially deserve my thanks for their logistical support and warm comradeship (Rick's campfire desserts were especially appreciated). Craig Axtell, present park superintendent, provided many useful comments on a draft copy of this report.

Gayle Pollock, Executive Director of the Bryce Canyon Natural History Association, provided much administrative support as well as a wealth of first-hand knowledge about the natural and cultural history of the park. Doug McFadden, Grand Staircase-Escalante National Monument Archeologist, freely shared his knowledge of the region, provided copies of relevant archeological reports, and also volunteered to analyze the survey's ceramic collection. Marion Jacklin, Dixie National Forest Archeologist, helped us get oriented, provided access to the forest's site files, and took us on a much-appreciated archeological tour of the Paunsaugunt Plateau.

The field crews are commended for their perseverance and strength. They, of course, are the people who actually conducted all the hard work, day in and day out, week after week. In 2000, Shannon Arnold, Chris Bevilacqua, Tiffany Bustin, and Michael Kohler served as crew members, and Lisa Meyer was the laboratory archeologist. Short-term crew members included Bonnie Bagley-Tainter, Jocelyn DeHaas, Sarah Payne, and Marianne Tyndall. Amanda Knuteson and Howard Newman (VIP extraordinaire) volunteered most of the season, and Trixi Bubemyre and Kendall Bustin also volunteered for short periods. The 2001 field season welcomed Lance Martin, Marianne Tyndall, Ben Vining, and Sara Wendt as full-time crew members, Lisa Meyer as crew chief, and Stev Weidlich, who volunteered most of the season. Short-term volunteers included Elizabeth Bennett, Katherine Hauth, Meredith Linn, Howard Newman, Noam Saxonhouse, and Anne Whitman. Back in the office, Sandi Copeland spent many hours organizing the voluminous photographic records, and Julia Wise volunteered to help with file management and digital artifact photography.

As will be seen in the following chapters, Sue Eininger, Cynthia Herhahn, and Donald Irwin

conducted substantial background research and broke new ground during the creation of the chapters that constitute this report. Phil Geib, Jonathon Horn, Alan Reed, and National Park Service reviewers provided insightful and useful comments on draft versions of this report, but the final contents are entirely the responsibility of the project staff. Nancy Lamm skillfully drafted the illustrations of artifacts, features, and sites. Nancy Ford applied her technical editing, formatting, and indexing skills to the final manuscript. Susan Eubank of the Grand Canyon National Park library provided the cover illustration. Lex Newcomb of the Glen Canyon National Recreation Area and Dan Yarborough of the Grand Staircase-Escalante National Monument helped me find the GIS shaded relief maps used in this report.

The staff of the Utah Division of State History provided much useful guidance on various aspects of the fieldwork strategy, compliance report, and National Register nomination. In particular, the division saw fit to provide ancillary funding through a project grant that allowed us to conduct detailed aspen dendroglyph recording and to properly curate the thousands of resulting photographs. With the assistance of the Bryce Canyon Natural History Association, these funds proved essential to the successful completion of this segment of the project. Copies of all dendroglyph photographs and records are archived at the Division of State History office.

Many others helped in many ways over the years, and I thank them all. Despite the short time frame allotted for the creation of this volume, I hope the results of the survey prove useful to students of western American archeology and anthropology.

Chris T. Wenker
February 2003

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Introduction

Chris T. Wenker

Bryce Canyon National Park encompasses 14,502 ha (35,835 acres) on the eastern edge of the Paunsaugunt Plateau, in Garfield and Kane counties in western south-central Utah. The park is internationally renowned for its unique erosional landscape, where brilliantly colored stone pillars and hoodoos descend from the eastern rim of the plateau and fill the precipitous canyons below the Pink Cliffs (Figure 1.1). The Bryce Canyon Archeological Inventory Survey (AIS) represents the first large-scale, comprehensive archeological survey conducted in the park.

An Archeological Survey in Bryce Canyon National Park

This volume summarizes the archeological data and presents the interpretations resulting from a comprehensive survey of most of the park land that lies on the top of the Paunsaugunt Plateau. The area surveyed covers 4,370 ha (10,799 acres). This effort began in 2000 with the creation of a research plan and sampling strategy. The fieldwork was conducted during the summers of 2000 and 2001, and the data processing, analysis, and research that resulted in this report were accomplished in 2002.

This project was conceived and conducted primarily to collect archeological site-location and condition data for park planning and management purposes (Wenker and Herhahn 2002). Nonetheless, it is hoped that the inventory project will contribute substantially to archeological research in the American West by providing new information about the park's heretofore poorly known archeological record (e.g., Eininger and Wenker 2002). This information fleshes out our comprehension of the human history of southwestern Utah from nearly 10,000 years ago up to the advent of the modern era.

Bryce Canyon National Park contains evidence of human occupation and use dating from the late Paleoindian/early Archaic period transition through the middle and late Archaic periods. Sites and artifacts of post-Archaic archeological cultures in the park are affiliated with generalized Formative/late Prehistoric groups, with the Virgin Anasazi, and with Numic or Paiute groups. No signs of permanent Native American habitation (in the form of architectural features) exist in the park. Most sites represent short-term residential locales or special-use areas, such as hunting or gathering sites.

Euro-American archeological sites are just as numerous but are more diverse in their character. Although the Paunsaugunt Plateau was certainly used by settlers as early as the 1870s, the oldest known site or feature in the park is an inscription that dates to 1891. Many other ranching or shepherding sites with inscriptions date to the 1920s and

Figure 1.1. ***The Pink Cliffs with hoodoo rock formations in Bryce Canyon National Park, Utah, showing the southwestern face of East Creek Ridge, part of the Paunsaugunt Plateau. View facing to the northeast.***

1930s, but the frequency of this site type decreases thereafter. Instead, sites related to the National Park Service and associated concessionaires dominate the post-Great Depression archeological record.

Organization of the Report

The initial chapters of this report describe the setting and history of the park. The survey methods and results are outlined in later chapters, and descriptive, analytical, and interpretive chapters complete the volume.

First, in Chapter 2, Chris Wenker and Cynthia Herhahn describe the park's geographic setting and summarize the geologic, hydrologic, and climatic characteristics of the park that are relevant to human occupation. A review of the region's paleoclimatic conditions emphasizes the different ecological circumstances that prevailed in the past and outlines the changes with which the occupants of Bryce Canyon National Park contended.

Chapter 3, compiled by Sue Eininger, Cynthia Herhahn, and Chris Wenker, uses available archeological information and historical documentation to outline the known human history of the park. Of particular interest are several sections excerpted from a local cowboy's unpublished memoir. These excerpts describe the lifeways of Paiute groups who lived in the Bryce Canyon area during the late nineteenth century.

In Chapter 4, Wenker summarizes the archeological work conducted in Bryce Canyon National Park during the years leading up to the present large-scale survey. The number and types of previously recorded sites are summarized, primarily to provide baseline information that can be compared to and contrasted against the results of the 2000-2001 survey.

Herhahn and Wenker then describe the development and implementation of the Bryce Canyon AIS in Chapter 5. This chapter describes the field strategies and methods that were used during the survey. The research design that guided the project and directed the data analysis for this report is also presented, with the hope that future researchers of the archeology of the Paunsaugunt Plateau will find it a useful guide for defining additional research questions.

Chapter 6, prepared by Eininger, summarizes the results of the fieldwork. This chapter tallies and describes the range of archeological sites and isolated occurrences (IOs), as well as the types of artifacts and features, found in the project area.

Donald Irwin presents the results of a morphological analysis and a temporal assessment of the projectile points that were collected from the Native American sites in Chapter 7. Using projectile point data from this survey and previous park projects, Irwin also evaluates aspects of prehistoric and historic Native American settlement and subsistence in the project area.

In Chapter 8, Wenker draws on the projectile point analysis as well as other artifact and site data to more fully evaluate the Native American archeology of the Paunsaugunt Plateau. Wenker evaluates and compares the overall flaked stone artifact assemblages at Archaic, late Prehistoric/ Formative , and Numic/Paiute sites to assess the park's relative occupational intensities through time. Using artifact and feature data as well as geographic information, Wenker also evaluates the functions of the plateau-top sites and compares the apparent temporal changes in the use of the Paunsaugunt Plateau with regional trends.

In Chapter 9, Eininger presents a descriptive summary and interpretive evaluation of the Euro-American archeological material in the project area. Historic aspen dendroglyphs (bark inscriptions) are the most common and visible feature type on the plateau, and Eininger describes the types of inscriptions and summarizes the range of names and dates that are carved in the park's aspen groves. This chapter also evaluates the historic archeological materials in their functional roles and tracks the appearance or disappearance of various site or feature types through time. For example, periodic changes in land-management policies, such as the issuance of livestock-grazing permits, may be reflected in the distribution of some site and feature types.

The Bryce Canyon AIS was conducted partly to facilitate environmental compliance for the park's prescribed fire program, and abundant data relevant to previous fire effects and current on-site fuel loads were collected at each site. Chapter 10, by Wenker, presents a brief evaluation of the effects of recent prescribed fires on the visibility and condition of Native American archeological sites in montane meadows and heavily forested areas. Surprisingly, little effect from modern fire is reflected in the data.

Chapter 11, also by Wenker, summarizes the results and interpretations of the project and suggests potential avenues for future research. One glaring gap in the present data is apparent: the virtual absence of information about the archeological record of the foothills and canyons below the Pink Cliffs.

Several appendixes, numbered according to their relevant chapters, follow Chapter 11. The first appendix (6.1) presents a descriptive table summarizing the 194 archeological sites recorded during the survey. A list of IOs recorded in the project area is presented in the second appendix (6.2). Appendixes 7.1 and 7.2 present a coding key and analysis data for 123 projectile points collected during the survey. The final appendix (7.3) contains a report by Richard Hughes that describes the results of x-ray fluorescence analysis of 15 obsidian projectile points collected from the project area.

2

Setting and Environment

Chris T. Wenker and Cynthia Herhahn

> Up the Sevier (East Fork) a few miles and then to the left a few miles more until we came suddenly on the grandest of views. We stand on a cliff 1,000 feet high, the "Summit of the Rim." Just before starting down the slope we caught a glimpse of a perfect wilderness of red pinnacles, the stunningest thing out of a picture.

This passage from Grove Karl Gilbert's 1872 notebook, recorded during the Wheeler survey, is one of the earliest descriptions of the area destined to become Bryce Canyon National Park (Scrattish 1985:9–10). In the late nineteenth century, the great federally funded western survey expeditions focused on collecting geologic and geographic information about the American frontier, but the surveyors also recorded a wide range of information about the region's hydrology, climate, flora, fauna, and culture (Bartlett 1989). This chapter adopts a similarly holistic approach. Relevant aspects of Bryce Canyon National Park's natural history, including geography, geology, climate, and biological resources, are described. A review of the region's paleoenvironmental conditions is also presented. These topics set the stage for subsequent discussions of the park's human history.

Physiographic Setting

Bryce Canyon National Park occupies the eastern escarpment of the Paunsaugunt Plateau in western south-central Utah (Figure 2.1). The Paunsaugunt Plateau is among the southernmost of Utah's High Plateaus, which form part of the transitional zone between the western edge of the Colorado Plateau and the eastern margin of the Great Basin. The park literally straddles a divide between these two provinces, because water flowing off the eastern face of the Paunsaugunt Plateau drains into the Colorado River, while water flowing westward into the interior of the plateau feeds the East Fork of the Sevier River, which ultimately sinks into a land-locked lake in western Utah.

Together with its neighboring High Plateaus, the Paunsaugunt Plateau forms part of the highest level of Utah's Grand Staircase, which is a terraced series of sandstone cliffs and mesas that drop southward in steplike fashion toward the entrenched Colorado River. The Pink Cliffs, which define the southern and eastern perimeter of the Paunsaugunt Plateau, are the highest tier of cliffs in the Grand Staircase.

Local Landmarks

The Paiute referred to the Paunsaugunt Plateau as *Paunsagantï* (beaver place), so named because of its profile (Kelly 1964:xii, 147). The center of the Paunsaugunt Plateau lies at a lower elevation than the cliff rims that bound its western, southern, and eastern edges, and the entire plateau also dips gently to the north. The East Fork of the Sevier River collects its headwaters from the southern interior slopes of the plateau and flows northward

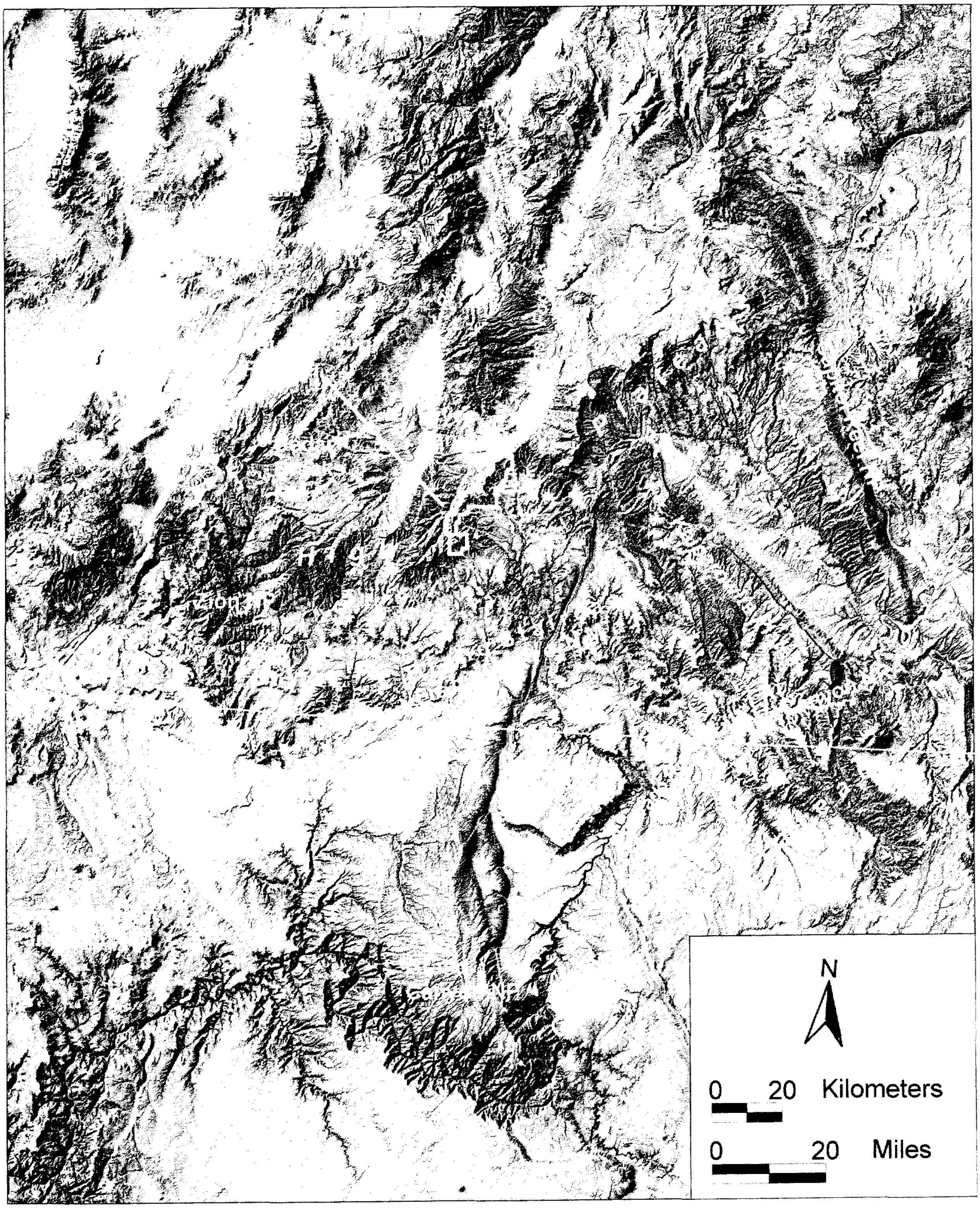


Figure 2.1. Location of Bryce Canyon National Park, Utah.

down the length of the plateau. Natural and cultural landmarks of the eastern Paunsaugunt Plateau that lie in and near Bryce Canyon National Park are illustrated in Figure 2.2.

Because Bryce Canyon National Park includes portions of the eastern plateau top as well as the canyons and foothills below, the terrain within the park boundary exhibits a great degree of topographic relief. The sheer Pink Cliffs themselves are in places over 90 m (295 ft) high, and from the rim of the Pink Cliffs to the canyon bottoms below, the elevation occasionally drops over 300 m (985 ft) over a horizontal distance of only 800 m (2,625 ft). Overall, elevations in the park range from 2,006 m (6,580 ft) above sea level (asl) along Yellow Creek to 2,778 m (9,115 ft) asl at Rainbow Point. The lowest plateau-top area in the park, along Utah State Route 12, lies at roughly 2,323 m (7,620 ft) asl.

Near the southern end of the park, Yovimpa Pass provides one of the few negotiable gaps through the southern Pink Cliffs. From this pass, the grassy montane valley of Podunk Creek drains northward into the plateau interior to feed the East Fork of the Sevier River. Northeast of the pass, Rainbow Point occupies the top of a promontory that juts eastward from the plateau rim. A high linear ridge extends north-northwestward from Rainbow Point. The eastern margin of this ridge is sheared by the Pink Cliffs, but the western face drops less steeply into the plateau interior (Figure 2.3). The northern end of this ridge is marked by a saddle at the head of east-facing Bridge Canyon. The relatively flat-topped Whiteman Bench extends northward from this saddle.

A dissected, narrow mesa, Whiteman Bench rises between the arms of the East Fork of the Sevier River on the west and East Creek on the east. The Pink Cliffs demark much of southeastern edge of the bench. The northeastern portion of Whiteman Bench lies in the interior of the Paunsaugunt Plateau, and the headwaters of East Creek derive from several narrow canyons along the eastern base of the bench. The southern and eastern branches of East Creek's valleys within the park converge in a series of open meadows collectively referred to as the East Creek Meadow (Figure 2.4, see also Figure 5.1).

East of Whiteman Bench, flat-topped East Creek Ridge juts southeastward from the plateau rim (see Figure 1.1). Just north of East Creek Ridge, Bryce Point also protrudes from the plateau. Most of the plateau-top terrain north of Whiteman Bench slopes westward to the plateau interior. This lower-elevation plateau-top region is studded with low hills and is crossed by broad, shallow canyons. From the cliffs below Bryce Point, the broad sweep of the Bryce Canyon amphitheater extends to the north. Fairyland Canyon forms another amphitheater farther north. The Pink Cliffs continue northward from Fairyland Canyon, but the escarpment becomes less precipitous and eventually grades into an area of steep, rugged badlands.

Bryce Canyon National Park is surrounded on all sides by large tracts of the Dixie National Forest. The Grand Staircase-Escalante National Monument also abuts part of the eastern park boundary, and private lands also lie to the east. The primary regional highway, Utah State Route 12, crosses east-west through the northern portion of the park. The main park highway, the Rim Road, enters the park from the north, passes the Bryce Canyon Lodge and Visitors Center area, and finds its southern end at Rainbow Point. A cluster of modern hotels and stores lies along the highway just north of the park. The nearest town, Tropic, lies below the park to the east, in the Paria River valley.

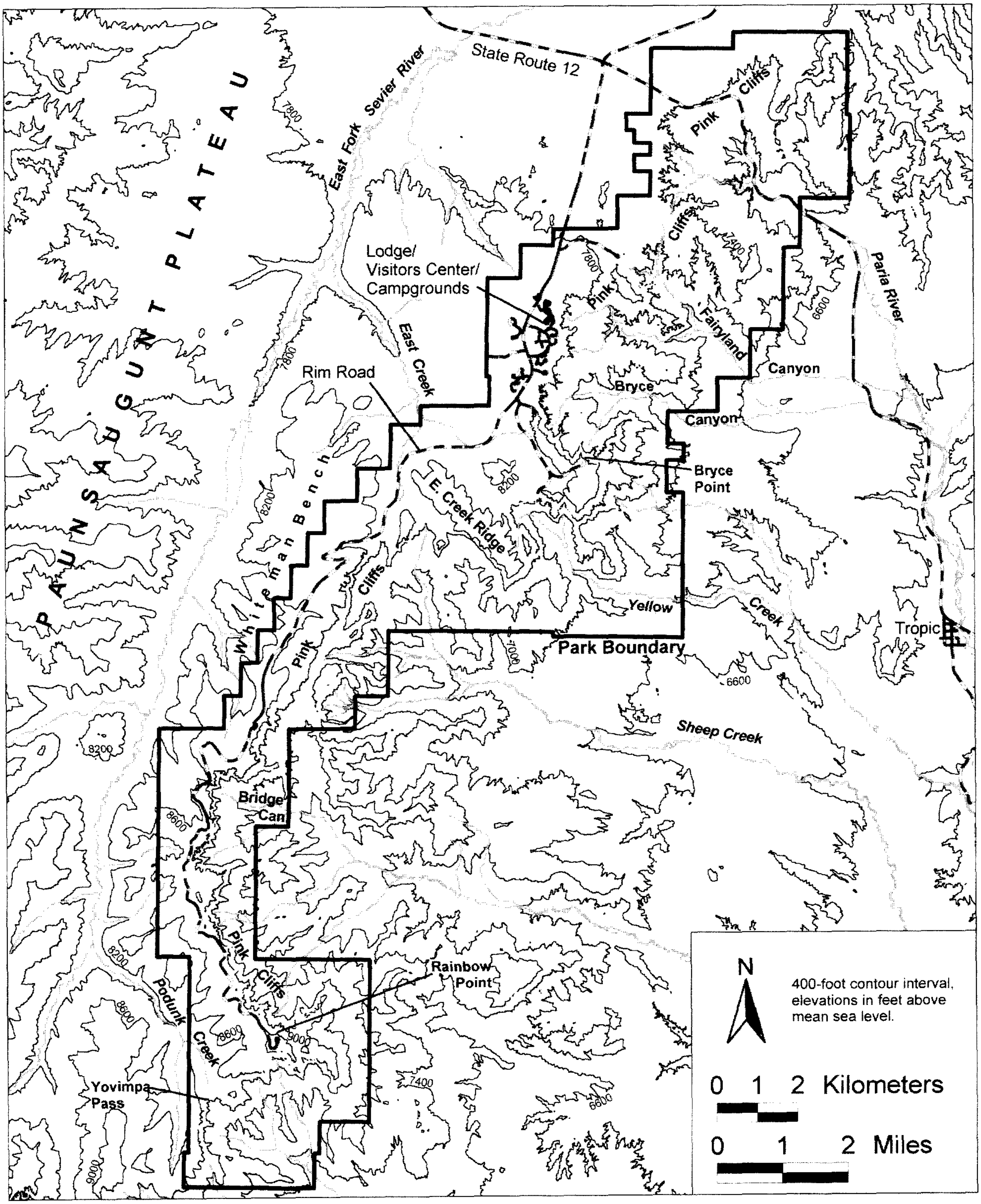


Figure 2.2. Vicinity map of Bryce Canyon National Park, Utah.

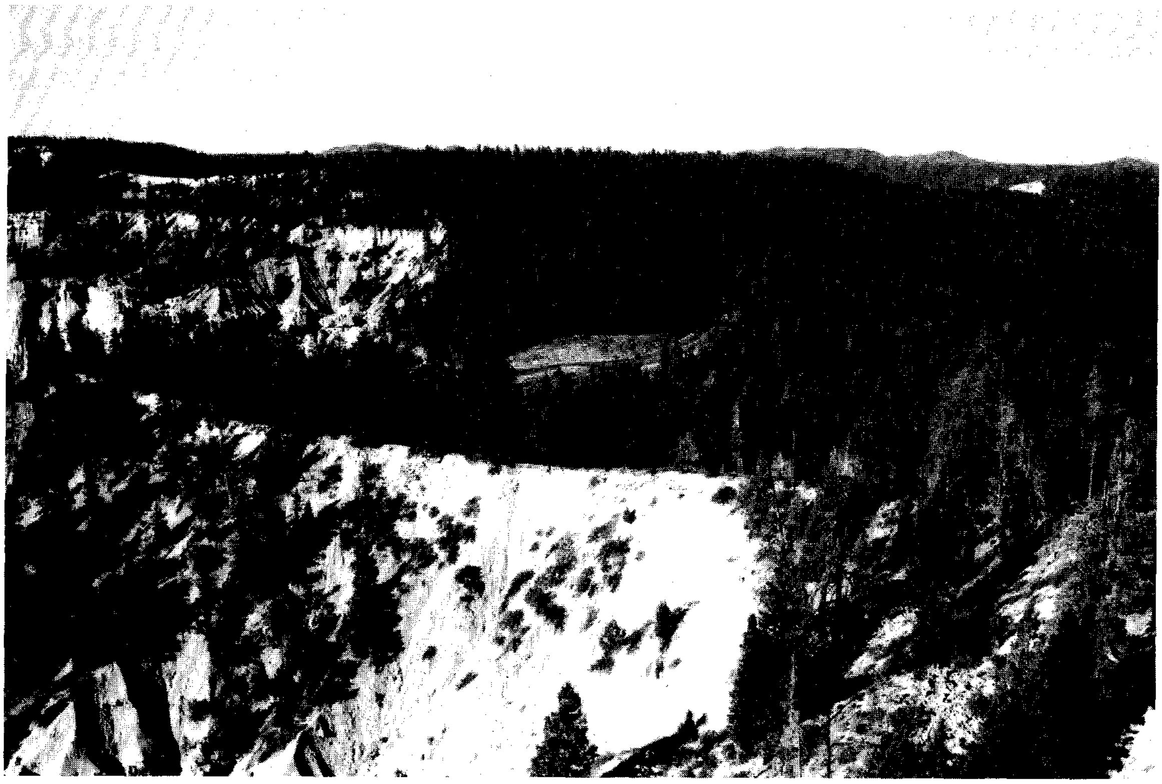


Figure 2.3. ***View of part of the Paunsaugunt Plateau from the southern end of Whiteman Bench, facing south. The Pink Cliffs lie on the left, the Rim Road is visible in the center, and the interior slopes of the plateau descend to the right.***

Geology

The eastern and western margins of the Paunsaugunt Plateau crustal block are marked by the Paunsaugunt and Sevier faults, respectively. The block immediately east of the Paunsaugunt Plateau once rose up to 425 m (1,395 ft) above the Paunsaugunt Plateau block, but the exposed rocks were softer and were more rapidly eroded. Hence, although the east-facing escarpment of the Paunsaugunt Plateau represents the down-thrust side of the fault, the plateau now stands over 300 m (985 ft) above the eroded Paria River basin to the east (Bowers 1991).

The Pink Cliffs are composed of the red, pink, and white beds of the Claron Formation, which dates to the early-to-middle Eocene Epoch. This formation consists mostly of interbedded, very fine-grained limestone and mudstone with small sedimentary clastic inclusions. A basal conglomerate of sandstone or sandy mudstone occasionally contains well-rounded pebbles and cobbles of quartzite, chert, and limestone. The Claron Formation, representing one of the youngest and most prevalent rock types in the park, is divided into two informal members. The upper white member (up to 90 m [295 ft] thick) is present only across the highest elevations in the park, including much of Whiteman Bench, Rainbow Point, East Creek Ridge, and Bryce Point. The underlying pink member (120–210 m [395–690 ft] in thickness) forms the capstone across most of the rest of the plateau. Rapid weathering and erosion along vertical joints and horizontal bedding planes in the Claron Formation produced the stone pillars and hoodoos for which Bryce Canyon National Park is renowned. At Bryce Point, the Claron Formation is uncomformably overlain by an unnamed, undated sandstone

Figure 2.4. ***View of East Creek Meadow, facing south toward the headwaters of East Creek* (center). *Whiteman Bench rises to the right. A dismantled 1930s Civilian Conservation Corps camp (Site 42GA3561) occupies the sparsely forested ridge in the left midground.***

conglomerate that contains abundant quartzite, chert, and limestone pebbles (Bowers 1991).

Formations underlying the Claron limestone are only exposed in the eastern portion of the park, below the Pink Cliffs. Cretaceous Period rocks include, in descending order, the Kaiparowits Formation, Wahweap Formation, Straight Cliffs Formation, Tropic Shale, and Dakota Formation. East of the park, Jurassic Period rocks including the Entrada Sandstone, Carmel Formation, and Navajo Sandstone are exposed in descending order along the Paunsaugunt fault zone (Bowers 1991).

Soil

Plateau-top soils in the park mainly represent the Pahreah–Syrett–Badland map unit, which includes soil types that are moderately deep and somewhat excessively drained, having formed in colluvium and residuum derived from sedimentary rocks. Below the Pink Cliffs, the soils in the northern part of the park (roughly north of Yellow Creek) fall in the Ruko–Rock Outcrop–Swapps map unit, while those south of Yellow Creek are part of the Badland–Rock Outcrop unit. Both of these map units contain shallow to moderately deep, well-drained soils with abundant rock outcrops, and both units are subject to high precipitation runoff and active erosion (United States Department of Agriculture/Soil Conservation Service [USDA/SCS] 1990:13–14).

Many other soils of minor extent exist on the plateau, including the Kade silt loam found inside the park along Podunk Creek and in the lower reaches of East Creek Meadow just outside the park. Kade silt loam is a deep, poorly drained soil formed in alluvium derived from limestone, sandstone, and shale (USDA/SCS 1990:54). This soil may be noteworthy because it can support wet meadow environments, and it may be an indicator of extinct marshy ecosystems on the plateau.

Climate

Climatic data recorded at the park headquarters between 1916 and 1984 indicate a yearly average rainfall of 41 cm (16 in) and a yearly average snowfall of 241 cm (95 in). January temperatures average –6° C (22° F) and July temperatures average 17° C (63° F) (USDA/SCS 1990:198). Most summer precipitation arrives as thunderstorms that form when moist air from the Gulf of Mexico moves across the area from the south and southeast. Winter precipitation in southwestern Utah is deposited by frontal storms approaching from the west. The Paunsaugunt Plateau lies in a rain shadow formed by the Markagunt Plateau to the west and Tushar Mountains to the northwest and, hence, receives less precipitation than those higher landforms (USDA/SCS 1990:3–4, 112).

Hydrology

As previously noted, the eastern scarp of the Paunsaugunt Plateau (the area occupied by the park) forms a drainage divide between the watersheds of the Paria River to the east and the Sevier River to the west. The 11 main watercourses that intermittently flow eastward toward the Paria River commonly head in the erosional amphitheaters immediately below the Pink Cliffs, although some runoff from the plateau top also feeds these drainages. To the west, the East Fork of the Sevier River collects nearly all runoff from the interior slopes of the plateau and flows northward off the mesa. Runoff from the park feeds this river through one perennial stream (Podunk Creek) and eight other intermittently flowing drainages.

Springs are commonly encountered on both the plateau top and below the Pink Cliffs rim. Springs on the plateau originate from saturated alluvial deposits or from water spreading along impermeable layers in the base of the Claron limestone. These springs are often only seasonally available due to the shallow depth of the aquifer deposits and the limited surface area available for recharge. Beneath the rim, many of the springs exist where saturated, permeable layers of the Wahweap and Straight Cliffs formations emerge. Larger recharge areas and storage aquifers lend more stability and permanence to these springs (Marine 1963; Ott 1996).

Modern Ecosystems: Floral and Faunal Resources

Due to the park's great topographic variability, ecosystems representative of the Upper Sonoran, Transitional, and Canadian life zones are present in a restricted area. Along the breaks of the Pink Cliffs, a mosaic of microenvironments often juxtaposes montane and desert ecosystems (Bowers 1991:1).

As the plateau drops in elevation from south to north (from over 2,743 m [9,000 ft] asl to about 2,316 m [7,600 ft] asl), vegetation communities change from dense groves of aspen and mixed conifers (including white fir, blue spruce, and Douglas-fir) to ponderosa pine forests and open, dry meadows of sedge and sagebrush. Manzanita, antelopebrush, and other low shrubs are common throughout the lower forested areas. In the moist, sheltered canyons immediately below the Pink Cliffs, ponderosa pine, Gambel oak, and manzanita dominate. The lower-elevation canyons and foothills are blanketed with pinyon pine, Utah juniper, and sagebrush (Buchanan 1960; Roberts, Wight, and Hallsten 1992). A century or more of fire suppression has resulted in densely forested areas in the park uplands that show low species diversity and contain heavy understory accumulations of deadfall and duff. Many meadow communities contain similarly low levels of species diversity and in the absence of fire, presently show signs of sagebrush encroachment (Buchanan 1981; Roberts, Jenkins, and Wight 1992; Roberts, Wight, and Hallsten 1992).

Principal mammal species in the park include elk, mule deer, black bear, cougar, pronghorn antelope, coyote, gray fox, bobcat, badger, porcupine, skunk, jackrabbit, cottontail rabbit, prairie dog, weasel, squirrel, chipmunk, and deer mouse. Rattlesnakes are common below the canyon rim and have been observed on the plateau top. Common birds include Steller's jay, Clarks' nutcracker, pigmy nuthatch, white-breasted nuthatch, mountain chickadee, gray-headed junco, hairy woodpecker, and red crossbill. Bald eagles migrate through the area, and golden eagles and osprey occasionally nest in the park. Peregrine falcons nest in several aeries in the Pink Cliffs (National Park Service [NPS] 1987:63).

Paleoenvironmental Conditions

Although detailed information is not available from the park itself (cf. Agenbroad et al. 1992), paleoenvironmental research throughout the Great Basin and Colorado Plateau provides a general picture of the regional environmental conditions that prevailed during the last 12,000 years. A review of past climatic variations and the concomitant environmental changes is fundamental to understanding the culture history and current archeological research issues relevant to Bryce Canyon National Park.

During the terminal Pleistocene and early Holocene Epochs (about 12,000 to 8000 B.P. [before present, i.e., 1950]), the environment of the Great Basin and the Colorado Plateau appears to have been wetter and cooler than at present, but warmer and drier than during the late glacial maximum at about 18,000 B.P. (COHMAP 1988; Hostetler et al. 1994; Kutzbach et al. 1993). However, the early Holocene Epoch climate was not simply wetter and cooler than today's; weather circulation patterns also produced a different annual cycle of precipitation and temperature extremes. For example, data and retrodictive models suggest that the summer monsoonal rain pattern of the Colorado Plateau was not established until after 9000 B.P. (Thompson et al. 1993). The multiple axes along which the climate changed (temperature, moisture, and seasonality) differentially affected the region's vegetation communities. Lacustrine zones and marshlands would have responded more strongly to moisture and temperature changes, while upland plant communities would have felt changes in moisture and temperature levels as well as in the seasonality of precipitation (Beck and Jones 1997; Huckell 1996).

Pluvial lakes in the Great Basin reached their maximum stands between 15,000 and 13,000 B.P. (Beck and Jones 1997:169). Temperatures increased between 12,000 and 8000 B.P., but effective precipitation did not show a concomitant decrease, allowing many lakes to persist, although below their maxima. This appears to be the case in the Sevier Lake basin (the nearest pluvial lake, roughly 160 km [100 mi] northwest of the park), where there is evidence that the lake stayed at very high levels until after 10,000 B.P. (Oviatt 1988). After 8000 B.P., significant desiccation occurred at most, if not all pluvial lakes in the Great Basin.

Early Holocene Epoch climatic changes also significantly affected the distribution of plant and animal communities away from pluvial lakes (Huckell 1996). During the terminal Pleistocene and early Holocene Epochs (12,000–10,000 B.P.), many vegetation communities occupied settings nearly 1,000 m (3,280 ft) below their current stands. The distribution of subalpine conifers shows this most dramatically, and in addition to elevational changes, the latitudinal limits of pinyon pine and Douglas-fir appear also to have extended south of their current range (Thompson 1990). The terminal Pleistocene and early Holocene Epoch vegetation of the Paunsaugunt Plateau probably closely followed these general trends. Based on data from paleoecological studies at nearby Cedar Breaks National Monument on the Markagunt Plateau (Anderson et al. 1999; Madsen et al. 2001), which occupies an environmental setting similar to that of Bryce Canyon National Park, the high plateau-top areas of southern Utah would have been dominated by spruce and fir species from about 12,000 to 8500 B.P.

The middle Holocene Epoch (ca. 8000–4000 B.P.) is generally characterized as a period of increased temperatures and decreased effective precipitation throughout the American west. Paleoclimatic data suggest that the increasing aridity of the middle Holocene Epoch significantly desiccated some lakes and many of the attendant marsh resources (Grayson 1993; Kelly 1997, 2001; Madsen and Currey 1979), although many lakes did not altogether disappear. In fact, Kelly (1997) argues that while some lakes such as Great Salt Lake suffered shoreline contractions, this effect actually produced larger marshy areas, because as lakes receded and occupied less area in their valleys, their peripheral marsh resource zones expanded into the previously flooded areas (Grayson 1993; Kelly 1997, 2001). Middle Holocene Epoch data from the Sevier Lake basin are somewhat inconclusive regarding the proportion of lake-to-marsh areas, but because the Sevier Lake basin followed the same pattern of fluctuations as the Great Salt Lake basin, it is possible that marsh resources became more areally extensive (Oviatt 1988). It is also possible that the lake levels became so low that there was only a saline playa at Sevier Lake during the driest times of the middle Holocene Epoch.

In addition to the overall diminution of pluvial lakes, the middle Holocene Epoch saw an elevational retreat of plant communities in many areas (Betancourt 1990). Data from Cedar Breaks National Monument show that ponderosa pine and Douglas-fir were invading from lower elevations (Anderson et al. 1999; Madsen et al. 2001). Even in the warm, arid, middle Holocene Epoch, pinyon pine was probably absent from the immediate area of Bryce Canyon National Park, although this species did colonize the eastern Great Basin from the adjacent Colorado Plateau near the end of the middle Holocene Epoch, by about 6000 B.P. (Grayson 1993).

The late Holocene Epoch (about 5000–4500 B.P. to present) is the period in which climatic conditions across the Great Basin and Colorado Plateau appear to have more or less reached their modern state. There is much episodic and annual variation in the climate during this time, but this variability is one of the defining features of the late Holocene Epoch (Dean et al. 1985; cf. Coats et al. 1999). Overall, effective moisture increased and temperatures decreased from those of the middle Holocene Epoch. Many of the desiccated lakes and marshes were partially reestablished (Grayson 1993), and vegetation communities shifted to lower elevational ranges (Grayson 1993; Thompson et al. 1993). Data from Cedar Breaks National Monument reflect these general trends. Plant macrofossils and pollen data suggest that ponderosa pine and Douglas-fir had shifted downward in elevation by 3000 B.P. in response to cooler temperatures at higher elevations (Anderson et al. 1999; Madsen et al. 2001). Given the similarities in elevation and climate between the Cedar Breaks and Bryce Canyon areas, it is reasonable to infer similar changes for the latter.

Significant environmental changes have also occurred during the historic period. Initially, Euro-American use of the Paunsaugunt Plateau's natural resources (timber, forage, etc.) was virtually uncontrolled. Limited supervision was imposed early in the twentieth century with the creation of federal forest reserves. By then, decades of intensive economic use of the plateau top had disrupted its natural ecosystem. The distributions and densities of plant species in the forests and meadows were significantly altered, producing attendant changes in animal species distributions as well as increased soil-erosion rates in alluvial valleys.

The effects of these factors were compounded by complete suppression of all fires in public forests. After Bryce Canyon National Park was fully established in the 1930s, commercial logging was immediately halted, although construction timbers were occasionally harvested and selective felling was conducted for insect control. Grazing was slowly phased out, although it did not completely cease until the 1960s. The philosophy of complete fire suppression in the park continued to be pursued until the 1980s. These management practices produced dense, monotonous stands of trees with thick undergrowth and deep accumulations of deadfall, litter, and duff. The forests of today probably bear little resemblance to those present prior to the late eighteenth century, which were probably more open with mosaic stands of diverse tree species (Buchanan 1960, 1981; Roberts, Wight, and Hallsten 1992).

The preceding summary of the region's natural history has sketched out the environmental constraints and available resources that shaped the past 12,000 years of human occupation in Bryce Canyon National Park and on the Paunsaugunt Plateau. The following chapter outlines our current perception of the region's cultural history, from the earliest Native American occupants to the park's residents of the modern period.

3

Cultural History

Sue Eininger, Cynthia Herhahn, and Chris T. Wenker

The following passage relates a Paiute account of the creation of Bryce Canyon, as explained to a park naturalist by an elderly Paiute man who lived on the Kaibab Paiute Indian Reservation in the 1930s.

> Before there were any Indians, the Legend People, *To-when-an-ung-wa*, lived in that place. There were many of them. They were of many kinds—birds, animals, lizards, and such things—but they looked like people. They were not people; they had power to make themselves look that way. For some reason the Legend People in that place were bad; they did something that was not good, perhaps a fight, perhaps some stole something. . . . the tale is not clear at this point. Because they were bad, Coyote turned them all into rocks. You can see them in that place now, all turned into rocks; some standing in rows, some sitting down, some holding onto others. You can see their faces, with paint on them just as they were before they became rocks. The name of that place is *Angka-ku-wass-a-wits* [red painted faces]. This is the story the people tell. (Presnath 1936, in Scrattish 1985:7, italics added)

For comparison, consider the following passage written in a moment of "feverish inspiration" by T. C. Bailey, a government surveyor, on November 18, 1876.

> Immediately east and south of the last corner set, the surface breaks off almost perpendicularly to a depth of several hundred feet—seems indeed as though the bottom had dropped out and left rocks standing in all shapes and forms as lone sentinels over the grotesque and picturesque scenes. There are thousands of red, white, purple, and vermilion colored rocks, of all sizes, resembling sentinels on the walls of castles, monks and priests in their robes, attendants, cathedrals and congregations. There are deep caverns and rooms resembling ruins of prisons, castles, churches with their guarded walls, battlements, spires, and steeples, niches and recesses, presenting the wildest and most wonderful scene that the eye of man ever beheld. (in Scrattish 1985:10)

Despite the temporal and cultural gulf separating these two accounts, both statements underscore the evocative impact of Bryce Canyon's surreal landscape. Over the past centuries, the Bryce Canyon area has been home to both Native Americans and Euro-Americans, and the landscape has surely wrought its imprint on the minds of many who have lived there. This chapter recounts the human history of the park and the plateau.

Native American Cultural History on the Paunsaugunt Plateau

Bryce Canyon National Park occupies a transitional area between the Great Basin and the Colorado Plateau physiographic provinces, and simultaneously the park lies along the peripheries of multiple

Native American archeological culture areas, but at the center of none. The archeological cultures present in the area cover a long time span and include such units as the Paleoindian, Archaic, Fremont, and Virgin Anasazi. Historically, Southern Paiute groups occupied the area. The cultural history of Bryce Canyon is also intimately tied to the changing environmental conditions that have occurred since the close of the Pleistocene Epoch (see Chapter 2).

Paleoindian Period

The Paleoindian period marks the earliest recognized human occupation in the general area of Bryce Canyon National Park. This period is characterized by large fluted points, such as Clovis (12,000 to 10,000 years B.P.) and Folsom (11,000 to 9000 B.P.), and a variety of unfluted lanceolate and stemmed dart or spear points. The unfluted points appear to continue in use from the late Paleoindian period to the early Archaic period (starting ca. 9500 B.P.) (Geib 1996a; Holmer 1986; Lindsay and Sargent 1979). Fluted points have not been found in Bryce Canyon National Park, but Clovis and Folsom points are known from nearby locales (e.g., Davis and Brown 1989; Davis et al. 1996; Gunnerson 1956; Hauck 1979; Tripp 1966, 1967). Large, unfluted, lanceolate, and stemmed points are also reported throughout the region (e.g., Christensen et al. 1983; Dominguez and Danielson 2000; Geib et al. 2001; Keller 1987; Keller and Hunt 1967; Schroedl 1977). The low frequency of fluted points in the area is not surprising, given that research throughout the Great Basin indicates that fluted points, which may reflect a specialized technology for exploiting large herbivores, are much more common near pluvial lake margins (Copeland and Fike 1988; Grayson 1993). Stemmed points are found in a wider range of environments, including Pleistocene lake margins as well as upland and riverine settings (Basgall and Hall 1991; Beck and Jones 1990, 1997). The latter settings are more characteristic of the Bryce Canyon National Park area. Two examples of Great Basin Stemmed points, markers of a terminal Paleoindian or early Archaic period occupation, are known from the park (see Chapters 7 and 8) and other stemmed points are reported from the region (e.g., Christensen et al. 1983; Kearns 1982). An undescribed multicomponent site near the Table Cliff Plateau to the northeast is also reported to contain a Paleoindian component (Kearns 1982:274).

Archaic Period

Archaic period materials are common on the Paunsaugunt Plateau. The archeological cultures of this period appear to have developed from Paleoindian groups through adaptive responses to changed environmental conditions, most notably the extinction of Pleistocene megafauna. The persistence of large stemmed projectile point types in the Archaic period further indicates that these tools reflect the use of a flexible technology that was not restricted to hunting megafauna.

Jennings (1953) proposed the Desert Culture concept to describe the apparent unity or patterning that was perceived among Archaic period sites throughout the Great Basin. Subsequent research in the Great Basin and Colorado Plateau has revealed more temporal and spatial variability in Archaic cultures than was initially apparent (e.g., Heizer and Napton 1970; cf. Bettinger and Baumhoff 1982; Kelly 1997). The focus of the current discussion involves the early, middle, and late Archaic periods of the eastern Great Basin and western Colorado Plateau, but references to western Great Basin developments are also included when relevant.

The early Archaic period in south-central Utah dates between approximately 9500 and 6500 B.P. and is characterized by the presence of Great Basin Stemmed and Pinto Series points (Holmer 1986). The subsistence strategies of the early Archaic period in the Great Basin appear to have had much in common with those of the terminal Paleoindian period (Beck and Jones 1997), aside from the obvious elimination of megafauna from the repertoire. Evidence of early Archaic period occupation of Bryce Canyon National Park is represented by several examples of Great Basin Stemmed, Pinto, and other large, untyped stemmed points. The sites of Sudden Shelter and Cowboy Cave, which lie within 160 km (100 mi) of the park, contain well-dated evidence of occupancy during the early Archaic period (Jennings 1980; Jennings et al. 1980).

The beginning and ending dates of the middle Archaic period vary across the Great Basin and Colorado Plateau, but for the Paunsaugunt Plateau area the dates of 6500 to 4000 B.P. are the most relevant. The time span of the middle Archaic period closely corresponds with the duration of the arid middle Holocene Epoch, which was characterized by a significant temperature increase and a decrease in effective moisture (Berry and Berry 1986; Geib 1996a; Holmer 1986). Notched projectile points including Sudden and Northern Side-notched types began to replace stemmed points (Beck and Jones 1997). An increase in the frequency of grinding slabs (see Jennings et al. 1980) and other artifacts associated with the use of plant seeds is also apparent, possibly reflecting a trend away from hunting and toward an expanded diet breadth that maximized returns from an arid environment (Beck and Jones 1997).

During this arid period, there is an apparent decrease in the occupational intensity of both the Great Basin and the western Colorado Plateau (Berry and Berry 1986; Geib 1996a; Grayson 1993), but there was clearly not a total abandonment of either area as previously suggested (Antevs 1948; Baumhoff and Heizer 1965). Geib (1996a) notes that this apparent population decrease may be the result of either a temporary abandonment of the area or a shift to a mobile residential strategy that decreased the visibility of archeological sites. There is evidence of continued occupation in many parts of the Great Basin (particularly near permanent water sources) (e.g., Geib 1996a; Kelly 2001; Madsen 1982; cf. Aikens and Madsen 1986) as well as the Mojave Desert (Sutton 1996). The presence of large side-notched projectile points in Bryce Canyon National Park (see Chapter 7) and in the region (e.g., Geib et al. 2001) provides evidence of continued middle Archaic period occupation in south-central Utah. High-elevation areas, such as the Paunsaugunt Plateau, may have been better watered than lower-elevation areas to the south and north, making them attractive settings (Geib 1996a:34).

Evidence of an increase in occupation is apparent in the late Archaic period, beginning about 4000 B.P. This period coincides with a phase of wetter and cooler climatic conditions. The appearance of Gypsum points marks the beginning of the late Archaic period (Geib 1996a), which lasts until about 2000 to1500 B.P. The apparent increase in occupation may reflect just that, or it could represent changes in land-use and settlement patterns that created a more visible archeological record, or the increase may be a combined function of these or other processes. Upland areas show increased occupancy, possibly related in some areas to the collection of pinyon seeds (Aikens and Madsen 1986). Caves and rockshelters that were apparently abandoned during the middle Archaic period were used intensively again during the late Archaic period. Many rockshelter sites of this age show evidence of structures and storage facilities and increased frequencies of grinding stones (Aikens and Madsen 1986; Grayson 1993; Jennings 1980). South-central Utah witnessed these general trends, as evidenced by the large number of sites with Gypsum and San Rafael Side-Notched points (see Chapter 7; also Davidson et al. 1978; Dominguez and Danielson 2000; Geib et al. 2001).

The increased evidence for structures, storage features, and grinding stones during the late Archaic period suggests an increased reliance on seed plants. This change presages the early use of cultigens, which may have been adopted by about 2000 B.P. (50 B.C.). The introduction of cultigens defines the end of the Archaic period and marks the beginning of Formative period adaptations in the Great Basin and western Colorado Plateau (Huckell 1996).

Late Prehistoric/Formative Periods

Formative period cultures differ from earlier Archaic period cultures in that they were at least partially reliant on cultigens and tended to be more sedentary. These late Prehistoric period cultures in the Great Basin and western Colorado Plateau appear to have developed out of earlier indigenous Archaic period groups. In the Great Basin, one of the hallmarks of the Formative period is the advent of the bow and arrow, as indicated by small corner- and side-notched projectile points. On the Colorado

Plateau, dart points remained in use alongside the bow and arrow until a slightly later date, despite the adoption of cultigens (Madsen and Simms 1998).

After the advent of pottery production around A.D. 500, it becomes easier to archeologically distinguish Formative period cultures, such as the Fremont and the Virgin Anasazi, although these pottery-using cultures clearly had antecedents that are in part identifiable through other material traits, such as basketry, sandals, and moccasins (Aikens and Madsen 1986; Geib 1996b; Huckell 1996). Despite the use of pottery and domesticated plants, hunting and gathering remained part of the subsistence routine of many Great Basin and western Colorado Plateau people. In some cases, reliance on cultigens and use of pottery were significant (e.g., among Puebloan groups), while in others, cultivation and use of pottery were tangentially incorporated into an economically viable hunting and gathering lifeway (e.g., among some Fremont groups).

Fremont

Many difficulties are encountered when developing a cultural history of the Fremont due to the great variability in the material traits of this archeological culture. Fremont groups appear to have developed from indigenous Archaic groups in the western Colorado Plateau and the eastern Great Basin approximately 2,000 to 1,500 years ago (Madsen and Simms 1998). Until the initial production of pottery around A.D. 450, the nascent Fremont followed a subsistence strategy similar to that of the contemporaneous Basketmaker II groups of the Colorado Plateau to the southeast, while maintaining a distinctly different material culture (Geib 1996b; Lindsay et al. 1968; Madsen and Simms 1998; Matson 1991; Matson et al. 1988). Following the adoption of pottery, the core characteristics of the Fremont culture included pithouses, above-ground jacal and masonry structures, plain and painted pottery, anthropomorphic clay figurines, and distinctive rock art motifs. This period is marked by a subsistence system based on cultigens bolstered by hunting and gathering wild resources. Distinct pottery traditions, along with variations in domestic architecture, allow the division of the Fremont into regional variants (Madsen and Simms 1998; Marwitt 1970). The two variants relevant to Bryce Canyon National Park are the Parowan Fremont to the west and the San Rafael Fremont to the east. Bryce Canyon National Park lies roughly along a nebulous dividing line between these two areas.

After A.D. 1250, Fremont subsistence strategies apparently switched, and foraging appears to dominate over farming. Evidence for large settled agricultural villages decreases. The reasons proposed for this shift range from climate change to the influx of Numic speakers (Bettinger 1991; Bettinger and Baumhoff 1982; Lamb 1958; Lyneis 1994a; Madsen 1975). Although total replacement of the Fremont population by Numic groups is an unlikely explanation for the demise of the Fremont culture, competition among indigenous Fremont farmers, indigenous Fremont hunter-gatherers, and immigrant Numic hunter-gatherers almost certainly played a major factor (Ambler and Sutton 1989; Madsen and Simms 1998).

No Fremont sites are presently identified in Bryce Canyon National Park. Evidence of use by Fremont groups is known from areas immediately surrounding the park, however. Several sites recorded on the Dixie National Forest along the nearby East Fork of the Sevier River contain either possible structures, Fremont ceramics, or small projectile points including Parowan Basal-notched and Bull Creek points (Dixie National Forest archeological site files, Cedar City, Utah; see also Kearns 1982). Several sites in Bryce Canyon National Park also contain late Prehistoric arrow points that could date to the Fremont occupation (see Chapters 7 and 8), but a Puebloan affiliation may also apply to these sites.

Puebloan Groups: Virgin and Kayenta Anasazi

Contemporary with the Fremont, the Virgin Anasazi archeological culture extends over portions of southern Nevada, northwestern Arizona, and southern Utah. This culture area encompasses a broad range of physiographic and environmental zones, and the archeological materials ascribed to this Puebloan group show a similarly wide range of architectural and artifactual types and settlement patterns. The taxonomic validity of the Virgin Anasazi has been a subject of some debate, but it is generally viewed as equivalent in scope and distinctiveness to the Kayenta, Chaco, and Mesa Verde Anasazi groups (McFadden 1996). The Kayenta Anasazi represent a better-known archeological culture that is recognized throughout northeastern Arizona and southeastern Utah, but Bryce Canyon National Park lies well outside the core Kayenta area.

Significant Puebloan occupation of the Grand Staircase physiographic province began during the Pueblo I period (about A.D. 700) and peaked in the late Pueblo II period (by A.D. 1150) (McFadden 1996). Larson and Michaelson (1990) posit that a catastrophic drought at the end of the Pueblo II period probably prompted the complete abandonment of the southern Great Basin by Puebloan groups (cf. Allison 1996). Others have argued that their demise was hastened by the arrival of Numic speaking hunter-gatherers from the Great Basin (Ambler and Sutton 1989).

A small number of sites in Bryce Canyon National Park contain Virgin Anasazi ceramics. Few others are known on the plateau. In a review of past research in Bryce Canyon National Park, Dominguez and Danielson (2000:11) previously asserted a "high frequency" of Virgin Anasazi sites on the Paunsaugunt Plateau, but these sites actually lie off the plateau, to the south in the Skutumpah Terrace and Alton areas (Davidson et al. 1978). Three sites attributed to the Kayenta Anasazi are reported north and northeast of the park (Hauck 1979), but the attribution of some of these sites to the Kayenta branch, or even to the Anasazi, seems questionable (see Kearns 1982:269–270). Use of the study area by Puebloan groups was probably restricted to upland resource procurement rather than significant long-term occupation, due to the absence of a suitable horticultural climate (e.g., McFadden 1996).

Numic/Southern Paiute Groups

Modern Numic-speaking people include Paiute and Shoshonean groups. Numic groups are thought to have spread from the far southwestern Great Basin starting sometime around A.D. 1000 (Bettinger and Baumhoff 1982; Fowler et al. 1973; Jennings 1978; Lamb 1958; Madsen 1975; Steward 1938). These highly mobile hunter-gatherers probably supplemented their seasonal rounds with occasional reliance on maize horticulture. Archeological materials that are indicative of these groups include small arrow points (particularly Desert Side-notched types) and thick, coarse-tempered, plain brown ware pottery (Lyneis 1994b, cited in Madsen and Simms 1998).

During the historic period, the park and its vicinity lay within the province of the Southern Paiute, who were first contacted by the Dominguez-Escalante expedition in 1776 (Euler 1966; Kelly 1934, 1964; Steward 1938). With the opening of the Spanish Trail soon after this expedition, the Southern Paiute fell victim to the Mexican and Ute slave trade, although little information is available from this early period (Euler 1966; Holt 1992). The impact of the slave trade appears to have been minor compared to the cultural and economic impact of the Mormon settlers in the 1850s (Euler 1966; Holt 1992). In southern Utah, much of the Euro-American settlement occurred along the Muddy and Virgin Rivers, but the relatively well-watered land of the Paunsaugunt Plateau also eventually attracted the settlers' interest. The Paiute territory east of the Paunsaugunt Plateau along the Paria River was settled by Euro-Americans in the late nineteenth century. Although specific instances of violence between the local Paiute and settlers are not reported, in the 1860s southern Utah witnessed a period of strife and violence between Euro-Americans and Native Americans known as the Black Hawk War (Euler 1966; Steward 1938:5). By 1870, warfare had ceased and most of Utah's Paiute groups had settled near towns or on reservations and depended on issued food for subsistence (Euler 1966; Holt 1992; Kelly 1964).

The Paunsaugunt Plateau lay in a nebulous frontier area used by several historic Paiute bands, including the Kaibab band to the south, the Kaiparowits band to the east, and the Panguitch band to the north and west. Within these band territories, the areas claimed by individual groups were typically defined by the locations of springs and other water sources "owned" by select group members (Kelly 1964).

Kelly (1964) maps the territories of two different groups of the Kaibab and Kaiparowits bands in the Bryce Canyon vicinity. The district known as *Ankatï*, which was territory of the Kaibab band, extended southeastward from the southern Paunsaugunt Plateau along "Kaibab Gulch" (probably Kitchen Corral Wash) to the Paria River. The "fringes of the Paunsaugunt [Plateau] . . . were virtually devoid of established camps. They functioned as communal lands, exploited by the Kaibab at large" (Kelly 1964:23).

The *Avua* territory of the Kaiparowits Paiute covered the upper Paria River valley east of the Paunsaugunt Plateau and extended south along the east bank to Cottonwood Wash. People of the *Avua* region occasionally joined the Panguitch Paiute in the latter's territory on the Paunsaugunt Plateau itself. During the winter, the people living in *Avua* occupied "winter camps located at the base of [the] red cliffs bounding [the Paria River] valley to the west, or on top of [the] cliffs, because of [the] fuel supply" (Kelly 1964:149–150, 175).

By this measure, the top of the Paunsaugunt Plateau appears to have fallen mainly in the territory of the Panguitch Paiute. A Panguitch informant stated, however, that Bryce Canyon and the eastern flank of the Paunsaugunt Plateau fell within the *Avua* region of the Kaiparowits band (Kelly 1964:175). Kelly (1964:145) further notes that a Kaiparowits Paiute informant claimed that the Bryce Canyon area was the property of her father-in-law, who was of the *Koosharem*. The *Koosharem* people, who occupied Grass Valley along the East Fork of the Sevier River north of the Paunsaugunt Plateau, are variously described as being either Paiute, Ute, "Utes affiliated with the Paiute, " or even "Ute, but not 'real' Ute" (Kelly 1964:34–35, 145). Based on this contradictory evidence, Kelly (1964:175) suggested that "Bryce [Canyon] must not have attracted a hunting and gathering people and probably was unoccupied."

In actuality, relatively abundant evidence of prehistoric Numic or protohistoric/historic Paiute use of Bryce Canyon National Park is present at several archeological sites containing brown ware ceramics; Desert Side-notched projectile points; or axe-marked, bark-stripped ponderosa pine trees. The memoir of John H. Davies, a local rancher, also places Paiute groups on and around the Paunsaugunt Plateau in the late nineteenth century (Davies n.d.).

Excerpts from the Davies Memoir

Between 1874 and 1879, Davies worked for the Kanarra Cattle Company as a cowboy on and around the Paunsaugunt Plateau. In later years he supervised the company. Davies (n.d.:14) reports that no matter how "interesting was the cowboy life, perhaps of even greater interest was [sic] the experiences I had with the Indians."

Davies' undated memoir, titled "Among My Memories," was apparently written in or after 1937. The document was posthumously transcribed and self-published by his relatives. Because the memoir is not widely available, several sections that describe his observations of a local Paiute group (possibly from the *Avua* area) are excerpted, verbatim, below.

> There were numerous Paiutes living on the same range over which our cattle roamed. There was a tribe of about 250 living in the section south and east of Bryce Canyon. I came to be well acquainted with their culture. As they were living in a semi-arid climate they had to resrot [sic] to much hard work and cunning to provide themselves with food. I have seen them come upon the East Fork [of the Sevier River] hunting for ground dogs. Sometimes they would hide about ten feet from a burrow and when the little animal came up to do his customary barking

there would be the swish of an arrow and the ground dogs [sic] life would be at an end. On other ocassions [sic] the Indians would provide themselves with long sticks with a little fork at one end. They would hold the forked end over a hole and when the ground dog made his appearance the hunter would swiftly pin him to the earth with the stick. They also were able to catch mice with a forked stick.

I have seen a fairly large group of Indian boys deploy themselves in a large circle to hunt rabbits. Once the circle was complete the young hunters would begin to close in and any bunny that was scared up within the circle would usually run wildly about within the human enclosure until a number of arrows had brought his life to a close. It was a rare thing for a rabbit to escape such a trap.

The Paiutes that I know also used the same method to kill chipmunks and other small game. They even used it in a modified form to kill deer down on a ridge near Sheep Creek. There is a narrow ridge there, walled in both the eastern and western sides and ending in a perpindicular [sic] cliff at its southern extremity. Hence, the only way a deer could leave this ridge would be on its northern end. Whenever they could the Indians would chase a deer south on to that ridge. Then they would begin to station themselves along the ridge, about fifty yards apart. Once this was done two or three of them would go to the southern end of the ridge to scare the deer back. Like the charge of the light brigade he would have to run past the line of hunters. Before he had reached the last one he would usually be so perforated with arrows that death would be a sweet relief from his pains. Each Indian would likely to be able to get from two to three shots at the poor creature.

Having killed the deer they would proceed to pull all the arrows out of it and would then have a roast. The portion of the meat that they were not able to consume before it spoiled they would cut into strips and dry in the sun. Salt, of course, was was [sic] unknown to them. The smaller animals were usually barbacued [sic]. As soon as possible after ground dogs, rabbits, and chipmunks were killed the unskinned body would be buried in hot coals. After a time it would be taken out and the skin which still remained on would be peeled off and the meal would commence. Everything but the bones was eaten. When a very young animal was cooked in this manner little balls of milk would usually be found partially solidified by the heat. These were looked upon as rare delicasies [sic] and were given to very young children as their portion.

During the late summer and early fall months the squaws made it a practice to gather grass seeds. They would make a kind of apron into which they would knock the seeds from the grass. To prepare the flour for eating they would generally mix it with water into a dough and bake the cake on a flat rock placed on the fire. Sometimes, however, they would wrap strips of dough around a stick and roast it in that fashion. . . .

[Once] I was riding over in the mouth of a canyon called Wild Cat, east of Cannonville. While looking toward the west I saw the tribe coming out of another canyon called Indian Hollow. Viewing them from a distance it was a rather picturesque sight. They had no domesticated animals. The squaws were plodding single file along a narrow trail. Most of them were fat and short in stature. Each of them carried on her back a large bag containing all her family belongings; and some of them were even carrying babies as well. In order to carry their burdens as comfortably as possible they walked with a stooped posture. As I gazed at them from a distance I must confess that they scarcely looked like human beings. The papooses who were old enough to walk were straggling along near their mothers and older sisters. The men and the older boys were scattered out on either side of the squaws and children hunting rabbits and other small game. . . .

> In general, they were a kind and peace-loving people. I associated with them at fairly frequent intervals over a period of many years and at no time did I entertain any fear of them. As with all classes of people, a few of them would steal if a good opportunity presented itself. The most of them, however, lived lives of honesty and integrity. While they chastized [sic] their children in no uncertain terms when the need arose, I never did see a parent whip a child among them. I became acquainted with a number of their songs after I had learned their language, and I sang with them when I was a boy in my teens. As I am now in the seventy-seventh year of my life and I am able to recall only one of them to mind:
>
> Pui-chatch, pui-chatch,
> Kocha el wino',
> Nu-ne-ish shut-cup Tirai-ki,
> Steva *nini* kuni-ki.
> (Mouse, mouse,
> You're no good,
> You keep stealing my food;
> Now get out of there fore I see you.) . . .
>
> The Paiute Indians of southern Utah used to have pow-wows at some central gathering place. On a number of occasions they had these meetings near enough for me to attend them. I took a real delight in joining in with their dances, songs, and confabs. One summer they were having an especially big pow-wow on East Fork. Paiutes from as far east as San Juan County came to participate in the ceremonies. (Davies n.d.:14–18)

Despite the occasional use of dated or unflattering colloquialisms, the affection that Davies felt for his Paiute friends is apparent throughout the memoir. Davies' relatively unknown manuscript is invaluable as a primary source of historical information recorded by a first-hand observer. Interested students of Paiute ethnohistory or early Mormon pioneering lifestyles are referred to the original document for more complete information.

Euro-American Use of the Paunsaugunt Plateau

Its high-elevation setting and dramatic, sometimes starkly inaccessible topography make Bryce Canyon National Park a destination for millions of modern-day visitors. Historically, however, these characteristics were a deterrent to Euro-American use and occupation. Early explorers only skirted Utah's High Plateau country. During the 1860s, settlers opted to homestead in the surrounding low-elevation river valleys that offered arable land and a more favorable climate. Following the establishment of Euro-American settlements in the 1890s, local residents stepped up their seasonal ventures onto the plateaus to exploit the previously untapped forage, timber, and water resources. Decades later, in the early twentieth century, another valuable resource was recognized atop the Paunsaugunt Plateau—its scenic splendor. The plateau's natural beauty was promoted by both commercial and government interests, and tourism was quickly established as a viable economic pursuit, influencing the use and occupation of the plateau in the decades that followed. Whether viewed as a formidable barrier, an exploitable resource, or a place of beauty, the Paunsaugunt Plateau has been a prominent feature of the region's history and development.

Early Expeditions West

The earliest Euro-American presence in south–western Utah was of a transient nature. In 1776, the Escalante-Dominguez expedition was searching for a route between the Spanish missions of New Mexico and those of California. These travelers were the first Euro-Americans to gaze upon the dramatic cliffs and plateaus of Utah's Grand Staircase. Journal entries place the expedition roughly 80 km (50 mi) west and south of Bryce Canyon. It is likely that during their passage through what is today northern Arizona, the voyagers would have had a distant view of the Paunsaugunt Plateau on the northeastern horizon (Crampton 1965:6–11; Scrattish 1985:8). Although

Friars Dominguez and Escalante never succeeded in finding a route to California, Mexican traders did eventually establish a trail in the 1820s. The Spanish Trail passed approximately 70 km (44 mi) northwest and west of the park, following the Sevier River and passing near the present-day towns of Parowan and Cedar City (Crampton 1965:12–15). This trail guided many travelers through the region over the following decades.

Early nineteenth-century frontiersmen also passed through the area en route to California. Jedidiah Smith's travels along portions of the Sevier and Virgin Rivers took him west of the Paunsaugunt Plateau in 1826. William Wolfskill and George Yount followed the Sevier River in 1830, passing roughly 30 km (19 mi) northwest of Bryce Canyon near the present-day town of Panguitch. Fourteen years later Captain John C. Fremont followed the Spanish Trail on a reconnaissance survey from California to Utah. Though these travelers were focused on more distant destinations, their observations helped prepare the next group of Euro-Americans for their ventures into the region (Crampton 1965:12–16; Scrattish 1985:8).

Exploration and Settlement of Southwestern Utah

From the 1850s to the 1870s, the nature of the Euro-American presence in southwestern Utah changed dramatically. The days of transient use were over, and Euro-Americans began to enter the region as a destination. Motivated by government, private, and Mormon leadership interests, this influx was shaped by two related goals: the establishment of new settlements in previously uninhabited areas and the exploration and investigation of regional resources.

Mormon settlement of Utah's Great Salt Lake area in the late 1840s was soon followed by a press to further expand the Mormon frontier. Using information gathered by travelers of the Spanish Trail, leaders of the Mormon church looked to southwestern Utah as a possible zone of future settlement. Mormon scouts were sent to the region in search of potential townsites. These scouts, like the westward voyagers before them, traveled along the river valleys northwest and west of the Paunsaugunt Plateau, passing near the future site of Panguitch and presumably within view of the western edge of the Paunsaugunt Plateau (Crampton 1965:27–30; Newell and Talbot 1998:45; Scrattish 1985:9).

Soon thereafter, southwestern Utah, as well as other regions of the Colorado Plateau, Rocky Mountains, Great Basin, and Pacific Coast experienced extensive Mormon colonization (Crampton 1965:45). During the 1850s several Mormon communities sprang up west of the Paunsaugunt Plateau along the Sevier and Virgin River valleys. Other towns were built west of the Tushar Mountains and the Markagunt Plateau (Crampton 1965:90, 109). Parowan and Cedar City were established by 1851 (Crampton 1965:36–37). Panguitch, one of several communities along the Sevier River valley, was founded in 1864 (Crampton 1965:111; Newell and Talbot 1998:58). Communities in high-elevation settings often struggled to establish a productive agricultural base due to the short growing season. After much trial and error, potatoes, grains, alfalfa, and meadow grass proved to be the most successful crops. Livestock grazing, however, was well suited to the higher environs, and this undertaking readily replaced farming as the dominant economic pursuit. Self-sufficiency was the key to survival; homesteaders relied on meat and dairy products, limited agriculture, and garden produce for their basic subsistence needs. The few commodities obtained from outside sources were acquired by bartering their meager surpluses or services (Alexander 1973:9; Newell and Talbot 1998).

The influx of settlers and the establishment of a permanent Euro-American population strained Native American and Euro-American relations. Increased friction between the groups culminated in the Black Hawk War of 1865 to 1868. This period of conflict saw a series of hostile confrontations between the settlers and local Ute, Paiute, and Navajo factions. As a result, many newly settled Sevier River valley communities were abandoned. Once the threat of further conflict had diminished in the early 1870s, the abandoned communities were rapidly resettled (Crampton 1965:117–125, 201). During the Black Hawk War the area east of the Paunsaugunt Plateau, which had always been well removed from the established trails and settlements, was first visited by Euro-Americans. In 1866, when Captain James Andrus was in pursuit of "marauding Navajos" his party ventured into the upper Paria River valley below the Pink Cliffs. His experience provided settlers with descriptions of the lands and resources east of the Paunsaugunt Plateau (Crampton 1965:127; Newell and Talbot 1998:67–69).

Exploration of southwestern Utah gained additional momentum during the 1870s as a result of a series of federally sponsored reconnaissance surveys of the American southwest. Although the expeditions that crossed the Paunsaugunt Plateau did not gain the same fame as Major John Wesley Powell's Colorado River surveys, significant data were collected from throughout the region. Lieutenant George C. Wheeler's survey team traversed the Paunsaugunt Plateau in 1872, mapping its geologic resources. Two members of the Wheeler expedition, Edwin Howell and Grove Karl Gilbert, are credited with the first written description of the spectacular pinnacle-filled landscape visible from the eastern plateau rim. In 1873, Almon H. Thompson and F. S. Dellenbaugh of Powell's survey reportedly climbed the southern tip of the plateau near Rainbow Point. Thompson's investigations also led him up the Paria River to its headwaters below the Pink Cliffs immediately east of the park. Between 1875 and 1877, Captain Clarence Dutton's geologic survey of the high plateau country and T.C. Bailey's General Land Office survey also examined portions of the Paunsaugunt Plateau. Although important data about the configuration and resources of the Paunsaugunt Plateau were collected, these findings were a small portion of much larger regional studies, and accordingly drew little immediate public attention.

Settlement East of the Paunsaugunt Plateau

Settlement in the immediate vicinity of Bryce Canyon did not begin until the mid-1870s, a period when the Mormon frontier expanded across the High Plateaus to the upper valleys of the Paria, Escalante, and Fremont Rivers (Crampton 1965:201). Stockmen were the first to venture east across the Paunsaugunt Plateau in search of rangeland for their rapidly growing herds. Others followed, motivated by reports of a favorable climate, well-watered lands, and ample grazing and timber resources (Daughters of the Utah Pioneers 1949:115; Newell and Talbot 1998:127). Clifton was the first of several communities established along the Paria River headwaters in 1874. Numerous homesteads also sprang up below the Pink Cliffs in the tributary canyons of the Paria River. Among these early settlers was Ebenezer Bryce, the namesake of the canyon that later prompted the establishment of the national park. Between 1874 and 1892, six closely spaced town sites were established in the Paria River amphitheater (Crampton 1965:204). Three of these communities, Tropic, Cannonville, and Henrieville, survive to the present day.

The valleys east of the Paunsaugunt Plateau provided a longer growing season and more hospitable farming climate than the earlier Sevier River valley settlements to the west, although the arable land was more limited. Many homesteaders, particularly those in the Cannonville and Henrieville areas, had to battle the effects of erosional downcutting (Daughters of the Utah Pioneers 1949:117–121; Newell and Talbot 1998:143–146). Success was largely dependent on the homesteaders' ability to tap and control the limited local water resources.

The success of the town of Tropic can be attributed in part to the construction of a major water-diversion system during the early 1890s. Concerns about the limited availability of irrigation water stimulated a plan to bring water to the Tropic Valley from the East Fork of the Sevier River, located atop the Paunsaugunt Plateau. A ditch 11 km (7 mi) long was constructed to carry water across the plateau top, over the Pink Cliffs rim and into Water Canyon. This natural watercourse then carried water down the plateau escarpment to a diversion ditch leading to the Tropic townsite (Crampton 1965:205; Hansen n.d.; Scrattish 1985:12). The Tropic Ditch is still in operation, crossing through what is today the northern portion of the park.

Early Economic Use of the Paunsaugunt Plateau

Livestock raising was a primary source of livelihood for the Mormon homesteaders. The number of stockmen in the area grew during the 1870s and 1880s, and attendant increases in herd sizes created a demand for livestock forage. High-elevation areas, which had previously drawn little attention due to their harsh winters and short growing season, were now looked to as a valued source of summer grazing land.

The Kanarra Cattle Company, a co-operative organization that included livestock owners from ranches in the vicinity of Kanarraville, Old Harmony, Cedar City, and Panguitch, was the first group to use the high country around Bryce Canyon for seasonal forage (Daughters of the Utah Pioneers 1949:33). The company expanded their summer range eastward from the Markagunt Plateau to the Paunsaugunt, and by 1873 Kanarra Cattle Company livestock were grazing along the East Fork of the Sevier River. A summer headquarters was established by 1874 at nearby Blue Fly Creek, approximately 6.5 km (4 mi) west of the present-day Bryce Canyon National Park Visitors Center (Buchanan 1960:7; Crampton 1965:204; Davies n.d.:13). The company then also extended its winter range to the Paria River headwaters east of the Paunsaugunt Plateau. The Kanarra Cattle Company introduced sheep grazing to the plateau in 1877 (Buchanan and Harper 1981:7). By the end of the century, sheep well outnumbered cattle across most of Utah's rangelands (Peterson 1973:5).

Operating on a much smaller scale, the local homesteaders also looked to the plateau as a source of grazing range. The homesteaders in the Paria River amphitheater initially used their homestead holdings and the lower slopes of the Paunsaugunt Plateau to meet their grazing needs. As demands on the local range increased, the homesteaders sought additional winter range in the pristine valleys to the south and east along the Paria River, and they also used the nearby Paunsaugunt Plateau for summer range (Condie 1963; Cope 1935; Rich 1961a, 1961b). In the late 1870s stock trails began to be established along the eastern slopes of the Paunsaugunt Plateau to expedite the seasonal movement between the Paria River valley and the high country atop the plateau (Broyles 1969). Presuming that the intensity of the exploitation of the Paunsaugunt Plateau paralleled that which occurred throughout Utah, by 1890 all available rangeland was probably fully occupied (Peterson 1973:5–6; Walker 1964:190). Public-lands grazing had become an integral part of the livestock industry's survival, for large and small interests alike.

Logging, although minor in scale when compared to the livestock industry, also influenced the development of the early homestead communities and land use on and around the Paunsaugunt Plateau. As towns grew, the demand for lumber increased, and suitable construction timbers became more difficult to obtain. In response to this need, several small sawmills were established in the Bryce Canyon area during the 1890s. These sawmills were built at the mouths of timber-rich canyons in the Paria River amphitheater and atop the plateau along the East Fork of the Sevier River (Ahlstrom 1935:8–9; Buchanan 1960:9; Cope 1935; Daughters of the Utah Pioneers 1949; Hansen n.d.:6; Rich 1961b:1). Sawmills opened and closed in response to lumber demands and as nearby timber resources were depleted. Timber was logged from the pristine forests across much of the plateau top, with some of this logging activity occurring within the boundaries of what later became Bryce Canyon National Park (Buchanan 1960:9).

Popularizing Bryce Canyon's Scenic Splendor

Although the beauty of the landscape did not go unnoticed by the homesteaders, the land's scenic value was of little importance in their daily routine. Ebenezer Bryce, who abandoned Utah for Arizona in 1880, apocryphally described the canyon as "a hell of a place to lose a cow" (Barnett 1965:32; Scrattish 1985:12). During the early twentieth century a new interest group learned of Bryce Canyon's scenery and recreational opportunities. A combination of factors—the dissemination of information gathered by the early federal land surveys, the establishment of federal land management agencies to oversee public lands, the increased accessibility of once-remote areas via road and rail, the growing appreciation for the preservation of the nation's natural and cultural heritage, and a continued quest for economic viability—all contributed to the next period of development on the Paunsaugunt Plateau.

With the establishment in the early 1900s of federal forest reserves and, later, the U.S. Forest Service (USFS), the public lands atop the Paunsaugunt Plateau were placed under the jurisdiction of the Sevier National Forest (today the Dixie National Forest). Forest Supervisor J. W. Humphrey was the first to recognize the potential of the scenic vistas of Bryce Canyon and the Paunsaugunt Plateau. Humphrey became a self-appointed advocate, encouraging locals and out-of-state visitors alike to visit Bryce Canyon. As a result of his efforts, the nation was introduced to the scenic wonders of the canyon through articles and photographs in several national publications (e.g., Dill 1916; Grimes 1918; Jeffers 1918; Stevens 1917). A road was constructed across USFS land to provide automobile access to the canyon rim, trails were constructed along and below the rim, and the USFS conducted numerous tours to Bryce Canyon in an attempt to raise private and government interest in the area's scenic value (Dammann 1993:4–8; Daughters of the Utah Pioneers 1949:292–294; Humphrey n.d.; Madrid 1993:3–4; Scrattish 1985:15–18).

Local residents Ruby and Clara Syrett, having recently purchased homestead land on the plateau top near the Bryce Canyon rim, were also drawn to the beauty of the place. Like Humphrey, they promoted the area, but on a more personal level. Their property was within riding distance of the canyon rim, and the Syretts made numerous trips with family and friends to view the spectacular landscape. As word of Bryce Canyon spread and promotional efforts reached a wider audience, the Syretts began entertaining visitors on a commercial basis. In 1919 they established an impromptu tent camp near the rim to accommodate the increased number of visitors. By the next year the Syretts had constructed a permanent lodge and several tent cabins near the rim (Dammann 1993:11–14; Farnsworth 1992; Scrattish 1985:18–23). In 1922, annual visitation to the Syretts' "Tourist's Rest" exceeded 3,100 persons (Dammann 1993:13). Automobile tours originating at the railhead in Marysvale, Utah, more than 80 km (50 mi) to the north, steadily brought in visitors despite the primitive roads (Madrid 1993:4–5).

The economic potential of commercial tourism at Bryce Canyon was quickly recognized by a larger outside interest—the Union Pacific Railroad. Bryce Canyon was one of several scenic destinations on the Colorado Plateau that, along with Zion National Park, the North Rim of Grand Canyon National Park, and Cedar Breaks National Monument, were coming into the limelight. In the early 1920s, the railroad initiated an aggressive campaign to obtain "the right to build or contract every conceivable lawful service for tourists" along this southwestern Utah loop (Markoff 1980:69). Union Pacific developed a multi-day scenic loop including Zion, Cedar Breaks, Grand Canyon, and Bryce Canyon, and established hotel and food services along the route (Madrid 1993:5–7; Markoff 1980:69–83; Scrattish 1985:32–48; Union Pacific System 1929; Woodbury 1950:194–208).

The recognition of the scenic value of Bryce Canyon did not result solely in commercial ventures, however. Congress's passage of the Antiquities Act in 1906 and the National Park Service Organic Act in 1916 reflected a growing interest in preserving the nation's natural and cultural heritage. Although there was little disagreement over the need to protect the scenic resources of Bryce Canyon, the nature of this stewardship produced much discussion. Legislative action was eventually proposed at both the state and federal levels. In 1919, only four years after Humphrey's "discovery" of the canyon, a bill was introduced in Congress recommending the area be established as "Utah State National Park" (Scrattish 1985:73–74). Further debate and reworking of the proposal over the next four years culminated in the establishment of Bryce Canyon National Monument by proclamation of President Warren J. Harding on June 8, 1923. Over 2,833 ha (7,000 acres) encompassing the Bryce Canyon amphitheater and the adjacent plateau were withdrawn from USFS lands for the establishment of the monument.

The Union Pacific Railroad, through its subsidiary Utah Parks Company (UPC), had already acted in anticipation of Bryce Canyon's federal recognition. In 1923, after lengthy negotiations with the state of Utah, UPC signed a twenty-five year lease for the use of a state-owned section of land along Bryce Canyon's rim. This was the same property used by the Syretts for their overnight tourist accommodations. The UPC also bought out the Syretts' water rights. Construction of a new facility began almost immediately. The Bryce Canyon Lodge was completed and auto tours were running by 1925. Over the next two years, five deluxe cabins, 67 tourist cabins, and several service structures were constructed; water and sewage facilities were upgraded; and telephone lines were installed (Dammann 1993:16–18; Newell and Talbot 1998:266; Scrattish 1985:81–85). Large-scale commercial tourism had firmly established a foothold at the previously remote plateau rim of Bryce Canyon.

National Monument and Park Administration

As outlined in the 1923 enabling legislation, Bryce Canyon National Monument remained under the administration of the USFS. A lack of federal funds precluded any major changes, and road improvements, trail work, and camp maintenance were the only types of projects conducted during the monument's early years. Improvement and expansion of the region's road network contributed to a swell of visitors. Bryce Canyon's proximity to other scenic destinations and its promotion as part of a tourist loop also factored into its growing popularity. By 1927, the annual visitor count was estimated at 25,000. Bryce Canyon achieved national park status in 1928. Its administration was transferred to the National Park Service under the administration of Zion National Park (Scrattish 1985:112–113). Park boundaries were enlarged several times, and by 1931 the park occupied 14,502 ha (35,835 acres), its present-day extent (NPS 1987:3; Scrattish 1985:101–103). UPC continued to operate and improve tourist accommodations in the park.

The withdrawal of forest lands and establishment of the monument, and later the park, had no immediate effect on the number of livestock permittees operating on federal lands. Commercial logging within the monument and park was immediately halted, however. Grazing activities remained under the jurisdiction of the USFS through 1929. Existing grazing rights were left intact when the National Park Service assumed control, although the elimination of grazing was a long-term goal. Any transfer of grazing rights within the new park required National Park Service approval, and each transfer was accompanied by a mandatory 20 percent reduction in permitted livestock (Scrattish 1985:107–109). Early grazing records indicate that in 1931, 12 permittees were using park lands, both on the plateau top and below the rim. Sheep far outnumbered cattle in that year (5,162 to 717, respectively), with only one of the 12 permittees grazing cattle (Rumberg 1956:2).

Development of the Park's Facilities and Administration

Park visitation continued to increase during the 1930s, despite the economic impact of the Great Depression. UPC focused on improving its overnight visitor facilities as well as accommodating the growing number of campers visiting the park. Federal funding levels continued to be low, although a small number of visitor-service construction projects were completed (Dammann 1993:31–32). Road improvements were the primary National Park Service goal, and the

Rim Road, which runs the length of the park, was completed during this period (Madrid 1993:9–13).

Although the Great Depression took a significant toll on the nation's economy, the 1930s marked a major period of growth and development at Bryce Canyon National Park. The lack of National Park Service funding was offset by various federal economic relief programs (e.g., Public Works Administration, Works Progress Administration, etc.) and labor was provided by the newly organized Civilian Conservation Corps (CCC). In 1934, CCC Company 962, based out of Zion National Park, established a seasonal camp at Bryce Canyon National Park. This camp, NP-3, was in operation until 1941. The camp's population numbered around 200 laborers and supervisors. The seasonal presence of CCC workers in the park resulted in the construction of numerous park buildings and structures including residences, administration buildings, and visitor facilities. Many miles of fence line, roads, and trails were built; thousands of erosion-control check dams were installed; and a variety of insect-control measures were applied to large tracts of the park's forests (Dammann 1993:44–46; Garfield County News 1987; Madrid 1993:14–15; Scrattish 1985:151–165). The Great Depression was actually the first period in the history of the park that Bryce Canyon National Park administrators were able to significantly direct the management of the park's resources and the development of its visitor and administrative facilities.

The trend of ever-increasing visitation at Utah's national parks and monuments came to a dramatic halt during World War II. At Bryce Canyon National Park, dwindling visitor numbers forced the closure of the lodge from 1942 to 1946. Park staffing was drastically reduced due to a lack of funds and the military draft. Other than general maintenance, and the continuation of some insect-control activities and checkdam construction, project work came to a standstill (Dammann 1993:64–65). Due to the lack of funds and manpower, the CCC was disbanded in 1942. The NP-3 camp was dismantled by the park in 1945 (Scrattish 1985:163–165).

During the 1940s Bryce Canyon National Park's livestock-use reduction policies produced gradually decreasing herd numbers. Only four permittees were using park land in 1940. During the mid-1940s, the composition of herd populations changed, and cattle again began to outnumber sheep. By 1947, sheep grazing was discontinued. By the mid-1950s, only two permittees were grazing cattle in the park (Rumberg 1956), and in 1964 grazing was completely eliminated (Dominguez et al. 1992:18).

The end of World War II triggered a rapid revival of tourism at Bryce Canyon National Park and throughout southwestern Utah. Although the tourist market rebounded quickly, federal funds did not keep pace, and the park found itself poorly equipped to handle the growing influx of tourists. This condition was symptomatic of post-war conditions throughout the National Park Service (Dammann 1993:91–93; Scrattish 1985:121–122). It was not until the late 1950s that the chance for renewal presented itself. Motivated by the upcoming commemoration of its fiftieth anniversary, the National Park Service embarked on a nationwide program of revitalization that was referred to as "Mission 66." Funds were funneled into the parks over a ten-year period to improve faltering and overtaxed facilities. Administrative and visitor facilities were upgraded or newly constructed. Mission 66 also engendered administrative changes. Bryce Canyon National Park obtained its independence and became a separate administrative unit from Zion National Park in 1956. Park staffing was increased and visitor programs were improved to meet growing interpretation and protection needs (Dammann 1993:113–133; Scrattish 1985:166–172). Mission 66 effectively laid the foundation for Bryce Canyon National Park's move into the modern era.

4

Previous Archeological and Historical Investigations

Chris T. Wenker

Past archeological investigations in Bryce Canyon National Park mainly included small, brief reconnaissances and development-related surveys and test excavations. Prior to the 2000–2002 Bryce Canyon AIS, the available archeological information was patchy, much data was outdated, and recent work was heavily weighted toward test excavations at plateau-top sites along the park's roadways.

Archeological Projects, 1974–1997

The Bryce Canyon National Park Archeological Overview and Assessment (NPS 1998) presents a summary of prior archeological investigations in the park. The following synopsis relies heavily on that document. Table 4.1 summarizes the park's prior archeological projects, all of which occurred in the closing decades of the twentieth century. Figure 4.1 illustrates the locations of these projects. The archeological sites that were recorded during these prior investigations are listed in Table 4.2 and their locations are indicated in Figure 4.2. The sites are not described in detail here, but Chapter 6 summarizes those that were part of the Bryce Canyon AIS project. The following discussion recounts only the more prominent archeological studies that have been conducted in the park.

The first reported archeological work at Bryce Canyon National Park occurred in 1974, when National Park Service archeologists F. A. Calabrese and Adrienne Anderson examined a sewer-line construction area near the park headquarters. They observed no archeological resources (Calabrese 1974a), but they recorded two lithic scatter sites in the far northwestern corner of the park (Calabrese 1974b). In 1979, National Park Service archeologist Ralph Hartley (1980a) conducted a more intensive survey, examining 1,226 ha (3,030 acres) in a number of development areas around the Bryce Canyon Lodge, Visitors Center, and campgrounds. This survey also examined corridors along the main paved roads. Hartley recorded 24 lithic scatter sites and 21 IOs. In addition, Hartley re-examined and re-recorded the two sites documented in 1974.

In 1983 National Park Service archeologist Kevin O'Connell (1984) surveyed approximately 72 km (45 mi) of boundary fence as well as four small construction areas. O'Connell recorded 10 lithic scatter sites and one site that included lithic and ceramic artifacts, but he failed to report the types of ceramics. In 1988 National Park Service crews surveyed 460 ha (1,137 acres) at several overlooks, trails, roads, and prescribed burn areas throughout the park. Fifteen new sites were recorded, including lithic scatters and aspen

Table 4.1. Summary of archeological projects.

Year	Project Type	Report	Project Size	Count of Sites‡	Count of Isolated Occurrences
1974	Survey	Calabrese 1974a, 1974b	NR*	2	–
1977	Survey	Pahlke 1977a, 1977b	~.8 ha (~2 acres)	–	–
1979	Survey	Hartley 1980a	~1,226 ha (~3,030 acres)	26	21
1980	Construction monitoring	Hartley 1980b	NR	1	–
1983	Survey	Thiessen 1983	NR	–	–
1983	Survey	O'Connell 1984	NR	11	
1983	Survey	Johnson 1983	NR	–	–
1988	Survey	Dominguez and Kramer 1988; Dominguez et al. 1989, 1992	460 ha (1,137 acres)	15	44
1988	Survey	Billat 1988	~2 ha (~5 acres)†	1†	1†
1989	Survey	Billat 1989	~1 ha (~3 acres)†	–†	–†
1989	Survey/Test excavation	Dominguez 1989a; Dominguez and Danielson 1993, 2000	~32 ha (~79 acres)	5	5
1989	Survey/Test excavation	Dominguez 1989b; Dominguez and Danielson 1993, 2000	~4 ha (~9 acres)	2	1
1990	Survey/Test excavation	Dominguez 1990; Dominguez and Danielson 1993, 2000; NPS 1991	~70 ha (~172 acres)	7	11
1991	Data-recovery excavation	Dominguez 1991a; Dominguez and Danielson 1993, 2000	NR	6	–
1991	Survey	Dominguez 1991b	~87 ha (~215 acres)	–	5
1992	Survey	Bladh 1992	~14 ha (~34 acres)	–	–
1993	Survey	Bladh 1993	NR	–	–
1994	Survey	Naylor 1994	NR	2	2
1997	Survey	Mathew 1997	NR	1	–
2000–2002	Survey	Wenker and Eininger 2001; Wenker and Herhahn 2002; Eininger and Wenker 2002; this volume	4,370 ha (10,799 acres)	194	4,860

* NR=Not reported.
† Within park boundary.
‡ Some sites were repeatedly visited during subsequent projects.

Table 4.2. Summary of archeological sites previously recorded.

Site Type	Count	Sites Re-recorded during AIS	Sites Not Visited during AIS
Lithic scatter	41	42GA1896, 42GA1899, 42GA1900, 42GA1901, 42GA1902, 42GA1903, 42GA1904, 42GA3383, 42GA3384, 42GA3387, 42GA3388, 42GA3488, 42GA3558, 42GA3559, 42GA3560, 42KA1989, 42KA3284, 42KA3288, 42KA3289	42GA906, 42GA1897, 42GA1898, 42GA1905†, 42GA1906, 42GA1907, 42GA1908, 42GA1909, 42GA1910, 42GA1911, 42GA1912, 42GA1913, 42GA1914, 42GA1915, 42GA1916, 42GA1917, 42GA1918, 42GA2635, 42GA2636, 42GA2637, 42GA3773, 42KA3282
Lithic/ceramic scatter	1	42GA2634*	–
Lithic scatter with hearths	1	–	42GA905
Lithic scatter/ historic camp	1	42GA3561	–
Historic camp	1	–	42GA3379
Dendroglyph grove	7	42KA3287, 42KA3290	42GA3385, 42GA3386, 42KA3283, 42KA3285, 42KA3286
Historic refuse	1	–	42GA3772
Total	53	23	30

* Outside AIS project area.
† In AIS project area, but not relocated.

dendroglyph groves (Dominguez and Kramer 1988; Dominguez et al. 1989, 1992).

National Park Service archeologist Steve Dominguez conducted two additional archeological projects in 1989. The first surveyed corridors for a proposed Rim Road construction project. Because much of the proposed road corridor had been previously surveyed by Hartley (1980a), Dominguez surveyed only those areas where the new corridor deviated from the previous survey route. One new lithic scatter site was found. Five lithic scatter sites were also test excavated as a part of this project, and one lithic scatter site was mapped and surface collected (Dominguez 1989a). The second project conducted in 1989 involved a survey of the proposed Sheep Creek/Swamp Canyon Connecting Trail. One isolated historic dendroglyph was recorded and two previously recorded lithic scatter sites were test excavated (Dominguez 1989b). Dominguez conducted additional work for the Rim Road widening project in 1990. Again, the work included surveys along corridors not previously inventoried by Hartley (1980a). Five lithic scatter sites to be impacted by road development were test excavated (Dominguez 1990). In 1991, Dominguez again investigated sites that would be impacted by road widening, construction of related facilities, or rehabilitation of former roads. This time, six previously recorded lithic scatter sites (Hartley 1980a) were excavated for data-recovery purposes (Dominguez 1991a; NPS 1991). Dominguez and Danielson (1993, 2000) later presented a synthetic overview of the 1989 to 1991 field investigations related to the Bryce Canyon road-widening projects. Subsequent to Dominguez's work only a few small surveys were conducted through the early and mid-1990s.

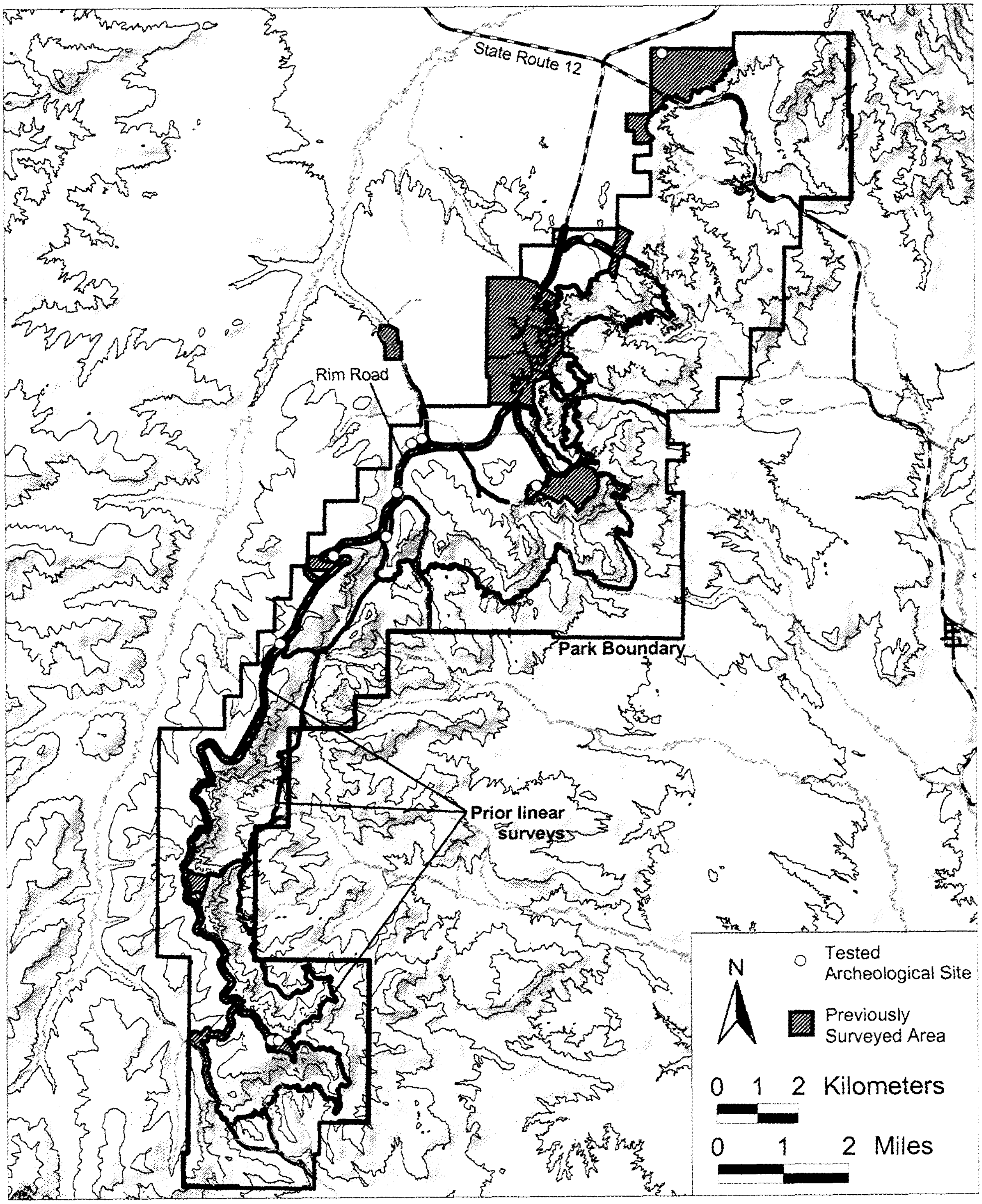


Figure 4.1. ***Locations of archeological surveys and test excavation projects in Bryce Canyon National Park prior to the 2000–2002 Bryce Canyon Archeological Inventory Survey.***

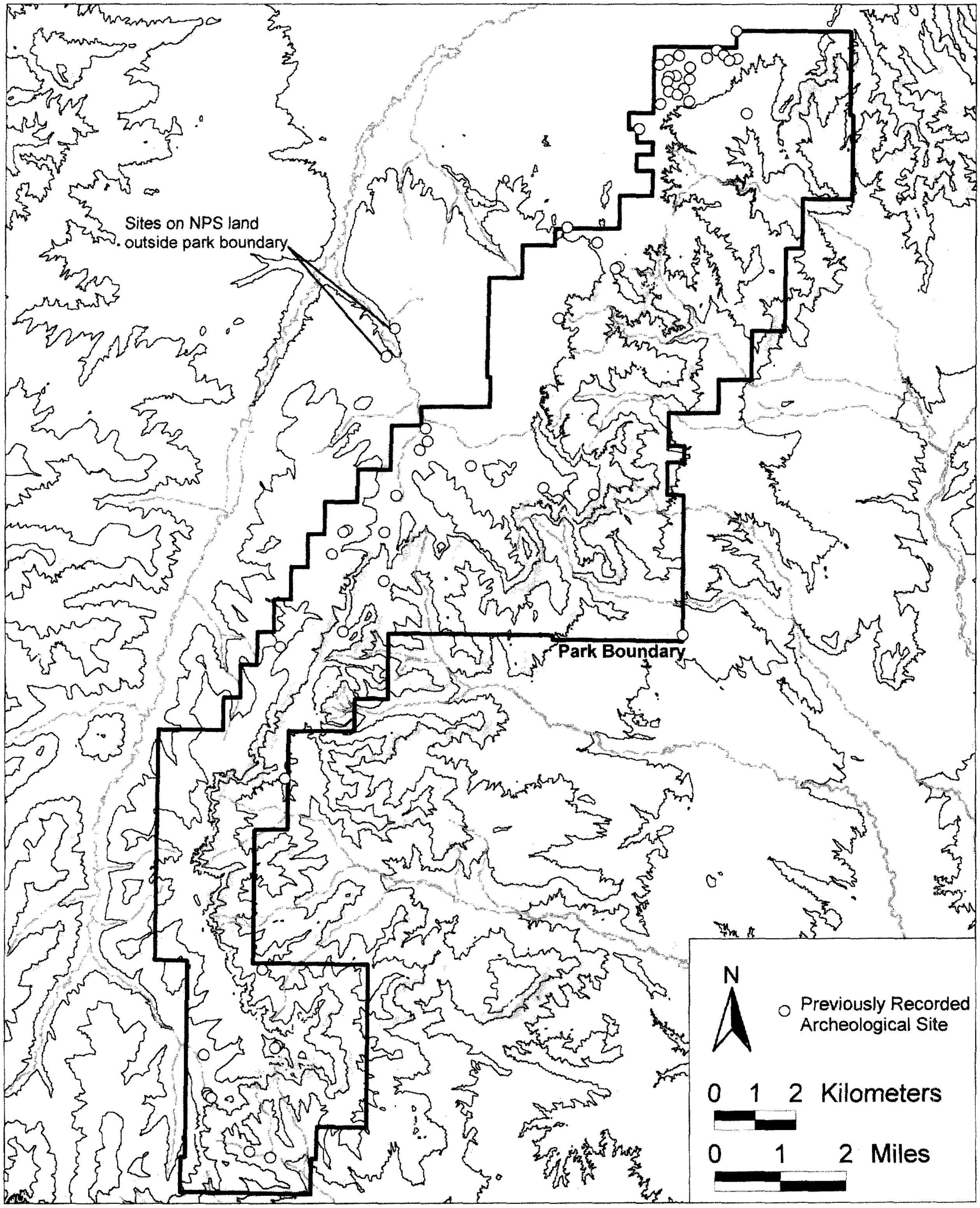


Figure 4.2. Locations of archeological sites recorded prior to the 2000–2002 Bryce Canyon Archeological Inventory Survey.

In sum, the archeological surveys from 1974 to 1997 covered roughly 1,702 ha (4,206 acres) throughout the park. Within the Bryce Canyon AIS project area, 1,063 ha (2,626 acres) had been surveyed during these previous projects, covering roughly 24 percent of the 4,370 ha (10,799 acre) total project area.

In addition to the sites recorded in the park, over 100 archeological sites have been recorded on the Dixie National Forest west and north of the park, particularly around Johns Valley and the Sevier Plateau to the north (e.g., Dykmann 1976). Three surveys were conducted in the Whiteman Bench area along the park's western boundary, but few sites were present (Dixie National Forest archeological site files, Cedar City, Utah). In 1980 Doug McFadden, Bureau of Land Management archeologist, examined a proposed borrow area just outside the eastern park boundary south of the Yellow Creek drainage but observed no cultural material (McFadden 1980).

The Escalante Project, a large-scale archeo–logical sample survey, examined several thousand acres in three main tracts in south-central Utah (Kearns 1982). The westernmost, Tract III, covered part of the eastern margin of Johns Valley. The southern end of Tract III extended to within 1.6 km (1 mi) of the northern boundary of Bryce Canyon National Park. The nearest sites recorded in Tract III lie roughly 6 km (4 mi) northeast of the park, and the only substantial site clusters lie at least 9.5 km (6 mi) to the northeast. Most sites in this comparatively low-elevation plateau-top area are Archaic period camps and hunting locales. Oddly, Kearns (1982:420) assigned a series of Garfield County site numbers (42GA1896 to 42GA1918, inclusive) to some Tract III sites that had also been assigned to sites in Bryce Canyon National Park in 1979 (Hartley 1980a), some of which are included in the Bryce Canyon AIS project. Hopefully this duplication will not impede federal archeologists from effectively managing the sites on their respective land.

Finally, in 2000 and 2001, National Park Service archeologists from the Intermountain Support Office conducted an intensive, large-scale, pedestrian archeological inventory survey of most of the plateau-top portion of the park. The Bryce Canyon AIS, which is the subject of this report, ultimately surveyed a 4,370-ha (10,799-acre) area extending between the western park boundary and the rim of the Pink Cliffs on the east, and from Water Canyon on the north to the southern end of the Pink Cliffs southwest of Yovimpa Pass. All previously surveyed land within this area was re-examined during the inventory, and many new sites were discovered. Overall, 192 archeological sites were recorded in the project area (two additional sites outside the project area, north of State Route 12, were also recorded). Wenker and Eininger (2001) and Wenker and Herhahn (2002) presented interim reports describing the preliminary survey results and management recommendations.

Archeological Sites and Research Results

Fifty-three archeological sites were known in Bryce Canyon National Park prior to the initial field season of the inventory (Table 4.2; Figure 4.2), but the types, distribution, and condition of sites throughout the park remained poorly understood. Forty-four of these previously known sites contained Native American components (including one multicomponent site with a historic camp). All but two of the Native American components consisted solely of scatters of flaked lithic artifacts. One lithic scatter also contained several hearths, and one site contained both lithic and ceramic artifacts (which proved upon a site re-visit to be Paiute Brown Ware sherds). The highest density of Native American sites is found in the northernmost section of the park, on the plateau top north of State Route 12. As will be seen, these northern sites fall outside the boundary of the inventory, so most were not re-examined during this project. The Bryce Canyon AIS relocated and recorded all but one of the 21 previously recorded sites with Native American components inside the project boundary (Site 42GA1905, a small lithic scatter, could not be relocated despite repeated searches).

Two historic campsites were previously known, one of which consists of the remains of a 1930s CCC spike camp that was re-recorded during the inventory. Previous investigations had also recorded seven historic aspen groves, but only two were known in the project area on the plateau top. One small historic refuse scatter that lay below the Pink Cliffs, outside the project area, was not revisited.

As noted above, National Park Service archeologists had conducted exploratory archeological excavations at 11 of these sites between 1989 and 1991. Most of these sites were investigated during salvage work prompted by the Rim Road construction project. Dominguez and Danielson (2000) report the final results of these excavations, which at that time represented the most extensive archeological investigation conducted in the park. All 11 excavated sites contained Native American components and one also contained the CCC camp. The Native American components consisted primarily of flaked lithic debris and tools. Ground stone artifact counts were generally low, and faunal, macrobotanical, and pollen remains were exceptionally uncommon. No stratified deposits were encountered, and few sites contained material buried more than 30 cm (12 inches) in depth. Projectile point styles recovered from the sites indicated use of the park from the middle Archaic through the Protohistoric periods. Radiocarbon assays returned dates ranging from 4100 to 190 B.P. Obsidian-source analysis showed a focus on material from Great Basin sources to the north and west. The analysts partitioned the sites into two groups: those situated near passes through the Pink Cliffs and those on the plateau interior. The lithic artifact assemblages from these site groups showed dissimilarities. Pass sites showed greater material diversity, higher counts of "complex" tools, and generally larger artifact sizes (except among "complex" tools) than the interior sites. The analysts took these characteristics as signs of different, albeit unidentified, land-use strategies. Lithic assemblage differences between early and late sites were also noted but not explained (Dominguez and Danielson 2000:61–62, 152–154).

During the road-widening project, as well as during other surveys, historic archeological sites generally received less analysis and interpretation. Substantial information about the dates of the CCC camp's construction and occupancy was already available in historic records, and the analytical results of the test excavations at the CCC camp failed to produce any further significant insight into camp activities (Dominguez and Danielson 2000). Conversely, the previously recorded dendroglyph sites provided useful baseline information about historic park use. These sites contained dated aspen carvings ranging in age from 1900 to 1964, with the bulk falling in the period between 1920 and 1940 (Dominguez et al. 1992).

The above summary encapsulates the archeological knowledge that existed at the beginning of the Bryce Canyon AIS. The unsystematic collection of data and the piecemeal nature of previous investigations prevented any meaningful assessment of the overall types, distribution, and condition of archeological sites on a parkwide basis. Only a rough outline of the park's occupational chronology and a general sense of the types of sites could be projected from existing data. This lack of information also perpetuated the assumption that few significant archeological resources existed within the park.

Relevant Historical Research

Several comprehensive summaries of Bryce Canyon National Park's history have been written (Dammann 1993; Scrattish 1985), but no formal administrative history has been prepared. The park's developmental background is more commonly treated as part of regional histories (e.g., Crampton 1965; Daughters of the Utah Pioneers 1949; Farnsworth 1992; Woodbury 1950) or as part of specific National Park Service resource studies (Caywood and Grant 1994; Dominguez and Danielson 2000; James R. McDonald Architects 1999).

Scrattish's (1985) historic resource study provides a comprehensive overview of the park's development and places the efforts of the National Park Service and the UPC at Bryce Canyon in a regional historic context. As with most other histories, most attention is lavished on the Bryce Canyon Lodge and associated infrastructure, but many references to historic Rim Road construction and the efforts of the CCC are also included, providing information relevant to certain historical archeological resources that are present in the project area. Dammann's (1993) unfinished, unpublished manuscript was written as a draft administrative history. This document echoes much of the information provided by Scrattish (1985) and focuses on the history of the park's administration, concessionaire activities, and prominent personalities.

Regional histories (e.g., Daughters of the Utah Pioneers 1949; Farnsworth 1992; Newell and Talbot 1998) often contain useful family histories that include the names and genealogies of some local residents who used the Bryce Canyon area during the historic period. Additional useful information is found in unpublished manuscripts and files at the Bryce Canyon National Park library and archive and at the National Park Service Denver Service Center Technical Information Center. These repositories contain many historic files about road construction, park supervisor's reports, CCC records, and even National Park Service checkdam-construction and erosion-control records. Much of the relevant unpublished material from these sources that pertains to the archeological resources in the inventory area is summarized in this report.

5

Field Methods and Research Design

Chris T. Wenker and Cynthia Herhahn

The Bryce Canyon AIS represents the first large-scale, comprehensive archeological survey conducted in Bryce Canyon National Park. The survey was primarily implemented to collect archeological resource-management data for the park's on-going ecological restoration programs. The introductory part of this chapter outlines the project's history and development and describes the areas covered by the survey. Following sections outline the field logistics and survey methods. The concluding section of the chapter explicates the research design that guided the survey and directed the data analysis.

Fire Management Units

The Bryce Canyon AIS was born out of the park's need to implement a long-term prescribed fire program. As defined in the task directive (NPS 2000), the primary goal of the inventory project was to discover and document all of the visible archeological sites within selected sample units in the park's plateau-top fire-management areas. The survey was designed to obtain data on the significance and condition of each identified archeological site, to record the effects of previous fires, and assess potential future fire impacts. Although driven by the prescribed fire program's specific planning and compliance requirements, the survey also helped fulfill a general National Park Service goal of completely inventorying archeological resources on land under its management.

The park's resource management staff identified 16 separate fire management units (FMUs), encompassing a total area of 4,148 ha (10,251 acres), that delineate the zones to be treated with prescribed fire (Figure 5.1; Table 5.1). Individual FMUs range in size from 9 to 1,581 ha (23 to 3,907 acres). The FMUs cover nearly the entire area between the western park boundary and the Pink Cliffs escarpment. The northern end of the FMU area lies along an east-west park boundary line that crosses the Pink Cliffs rim north of Fairyland Point. The southern end of the FMU area is marked by the intersection of a north-south boundary line and the cliff rim on the long narrow ridge extending southward from the western side of Yovimpa Pass. Between 1983 and 2001, park managers ignited prescribed fires totaling 2,221 ha (5,490 acres) in 12 of the FMUs.

All of the FMUs had received some level of archeological survey prior to 2000, but the proportions of coverage varied. In the entire project area, 1,063 ha (2,626 acres) had been previously inventoried, and in the burned FMUs, 638 ha (1,577 acres) had been surveyed. Most of these previous archeological inventories were restricted to narrow corridors for trail-maintenance or road-construction projects (Figure 4.1). All previously surveyed blocks and linear corridors within the FMUs were re-surveyed during the inventory.

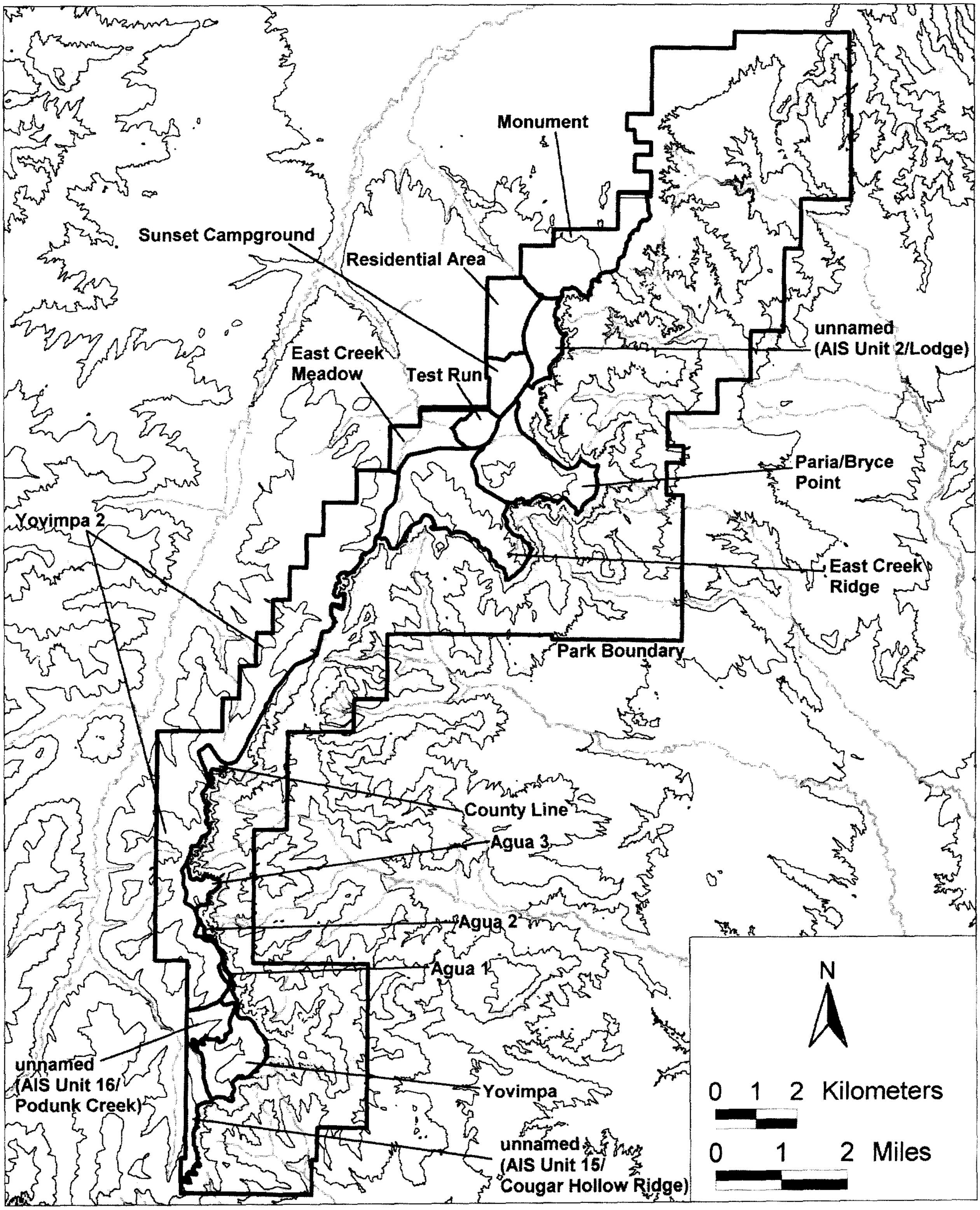


Figure 5.1. ***Sixteen plateau-top fire management units in Bryce Canyon National Park that define the archeological inventory project area.***

Table 5.1. Fire management units and previous archeological survey coverage.

Fire Management Unit Designation	Year Burned	Total FMU Area		Area surveyed prior to AIS	
Monument	1994	384 ha	(949 acres)	79 ha	(194 acres)
unnamed (AIS Unit 2/Lodge)	unburned	139 ha	(344 acres)	139 ha	(344 acres)
Residential Area	1990, 1991, 1998, 1999	197 ha	(486 acres)	197 ha	(486 acres)
Sunset Campground	1992	121 ha	(300 acres)	113 ha	(280 acres)
Test Run	1983	74 ha	(183 acres)	7 ha	(18 acres)
East Creek Meadow	2000	160 ha	(396 acres)	20 ha	(49 acres
Paria/Bryce Point	1993	393 ha	(972 acres)	138 ha	(341 acres)
East Creek Ridge	2001	569 ha	(1,405 acres)	36 ha	(89 acres)
County Line	1995	28 ha	(70 acres)	11 ha	(26 acres)
Agua 3	2000	52 ha	(128 acres)	28 ha	(70 acres)
Agua 2	1999	9 ha	(23 acres)	6 ha	(14 acres)
Agua 1	1999	21 ha	(52 acres)	12 ha	(30 acres)
Yovimpa	1995	213 ha	(526 acres)	28 ha	(69 acres)
Yovimpa 2	unburned	1,581 ha	(3,907 acres)	08 ha	(515 acres)
unnamed (AIS Unit 15/Cougar Hollow Ridge)	unburned	113 ha	(279 acres)	9 ha	(47 acres)
unnamed (AIS Unit 16/Podunk Creek)	unburned	94 ha	(231 acres)	2 ha	(54 acres)
Total for All FMUs	–	4,148 ha	(10,251 acres)	1,063 ha	(2,626 acres)

During the fieldwork, the FMUs provided the structure for subdividing the project area into manageable parcels. The FMUs also represented the areas of primary interest to park managers, and all compliance-related archeological site information was categorized by fire management units. In this survey report, however, the FMUs play little role in the description and interpretation of the park's archeological resources. The irregular sizes and archeologically arbitrary boundaries of the FMUs preclude their use as comparative sampling strata for data analysis. The FMUs do, however, enable the identification of sites burned by recent prescribed fires. The effects of prescribed fires on archeological resources are explored later in this report.

Logistics and Methods

During the 2000 and 2001 summer field seasons, the entire area of 4,148 ha (10,251 acres) covered by the FMUs was intensively surveyed. An additional 221 ha (548 acres) outside and adjacent to the FMU boundaries were also surveyed, providing overall survey coverage of 4,370 ha (10,799 acres) (Figure 5.2). Wenker and Eininger (2001) and Wenker and Herhahn (2002) present detailed descriptions of field logistics and methods, and the following sections summarize these topics.

Initial Sampling Strategy

The task directive (NPS 2000) initially anticipated that the project would be able to inventory between 56 and 67 percent of the prescribed fire management area. The task directive outlined a strategy to ensure that the survey results would be representative of the overall project area. The survey plan involved a multistage approach that selected a stratified random sample of 80 percent of the previously burned areas that were not archeologically surveyed. Once the 80 percent sample was surveyed, the topographic and vegetative characteristics of areas that exhibited high versus low probabilities of containing archeological sites were to be defined and selectively surveyed.

Daily survey rates exceeded expectations, however, and it was soon anticipated that the entire project area could be inventoried in the allotted two-year schedule. Hence, the probabilistic method was rendered obsolete, and the sampling plan was eventually abandoned in preference of a strategy that focused on surveying the entire prescribed burn area.

Survey Schedule and Methods

During both summers, field operations centered around a car-accessible base camp at the southern end of Whiteman Bench. Each field season saw the use of two four-person survey crews and a lab archeologist. Each crew was composed of a crew chief, two professional field crew members, and a park volunteer. The first field season began on May 15 and continued through August 28, 2000. The second field season began on May 16 and continued through August 15, 2001. The fieldwork was conducted during work sessions that consisted of eight 10-hour days followed by six days of leave. Fifteen work sessions, totaling 120 days, were spent in the field. Several days at the start of each field season were spent on crew orientation, training, and camp set up, and one day at the end of the season was used to close down the field camp.

Due to the linear layout of the park, logistical concerns were relatively minor for a survey of this size. Paved or dirt roads allowed good access to most units. Numerous man-made features and distinctive topographic features provided ready landmarks for locating individual survey areas.

Survey parcels were investigated by walking parallel transects with crew members spaced 15 m (50 ft) apart. Using a four-person crew, each survey sweep covered a corridor roughly 60 m (200 ft) wide. Transect orientation and spacing was maintained by using temporary flag lines. As the crew proceeded into the survey parcel, new flag lines were laid along the inside edge of each new transect, and those flag lines then guided subsequent return sweeps. This procedure was repeated back and forth across the landscape, regardless of terrain, until the entire survey parcel was examined.

Recording Archeological Resources

When cultural materials or anomalies in the natural landscape were noted, crew members stopped to investigate the area by looking for additional artifacts or evidence of human use. Individual artifacts, artifact concentrations, and features were marked with pin flags to determine the distribution, extent, and nature of the cultural items.

All cultural material that could be demonstrated or estimated to predate 1950 were recorded as archeological resources. Further, aspen dendroglyphs with dates through 1959 were also recorded as archeological resources, as were all undated aspen dendroglyphs that appeared "old," based on the degree of bark regrowth. Only the obviously recent bark carvings were discounted.

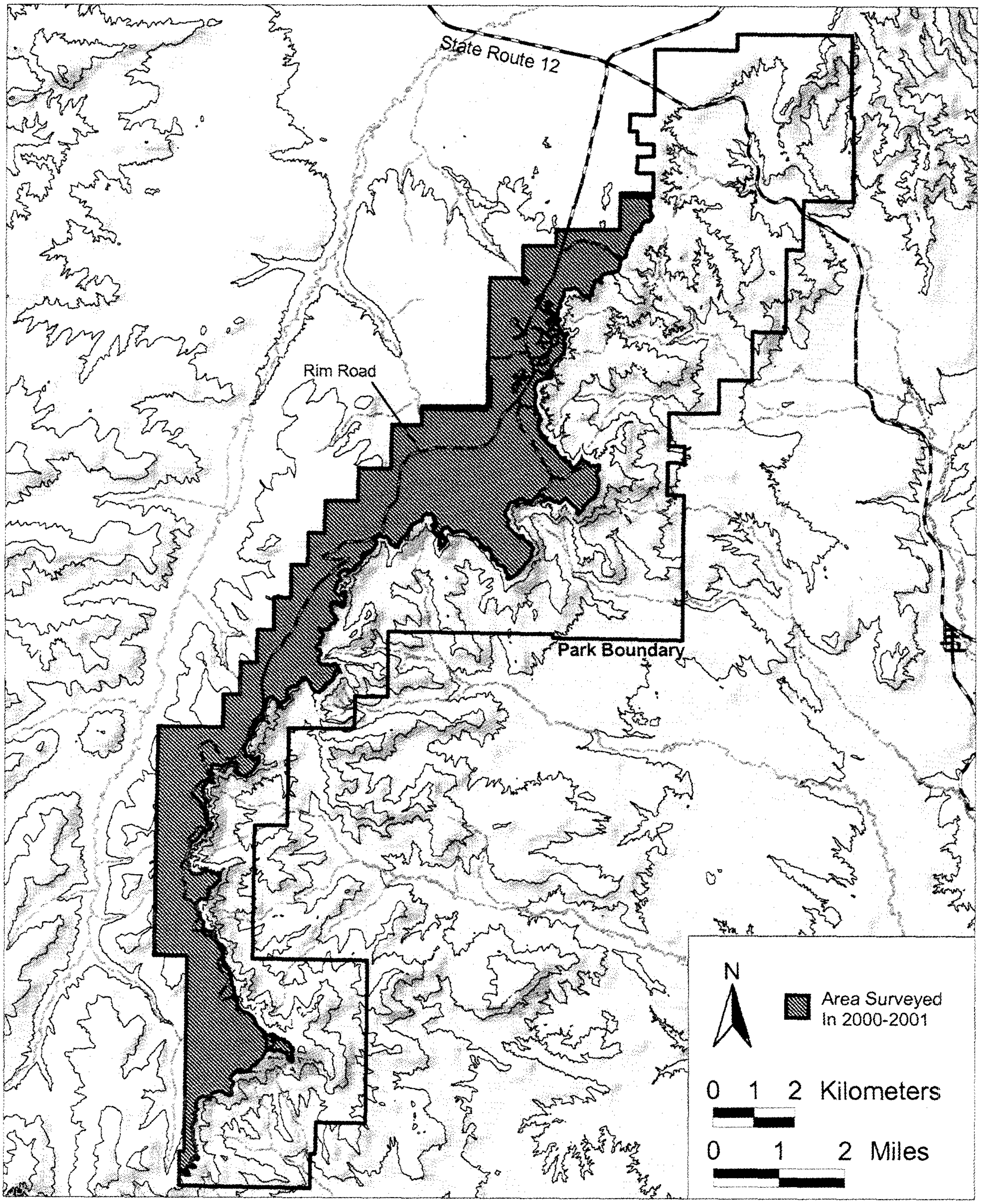


Figure 5.2. ***Area surveyed during the 2000–2001 field seasons of the Bryce Canyon Archeological Inventory Survey.***

Depending on the abundance of material, these resources were then classified as either sites or isolated occurrences (IOs). As a general rule, artifact scatters constituted sites if they contained six or more Native American artifacts or 16 or more Euro-American artifacts within a 15-m diameter area. Archeological resources not meeting these minimum criteria were recorded as IOs. Isolated occurrences included single artifacts, small artifact scatters not meeting the required site density, features of questionable cultural origin, and isolated features lacking any associated artifacts. Multiple features or features with artifacts typically qualified as sites. These definitions were flexible, however, and crew chiefs wielded considerable discretion in determining the appropriate field-recording approach. For example, some small Native American artifact scatters that contained fewer than six items but that displayed high proportions of tools or imported lithic materials, were recorded as sites. Some Euro-American IOs consist of refuse scatters with more than 15 individual items, but these qualified as IOs because they consisted of many small broken shards or fragments of a few (<15) large glass, ceramic, or metal artifacts. Other spatially extensive Euro-American refuse scatters that contained more than 15 items also constituted IOs because the density of material within any given 15-m diameter area did not meet the minimum criterion of a site.

Site documentation followed a component-based recording system—a component being an array of temporally and culturally related archeological remains that could be spatially segregated within the bounds of a site. Site boundaries were determined based on the extent of features or artifacts across the landscape. Sites with features or artifact scatters that appeared to be the result of a single occupation or use period represented single-component sites. This approach was used for the majority of the sites where no spatially discrete evidence of multiple occupations by different cultural groups could be discerned. Sites that contained evidence of multiple occupations that could not be spatially segregated (such as a single lithic scatter containing a mix of early and late projectile point styles) were also treated as single-component sites during recording (but are analyzed as multioccupation sites; Chapter 8). Multi-component sites were designated as such only when it was possible to spatially define material from two or more distinct occupations or cultural periods (e.g., a lithic scatter adjacent to a historic-era refuse scatter).

Each recorded archeological resource was assigned a sequential, project-specific field number (prefaced with "AIS" for sites and "IO" for isolated occurrences). All forms, maps, photos, field specimen logs, mapping records, and related documentation were cross-referenced using the field number. Sites were recorded on project-specific data forms that captured basic descriptive, locational, environmental, and management information as well as data pertaining to cultural and temporal affiliation, feature and assemblage characteristics, artifact technologies, susceptibility to fire, and future management recommendations. Supplementary data fields were also recorded to address park-specific research and management issues. To adequately record the numerous dendroglyphs and telephone-line features, additional forms were created during the survey to capture the unique attributes of these site types. Copies of the 2000 site-recording forms and manuals are presented by Wenker and Eininger (2001). Hand-drawn, scaled site maps that show the location of the site datum and boundaries, the location and extent of artifact scatters, features, or collected artifacts, and the site topography or other relevant physical features were created on ruled graph paper using hand-held orienteering compasses and metric tapes or pacing to measure distances. Global positioning system (GPS) data were collected for site datum and boundary locations using Trimble GeoExplorer® I and II data collectors. Site locations were also hand-plotted on U.S. Geological Survey (USGS) 7.5′ topographic maps. Sites were photographed using black-and-white 35-mm print film and single-lens-reflex cameras. Photographs included locational views, representative features, and overviews of the site's vegetation cover for fire management purposes. Every recorded aspen dendroglyph at each site and IO was thoroughly photographed to record its appearance, extent, and condition.

Some level of artifact analysis was conducted at nearly all sites. The sites that did not receive analysis included only those that had been previously surface collected to such an extent that few items remained available for study. Depending on the assemblage size, standard strategies were used for conducting analysis on either the entire assemblage or on a representative, arbitrarily selected sample (see below). Artifact-inventory forms collected artifact-specific attributes pertaining to material, size, technology, use, and affiliation (see Wenker and Eininger 2001). All artifact analyses were conducted on-site as part of standard site-recording procedures. Temporally diagnostic artifacts, such as projectile points or ceramics, were collected for laboratory analysis and curation.

Flaked lithic artifact analysis sample sizes were determined based on the overall site artifact count. At sites containing fewer than 30 items, all were analyzed. At sites containing between 31 and 500 flaked stone items, at least 30 were systematically selected for analysis (obtaining a 6 to 97 percent sample). At sites containing over 500 flaked lithics, 60 were selected (obtaining at most a 12 percent sample).

At sites that contained fewer than 100 items, all artifacts were flagged and a random number table was used to select 30 individual flagged items for analysis. Sites with more than 100 items were subdivided, either by establishing two or four circular sample areas or by dividing the site into quarters and selecting two or four quarters. Artifacts in each of the selected sample areas were flagged and a random number table was used to select 15 items from each unit for analysis.

Recording procedures for IOs were less detailed than those used for site documentation. A one-page form captured basic descriptive, locational, and environmental information (Wenker and Eininger 2001). To expedite the process of recording thousands of historic checkdams, a checkdam-specific recording form replaced the IO form. IO locations were hand-plotted on 7.5′ USGS topographic maps and their locations were GPS-recorded.

Immediately following the completion of each summer's fieldwork, the site and IO data were entered into a Microsoft® Access database. The database was designed for data storage and analysis, site form and report preparation, and future park resource management purposes. Other post-fieldseason work included processing GPS data, creating Geographic Information System (GIS) coverage, and cataloguing field specimens and photographs.

Research Design

From the outset, the Bryce Canyon AIS followed the resource-management need to identify the number, type, and condition of the park's archeological resources, but the survey also presented an opportunity for conducting archeological research. Basic information about the chronology and cultural affiliation of archeological sites forms the foundation of any plan of research, but as outlined below, broader archeological questions of regional interest are also developed for the sites in Bryce Canyon National Park.

Preliminary Research Plans

In 1991, National Park Service archeologists developed a project-specific research design for data-recovery excavations at 11 Native American sites and a single Euro-American site along the Rim Road construction corridor (NPS 1991). That document, written part-way through the multiyear project, outlined the project's field methods and described the expected range of recovered artifact and data classes. The primary goal of the research design for Native American sites was to "allow the development of a culture chronology for Bryce Canyon, which has not been explicated to date. The data will also allow investigation of several aspects of forest fire history and cultural use of post-fire communities" (NPS 1991:1–2). Similarly, for the historical CCC campsite, "many issues regarding the hierarchic nature of the camp's layout, the distribution of personnel, and socio-economic disparities are not explicit in the documentary sources. Recording these traces of facilities and associated discards will allow examination of these issues" (NPS 1991:2).

Similarly, the preliminary research design that directed the field strategy during the 2000 and 2001 inventory seasons outlined a suite of fundamental questions about the park's cultural history (Wenker and Eininger 2001:15–18). The research domains that initially directed the Bryce Canyon AIS included: (1) chronology of Native American and Euro-American use of the park, (2) Native American and Euro-American land-use patterns, and (3) Native American and Euro-American cultural affiliation and interaction. These divisions allow synchronic and diachronic evaluations within and among each research domain or sub-domain.

Both of the above research designs emphasize the basic need to flesh out our understanding of the human history at Bryce Canyon National Park. Because this type of baseline data was sorely lacking, questions about the chronology of human occupation, cultural affiliation, and patterns of land use dominated the research plans. These issues remain as the most important research questions in the present study. While the results of the project may help expand or refine our knowledge about these topics, these issues should remain at the forefront of future archeological research as well.

After the end of the 2001 field season, the range and types of archeological resources at Bryce Canyon National Park were fairly well understood. As outlined below, the preliminary research design expanded to involve a variety of research questions that could be explored with available data. Necessarily, the research design acknowledges the survey's data-collection methods, which were implemented through a management-oriented, compliance-driven inventory project. Certain established aspects of the field methods (such as the practice of recording sites apart from IOs, or the use of 15-m-wide transects) must be accommodated by the research plan. Similarly, the range of data classes collected in the field limit the topics that can be addressed by the final research design.

Revised Research Plan

The three primary research domains (chronology, land use, and cultural affiliation) outlined by Wenker and Eininger (2001) remain central to the Bryce Canyon AIS. The goal of the chronology research domain is the determination of the sequence of prehistoric and historic occupations that occurred in and near the project area. Events that occurred within recent memory or during the period of recorded history are relatively easy to identify and order chronologically. As the time period in question becomes more remote, an area's occupational history becomes more difficult to confidently identify and order. At this point, the focus lies not on identifying individual events but on outlining patterns or general sequences of occupations. An investigation of chronology cannot be divorced from issues such as cultural affiliation and land-use patterns, however.

The goal of the research domain that focuses on land use is the identification and interpretation of the function, periodicity, and duration of the episodes of human occupation in the project area. Meaningful appraisals of these subjects rely heavily on accurate chronological evaluations, and in the absence of such temporal control, only broad patterns may be discerned. Finally, the cultural affiliation research domain attempts to discern the cultural patrimony of groups who occupied the area. Rarely can the actual affiliation of the Native American occupants of an archeological site be identified. In the absence of written records, determinations of affiliation with an archeologically defined cultural unit rely on diagnostic items of material culture such as pottery types, projectile points, and architectural styles, or, more rarely, perishable items such as basketry, footwear, or textiles. Frequently, only broad generalizations of affiliation with regional traditions can be made. Euro-American cultural affiliations may be determined through historic records or by the identification of ethnically diagnostic features such as inscriptions, styles of habitations, or artifacts.

Once the bare framework of the chronology, land use, and cultural affiliation of the park's archeological sites is sketched out, data classes that may be open to productive avenues of investigation become apparent. Below, more refined research questions are developed and draped over the framework. Subsequent report chapters will investigate these questions to illuminate selected aspects of the park's human history.

Native American Archeological Research Topics

The Native American use and occupation of Bryce Canyon National Park extends from the late Paleoindian-early Archaic period transition (ca. 9500 B.P.) to the historic period (A.D. 1880s to 1900s). The park's sites are known mainly from their surface remains, although several have been previously test excavated. The inventory project documented the first late Paleoindian/early Archaic, Puebloan, and Paiute sites in the park. Although no habitation structures are known, the sites of all time periods can be interpreted as temporary camp sites or locales of seasonal resource procurement or processing. Some research topics that can be studied with data from these sites include cultural-history reconstruction, environmental adaptation, economic and technological change or stability, seasonal transhumance, and issues of regional or cultural affiliation. Sites in the park are uniquely poised to address these questions for several reasons, including: (1) the Paunsaugunt Plateau's location at the confluence of multiple archeological culture areas, (2) the long span of occupation in the park, (3) a paucity of comprehensive archeological survey coverage in lands adjacent to the park, and (4) a dearth of regional research conducted in comparable high-elevation settings.

Late Paleoindian/Early Archaic Period Archeology in South-Central Utah

As discussed in Chapters 2 and 3, the environmental changes of the last 12,000 years affected cultural developments in south-central Utah in fundamental ways. This is abundantly clear in the Paleoindian/Archaic cultural transition, which spans the late Pleistocene/early Holocene Epoch transition. The sites that contain late Paleoindian/early Archaic period components in Bryce Canyon National Park lend themselves to two closely aligned research topics concerning the relationship between stemmed and fluted points, one of the longstanding research issues in the Great Basin. One research question investigates the environmental contexts in which large stemmed projectile points were used during the late Paleoindian and early Archaic periods. A second related question studies the possible subsistence strategies that may be indicated by the continued use of these points after the end of the Pleistocene Epoch.

Several sites in Bryce Canyon National Park that contain Western Stemmed, Pinto, and other untyped stemmed projectile points contain information that can contribute data useful for studying some of these research questions. In particular, the geographic setting of the park provides a view from the eastern Great Basin and the western Colorado Plateau. Much previous research has focused on the central and far western Great Basin, leaving the eastern margin understudied and not well-represented in the archeological literature. The study of early sites containing stemmed points can provide data from a rarely investigated environmental setting. In addition, analysis of the stemmed points from the park can contribute to the larger body of data regarding the morphology of stemmed points. The significance of the park's early period sites lies in their contribution to an overall regional picture of land use and subsistence strategies based on distributional and morphological studies, rather than in the absolute abundance of stemmed points on a local level.

Middle and Late Archaic Period Archeology in South-Central Utah

The middle and late Archaic period sites in Bryce Canyon National Park best relate to two primary research topics. One research question studies the processes by which the close similarities in Archaic period cultural material of the southeastern Great Basin and the western Colorado Plateau developed. The second research topic explores the apparent increased use of upland areas during the middle Holocene Epoch and evaluates the possibility that this land-use change may be related to expanding diet breadth conditioned by increasing aridity and decreased availability of large game.

The first research topic concerns the relationship between middle and late Archaic period hunter-gatherers of the eastern Great Basin and western Colorado Plateau. Bryce Canyon National Park straddles the interface between these two physiographic provinces, and in this region, the Great Basin and Southwestern archeological culture areas are typically ascribed to these respective physiographic provinces (at least with regard to post-Archaic cultural groups). However, the strong affinities between the cultural materials of the Archaic people of southern Utah and Nevada and the northern Southwest is a topic of recent discussion and research (Aikens and Madsen 1986; Berry and Berry 1986; Huckell 1996; Matson 1991). Generally, the Archaic period points found on the western Colorado Plateau bear little similarity to those of the Oshara sequence of the northern Southwest (Irwin-Williams 1973), but are quite similar to those from central Utah (Geib 1996b:29; Geib et al. 2001; Irwin 2001).

The continuity in material culture from the southeastern Great Basin to the western Colorado Plateau may indicate cultural homogeneity among the groups inhabiting western, central, and southern Utah. Alternately, the broad range of continuity in material culture may not be a cultural marker. Instead it may be indicative of flexible technological adaptations that proved useful in all of the various physiographic provinces of the eastern Great Basin and western Colorado Plateau, despite the variable resource zones (e.g., marsh, desert scrub, woodland, montane forest) that the technology was required to accommodate. The sites in Bryce Canyon National Park can provide additional data to confirm or refute the presence of a strong Great Basin influence in the western Colorado Plateau. The nature of this relationship has broader implications for the archeological study of regional material-culture similarities, a topic of considerable archeological interest worldwide (e.g., Carr and Neitzel 1995; Conkey and Hastorf 1990; Hodder 1990; Jochim et al. 1999; Sackett 1985, 1990; Wiessner 1983, 1984).

Another important research issue in the Great Basin/Colorado Plateau interface, particularly for the middle and late Archaic periods, involves tracing the development of a Great Basin-oriented subsistence system that appears to focus on lacustrine and riverine marsh environments but also incorporates upland resource procurement zones such as the Paunsaugunt Plateau. Extensive archeological research has been conducted on sites in the marsh environments around relict Pleistocene lakes in the Great Basin (e.g., Heizer and Napton 1970; Janetski 1986; Kelly 2001; Madsen 1982; Thomas 1985), but few researchers investigate nonlacustrine wetlands.

Because much of the eastern and southern Great Basin lacks large lakes, smaller and more dispersed marsh resources along rivers, streams, and small lakes may have been crucial to Archaic period Great Basin adaptations. In the Great Basin/Colorado Plateau transitional area, these types of mesic resource zones are typically found only in the highest-elevation settings. In the vicinity of Bryce Canyon National Park, portions of the East Fork of the Sevier River and its tributaries may have provided just such a resource zone. If marsh resources did exist in the park itself, they probably would have been found in the areas of East Creek and upper Podunk Creek, or in the wetter canyons below the Pink Cliffs. If the presence of past wetlands could be determined through paleoenvironmental research, the middle and late Archaic period sites of the plateau could have the potential to provide important information relevant to the study of montane adaptations in the Great Basin/Colorado Plateau transitional zone during the middle and late Holocene Epoch.

Late Prehistoric/Formative Cultures: Fremont and Puebloan Groups on the Paunsaugunt Plateau

Following the end of the Archaic period, the cultural-historical picture becomes very complex due to the overlapping ranges of groups who pursued a variety of adaptive strategies and exhibited a high degree of demographic fluidity. The research questions that focus on the late Prehistoric or Formative (e.g., Fremont, Puebloan) occupation of the area explore the adaptive responses engendered by the addition of horticultural products to post-Archaic period subsistence strategies.

The Archaic period clearly shows a hunting and gathering focus, but post-Archaic period subsistence pursuits ranged from full-time foraging to full-time farming, and included everything in between (Madsen and Simms 1998). The Fremont archeological culture fully represents this range of subsistence strategies. While no recorded sites in Bryce Canyon National Park are clearly of Fremont origin, many of the park's nonceramic sites are certainly late Prehistoric (i.e., post-Archaic) in age. Several Fremont sites are known from along the East Fork of the Sevier River near the northern and western park boundaries, so a Fremont presence on the plateau is certain. The proximity of the contemporaneous Virgin Anasazi culture area to the south, which has a definite presence in the park, further complicates the process of determining the cultural affiliation of the park's aceramic late Prehistoric sites. These sites must be accounted for in the interpretation of the park's prehistory and are considered in this discussion as generalized late Prehistoric/Formative sites that may have been occupied by Fremont, Puebloan, or other post-Archaic groups. The generalized late Prehistoric/Formative archeological record in Bryce Canyon National Park does not contain any signs of sedentary villages, but it does contain sites that may be related to the procurement of wild resources. Prominent research issues applicable to all late Prehistoric/Formative sites center on the study of land-use patterns away from settled villages, the extent of prehistoric catchment areas, and how these areas interface with procurement zones of other contemporary late Prehistoric- or Formative-era peoples (e.g., Parowan vis-à-vis San Rafael Fremont, or Fremont vis-à-vis Puebloan groups).

The research issues that apply specifically to the Puebloan use of Bryce Canyon National Park also focus on montane resource procurement. Unlike Fremont farmers, Virgin Anasazi horticulturists are believed to have been less reliant on wild resources, and their settlement patterns were structured to emphasize farming rather than to optimize access to wild resources (Lyneis 1995; McFadden 1996; cf. Fawcett and Latady 1998). The park's Puebloan sites are not numerous, but they can provide a broader view of Puebloan subsistence practices than that derived solely from architectural sites at lower elevations.

The Numa and the Southern Paiute on the Paunsaugunt Plateau

Many of the sites in the park with Southern Paiute Brown Ware ceramics also show a strong reliance on flaked stone tools, indicating a possible prehistoric or protohistoric temporal affiliation. These potentially early Numic sites may contribute important information relevant to the origin of Numic-speaking groups in the eastern Great Basin (Aikens and Madsen 1986; Bettinger and Baumhoff 1982; Holmer 1994; Lamb 1958). The archeological study of historic Southern Paiute sites is similarly important because it provides a more balanced history of this marginalized group than that recorded by Euro-American explorers and settlers, and it fills some of the many gaps in the ethnographic information collected in the 1930s (Kelly 1934, 1964; Steward 1938). The sites in the park that can be confidently assigned a historic or protohistoric Numic affiliation contain bark-stripped ponderosa pine trees that show the marks of steel axes. The presence of bark-stripped trees in the park suggests that these groups were under significant subsistence stress, so sites of this period can be studied to document the impact of Euro-American settlement on Paiute subsistence practices and land-use patterns (Martorano 1981, 1988; Schroeder 1965; Swetnam 1984; cf. DeVed and Loosle 2001:12).

Undated/Unaffiliated Native American Sites in Bryce Canyon National Park

Many Native American sites in Bryce Canyon National Park do not contain temporally diagnostic artifacts or features on the modern surface. These sites cannot presently be attributed to an archeological culture or a cultural affiliation more specific than that of generalized Native American. Many of these sites may contain hidden or buried artifacts or features; duff and vegetation inhibited visibility at many sites and some temporally diagnostic artifacts may have gone unnoticed during the survey. Furthermore, the results of previous archeological test excavations at several Native American sites along the Rim Road (Dominguez and Danielson 2000) indicate that buried artifacts and possible cultural deposits are not uncommon. Hence, once their cultural affiliations are determined, these sites could exhibit potential to contain data relevant to answering certain of the above research questions.

Even if sites cannot be attributed to a general cultural or temporal group, the data contained in those sites' artifacts and features can provide important information about generalized high-elevation adaptations. These unaffiliated sites present archeologists with opportunities to develop new interpretive methods or to independently test existing interpretations of affiliated sites. For example, the unaffiliated sites can provide archeologists with generalized information about the atemporal technological aspects of high-elevation resource procurement or processing sites. The range of functions of high-elevation sites of unknown affiliation can be contrasted against the functions of sites of known affiliation to examine the degree of functional variety or homogeneity at all montane sites. The interpretive benefits of this type of study are manifold. If differences in site function at affiliated sites show patterned changes through time, the unaffiliated sites that show similar patterns may be better placed in context. Conversely, if technological adaptations at affiliated sites show little change through time, the results of a technological analysis of unaffiliated sites can provide a control sample to test the validity of such an interpretation. Other important research avenues could include sourcing lithic materials to examine generalized regional exchange patterns, or examining site distributions to determine the intensity of regional land use. This evaluation is especially true when the Native American site density in Bryce Canyon National Park is compared with site densities in adjacent areas of the southern Paunsaugunt Plateau on the Dixie National Forest. There, in a nearly identical plateau-top setting, remarkably few archeological sites have been recorded, partly due to different survey methods and probably partly due to different site-definition criteria. Regardless, the density of sites now recorded within the park reflects a Native American occupational intensity that was previously unsuspected, which enhances the significance of all of the sites.

Euro-American Archeological Research Topics

Archeological evidence for the Euro-American use and occupation of Bryce Canyon National Park extends from 1891 to the 1950s, and historical records suggest that settlers were using the plateau top as early as the 1870s. Again, most of the archeological sites are known mainly from their surface remains, but one campsite has been test excavated.

The aspen dendroglyph sites and the watering troughs provide the only concrete evidence of occupation and use of the area by local ranchers and shepherds during the prepark period. Because these sites contain primary, unique evidence about the earliest period of economic exploitation on the plateau top, these features can inform such topics as grazing practices and vernacular art with data that is not available in written records or archives. Other Euro-American sites, such as work camps, residential sites, concessionaire utility sites, and refuse dumps, are related to the development and operation of the national park. All park-related Euro-American historic archeological sites are unique to Bryce Canyon National Park, hence their primary significance lies in their ability to convey specific information about various periods in the park's development.

Early Euro-American Economic Use of the Paunsaugunt Plateau.

The earliest settlers who homesteaded the area around the Paunsaugunt Plateau mainly pursued a subsistence economy. After a few decades, by the 1890s, a regional economy had emerged that included cooperative grazing associations, sawmills, and irrigation works, but most individuals still pursued a self-sufficient lifestyle. The plateau-top areas were among the last to be exploited due to their inaccessibility, short growing season, and the presence of range and timber in low-elevation settings around the plateau. Among the first to take full advantage of the high-elevation plateau resources were the ranchers and grazers who made up the cooperative Kanarra Cattle Company, but independent grazers also surely made use of the plateau's pastures soon thereafter. Loggers also entered the plateau-top forests during this period, but no certain evidence of their presence in the park is available. The only concrete evidence of occupation and use during the prepark period is found at the aspen dendroglyph sites and the watering troughs. These properties provide evidence of use mainly by the ranchers and shepherds of the 1910s to the 1940s, although some of the historic dendroglyphs can be related to National Park Service employees, park visitors, CCC laborers, USFS rangers, and the like.

Throughout the American West, the sites of large historic ranches (such as Grant-Kohrs Ranch in Montana and the J A [Goodnight] Ranch in Texas) are commonly preserved and interpreted as being the most exceptionally significant examples of this early period of western ranching (National Survey of Historic Sites and Buildings 1959), but these sites fail to represent the full range of the western livestock industry in the nineteenth and twentieth centuries. Thousands of small, independent ranchers also ran their stock across the western states, including Utah (Beckstead 1991). The history of grazing in Utah is recognizably different from that of other western states, however, and this historic phenomenon has left lasting social imprints on the state's modern residents. By the late 1870s, a distinctive type of Mormon livestock management (based on Eastern and Midwestern American practices) had developed in Utah. This system blurred the difference between farm stock and range stock. Utah's grazing practices were shaped by the Mormon penchant for cooperation and group life. Most Mormons lived in towns, from which they worked their small nearby farms, and almost all kept a few head of livestock that usually grazed in pooled town or cooperative herds when they were not penned at the farm. After 1880, however, a host of internal and external conditions (including the invasion of Texas cattle and cowboys, and a dramatic increase in the number of sheep) imposed some aspects of the western ranching pattern upon the village-based Mormon grazing system. Still, the typical pattern of a large number of small-herd owners characterized Utah's ranching well into the middle of the twentieth century (Palmer 1974; Peterson 1973, 1989).

This uniquely Mormon approach to livestock management produced an archeological and historic ranching landscape that is generally unobtrusive in character. Unlike the grand ranch complexes of the famed Old West, the sites, buildings, and structures related to Utah's historic grazing economy are rarely preserved and are often barely perceptible. Some aspects of the history of this economic pursuit are preserved in state and local archival records, and published and unpublished histories. Memoirs provide additional details about this time period (e.g., Daughters of the Utah Pioneers 1949; Davies n.d.), but the tangible remains of this important component of Utah's rural economy are rarely encountered today. Most commonly, small cowboy or shepherd camps, corrals, and other limited-use sites are found by archeologists (e.g., Geib et al. 2001). Generally, few of these ephemeral site types can be precisely dated or attributed to use by a specific group or individual, which limits their interpretive potential.

The ranching and shepherding sites that are present in Bryce Canyon National Park are indeed unobtrusive—they consist mainly of aspen dendroglyphs and water troughs—but unlike most ephemeral stock-raising sites, the park's sites can often be dated and attributed to specific individuals or groups. The inscriptions at these sites exhibit numerous personal names, dates, towns and cities, brands, messages, and drawings. As such, these sites contain a primary, unique record of everyday life as recorded directly by the plateau-top laborers themselves (be they cowboys, shepherds, loggers, etc.). Essentially, the inscriptions at these sites are historic diaries, conveying the desires, frustrations, and personal experiences of the cowboys and shepherds of the past. Archeologically and historically, these sites serve as one of the very few primary sources of information documenting early-period grazing activities on the Paunsaugunt Plateau. The movements of some specific individuals may be tracked by year and month, and a rough outline of the historic schedule of summer grazing on the plateau may be created.

Further, many of the inscriptions include drawings and figures, some of which were drawn with a crude hand or are pornographic, but others are elegantly composed and finely executed. These figures represent a class of vernacular art that also conveys the personal experiences and, occasionally, social mores of the plateau-top laborers who, presumably, were stationed with their herds in remote locations for long periods of time and took the time to invest their figures with highly personal meanings. Mallea-Olaetxe (2000) observes a paradoxical nature of aspen dendroglyphs: sometimes the inscriptions document highly personal or private desires, and even though these inscriptions were publicly displayed, they were never meant for wholesale public consumption. Certainly, the aspen inscriptions of guns, gambling, and women that are present at the Paunsaugunt Plateau sites were never meant to be viewed by the families of the artists, many of whom probably had a strict Mormon upbringing, but these elements provide tantalizing glimpses of the private mindset of the young men who ran their herds on the plateau. Accordingly, the aspen dendroglyphs and other historic inscriptions in the park find their interpretive potential through their ability to provide important information about the timing and extent of the annual rounds of transient grazers and through their ability to convey the identity and psyche of the historic personalities who worked on the plateau.

National Park Service Tenure on the Paunsaugunt Plateau

Euro-American sites such as work camps, residential sites, concessionaire utility sites, and refuse dumps are related to the development and operation of Bryce Canyon National Park. These sites represent activities that were conducted either directly by the National Park Service or by its concessionaire, the UPC, in the period between 1928 and the 1960s. No sites related to the USFS 1923–1928 period of management are known in the park.

Temporary Euro-American campsites such as those in the park often appear inconsequential at first, but as Smith (2001:31) points out, "the archaeology of temporary shelter[s] seeks to reconstruct cultural activities from the barest of physical remains. . . . The challenge of interpreting these ephemeral archaeological remains is often increased by the active process of site dismantling and reuse associated with later occupation. When both historical and archaeological data are available for a camp, inferences drawn from archaeological remains can be compared with written documents, providing models that can be used in the interpretation of sites that lack an historical tradition." For example, among the nation's CCC camps, seasonal and regional differences in the camps' locations and configurations developed as the work program evolved (Paige 1985). The study of the archeological remains of work camps (both CCC and others) can illuminate changes in camp structure and function through time that may not be recorded in archived records. Other aspects of personal life that are generally downplayed in administrative histories such as ethnicity, subsistence, or recreational pursuits (e.g., alcohol consumption) may also be discerned in the archeological materials (Smith 2001:37).

The primary interpretive potential of the historic National Park Service sites lies in their ability to reveal various activities that occurred during the park's development, such as periods of road and building construction. At another interpretive level, these sites can also provide information about the general development of western national parks that may be comparable to similar sites in other parks (e.g., Culpin [1994:503–514] discusses early twentieth-century work camps in Yellowstone National Park).

Sites that were created by other entities such as the CCC or UPC represent distinct activities conducted by outside interests working under the purview of National Park Service management. Hence, while these sites also contain elements unique to the park, their association with similar sites in other locations can be drawn more easily. For example, Bryce Canyon National Park's CCC camp actually represents a spike camp from the CCC base in Zion National Park, so the structure, content, and functions of this camp can be compared to similar camps at Zion National Park and across the rest of the country. Similarly, the UPC was also active in Zion National Park, and the UPC sites with structural remains and refuse deposits in Bryce Canyon National Park can be compared and contrasted with those in Zion National Park, as well as with other tourist facilities at national and state parks across the country to examine topics such as concessionaire management activities and tourist demographics. Limited documentary or archival information is available for some of these sites, but others are known only from their archeological remains. The wide range of data contained in these diverse sites can illuminate the general character of work practices and daily activities that were undertaken during the historic period of park management and development.

6

Summary of Survey Results

Sue Eininger

This chapter provides a quantitative summary of the accomplishments and observations of the Bryce Canyon AIS. The following discussion outlines the survey coverage and the numbers and types of archeological resources that were encountered. Further analyses and interpretation of these findings and their relevance to the park's culture history are presented in subsequent chapters.

Survey Coverage and Results

The inventory project examined a total of 4,370 ha (10,799 acres) of park land (see Figure 5.2). This area includes 4,148 ha (10,251 acres) covering the park's 16 plateau-top FMUs as well as an additional 222 ha (548 acres) outside and immediately adjacent to the FMUs. Twenty-four percent of the surveyed area (1,063 ha [2,626 acres]) had been previously surveyed during a variety of park projects. These areas were resurveyed during the inventory to ensure consistent and comprehensive coverage. The remaining 3,307 ha (8,173 acres, or 76 percent of the survey area) constitute new survey coverage.

A total of 194 sites was recorded during the project (Figure 6.1). Twenty-three of these sites had been previously recorded; the remaining 171 sites represent new discoveries. Site density is highly variable across the project area. For example, within the Yovimpa 2 FMU in the southwestern portion of the park (see Figure 5.1), site density is calculated at 1 site per 131 ha (326 acres). Given the steeply sloping, forested terrain that characterizes this area, a low site density is not unexpected. Conversely, in the Sunset Campground FMU in the northern portion of the park, site density is much higher (1 site per 11 ha [27 acres]). Most of the sites in this latter area are Euro-American and reflect several decades of commercial and National Park Service development around the Bryce Canyon Lodge. In the project area as a whole, the site density is one site per 23 ha (56 acres). This density represents a two-fold increase when compared to projections from previous archeological survey results. This increase in site frequency can be readily attributed to the more intensive ground coverage and recording strategies of the inventory project.

Isolated occurrences (IOs) were also recorded in much greater numbers during the inventory project than during previous surveys. A total of 4,860 IOs is identified. The vast majority of these (n=3,909) consist of log-and-rock checkdams constructed between the 1930s and 1960s as part of a park-initiated erosion-control program. All checkdams lie in the northern portion of the project area, in alluvial valleys that are crossed by many old, incised erosional gullies. Some valleys contain as many as 190 checkdams per hectare.

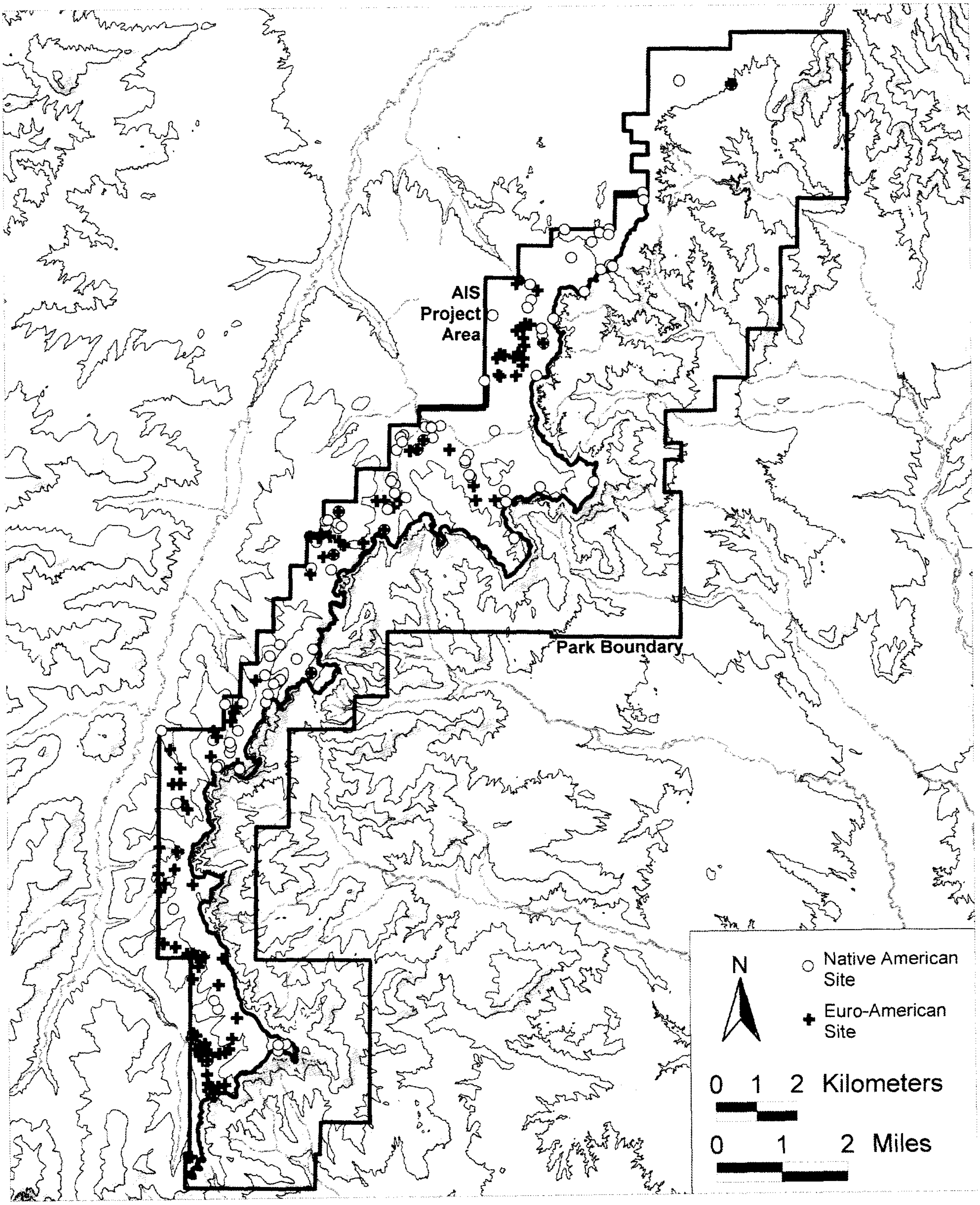


Figure 6.1. ***Locations of archeological sites recorded during the Bryce Canyon Archeological Inventory Survey project.***

The remaining 951 IOs consist of single artifacts, isolated features, and sparse artifact scatters that do not meet the project's site criteria (Chapter 5). These IOs most commonly include projectile points, small nondiagnostic lithic scatters, single cans or bottles, sparse historic refuse scatters, dendroglyphs, and a variety of other isolated artifact and feature types. Within the project area as a whole, density is calculated at one IO per 5 ha (11 acres), although, as with site density, IO density is generally higher in the northern portion of the project area.

Two of the 194 sites recorded during the inventory lie outside the survey area proper. One site (42GA2634), originally recorded by O'Connell (1984), was re-recorded in 2001 by Bryce Canyon AIS staff during a nationwide National Park Service site-condition assessment project. The other site (42GA5287), a historic inscription and pictograph, was known to park staff and local residents but had never been officially recorded or included in the park database. The site was recorded by Bryce Canyon AIS staff at the end of the 2001 field season after the project-area survey was complete. Subsequent discussions of project data will include all 194 sites. A summary list of the sites, noting cultural affiliation, site type, size, and observed cultural material, is presented in Appendix 6.1.

Summary of Sites

As mentioned above, 194 sites were recorded during the inventory project. Cultural material representing Native American, Euro-American, and unknown culture groups is present (Table 6.1). The majority of sites are single-component sites representing one culture group or temporal period. Euro-American sites slightly outnumber Native American sites. Of the 182 single-component sites, 96 are Euro-American and 86 are Native American.

Table 6.1. Cultural affiliations of sites.

Cultural Affiliation	Count
Euro-American single-component site	96
Native American single-component site	86
Native American and Euro-American multicomponent site	9
Native American and Unknown affiliation multicomponent site	1
Euro-American and Unknown affiliation multicomponent site	1
Native American, Euro-American, and Unknown affiliation multicomponent site	1
Total	194

Twelve sites containing spatially discrete material representing combinations of Native American, Euro-American, or unknown culture groups are recognized as multicomponent sites. The components of unknown affiliation lack the diagnostic attributes with which to definitively identify either a Native American or Euro-American affiliation. Most of the multicomponent sites contain both Native American and Euro-American material. For example, Site 42GA3560 contains six scatters of Native American flaked and ground stone artifacts along with a broadly scattered array of historic Euro-American cans and glass. Site 42GA5281 is a single Paiute bark-stripped ponderosa pine tree that also displays a Euro-American inscription carved into the bark-stripped area. Site 42KA5798 consists of a fairly localized Native American lithic scatter, a rock feature of unknown affiliation, and a Euro-American spring-improvement feature. Two other multicomponent sites (42GA1904 and 42GA5242) contain three components: (1) prehistoric Native American flaked lithic scatters, (2) probable early historic Paiute bark-stripped trees, and (3) arrays of Euro-American features (mostly dendroglyphs) and artifacts (Figure 6.2).

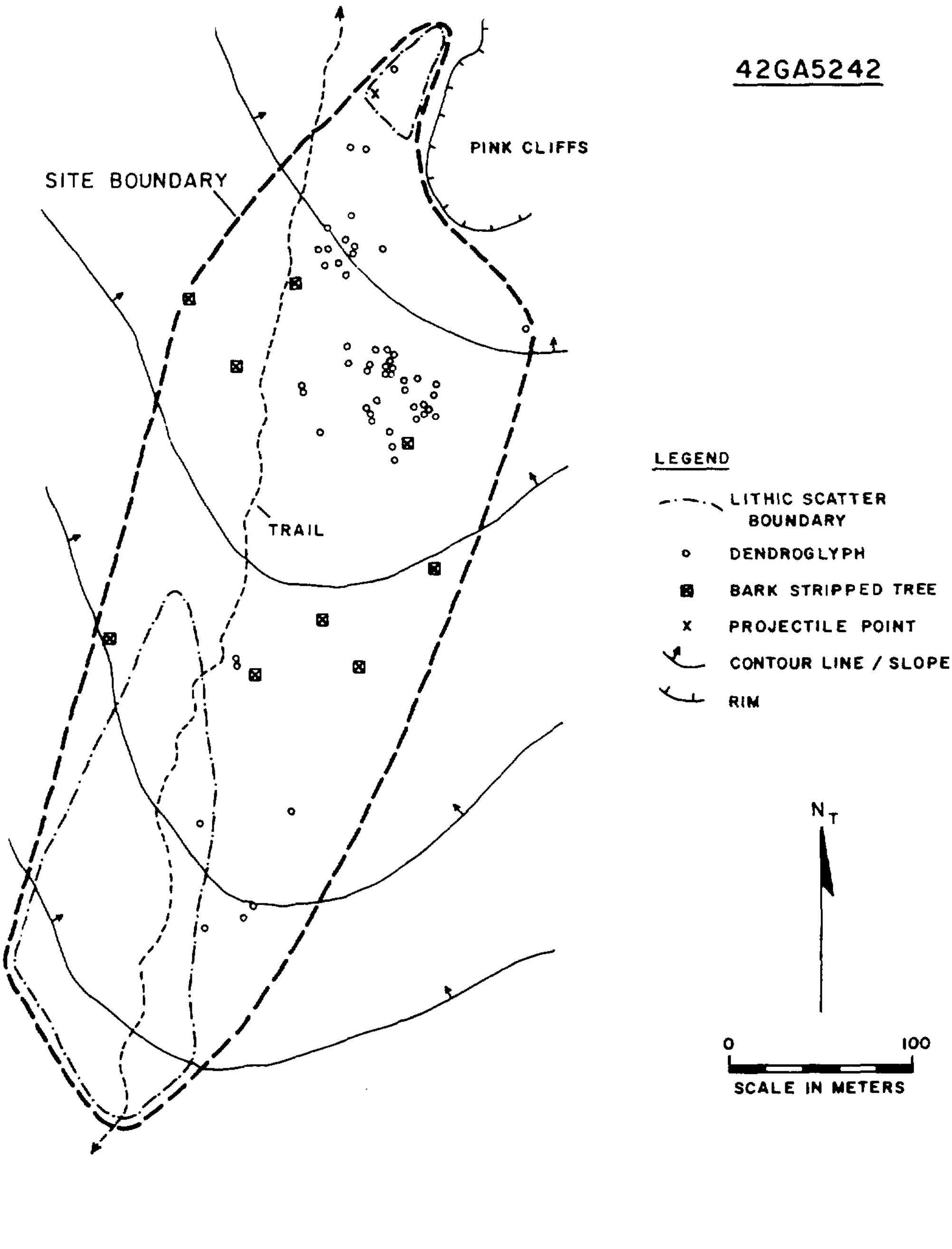


Figure 6.2. ***Map of Site 42GA5242, a multicomponent site containing an Archaic period lithic scatter, several Numic/Paiute bark-stripped trees, and a grove of Euro-American aspen dendroglyphs.***

Overall, Native American material is present at 97 sites and Euro-American material is present at 107 sites. To categorize the wide variety of single and multicomponent sites in the project area, 25 different descriptive site types were assigned (Table 6.2). These types are based on descriptive classifications used for preliminary field assessment and sorting, and account for the various combinations of artifact scatters and features found within each site. Analysis and interpretation of the site types in relation to their specific cultural affiliations are presented in Chapters 7, 8, and 9.

Most sites in the project area (n=105) are comprised of artifact scatters with no associated features. Native American lithic scatters (e.g., Figure 6.3, top), which predominate, are recorded at 80 sites; lithic and ceramic scatters are noted at seven. Simple artifact scatters are a less common site type among Euro-American sites, and features are much more prevalent. Among the 96 single-component Euro-American sites, only 14 refuse scatters and 5 dumps are recorded. Of the 12 multicomponent sites only two contain Native American and Euro-American artifact scatters with no associated features. The contents of the park's artifact scatters are described in a following section.

Eighty-nine sites are comprised of one or more features with or without associated artifacts (e.g., Figure 6.3, bottom, and Figure 6.4). The sites with features are largely of Euro-American affiliation and occur in single-component and multicomponent settings. Aspen dendroglyph sites are the most common Euro-American single-component site type (n=65). Other single-component site types, represented by one or two sites each, include formal and short-term campsites (e.g., Figure 6.5), gravel pits, spring improvements, telephone lines, and structural remnants. Multicomponent sites also contain a variety of Euro-American features. Examples include Site 42GA5278, a Virgin Anasazi lithic and ceramic scatter located around the remnants of a National Park Service cabin foundation and Site 42GA1902, a Native American artifact scatter next to a Euro-American water trough and refuse scatter. Features are exceptionally uncommon among the Native American sites. Only two single-component and four multicomponent sites contain definite Native American features. The variety and types of features recorded in the project area are more fully described in a following section.

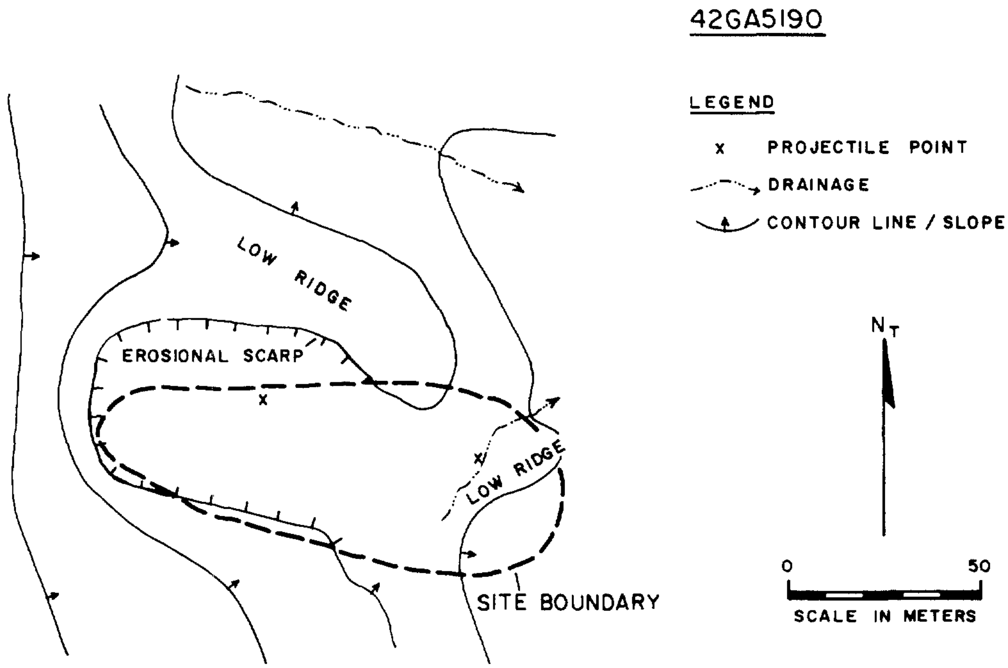
Site size is highly variable depending on site type, location, and duration of use. Site areas range from 2 m^2 to over 150,000 m^2 (Table 6.3). The smallest sites consist of single features, small clusters of features, or highly localized artifact scatters. Larger sites (greater than 10,000 m^2) are typically multicomponent and consist of dispersed but continuous scatters and features. Examples of the most expansive sites include Site 42GA3561, a Native American artifact scatter dispersed among the remains of a CCC camp; Site 42GA5288/42KA5814, a 9.6-km (6-mi) long telephone line corridor extending north-south through the park; and Site 42GA5242 (Figure 6.2), a multicomponent site including an extensive Archaic period lithic scatter, a probable historic Paiute component consisting of several bark-stripped trees, and an array of Euro-American aspen dendroglyphs. Most of the sites (n=109), however, cover less than 1,000 m^2 and rarely exceed more than 100 m across.

Because of the numerous multicomponent sites and the wide range of site types, further discussion of the site materials will be presented at the component level. Two hundred nine individual site components are identified among the 194 sites. This total includes 99 definite Native American components, 107 Euro-American components, and 3 components of unknown affiliation. Although the unknown components cannot be definitively assigned to either Euro-American or Native American cultural affiliations, based on the available field data, the unaffiliated rock features at Sites 42GA5240 and 42KA5798 will be discussed as probable Euro-American components and the unaffiliated pictograph feature at Site 42GA5287 will be discussed as a probable Native American component. Hence, for interpretive purposes, the project area contains 100 Native American components and 109 Euro-American components.

Table 6.2. Descriptive site types.

Site Type	Count
Native American Single-Component Sites (n= 86)	
Lithic scatter	80
Lithic and ceramic scatter	4
Thermal feature with lithic and ceramic scatter	1
Lithic scatter with culturally modified trees	1
Euro-American Single-Component Sites (n=96)	
Dendroglyph	65
Refuse scatter	14
Refuse dump	5
Formal campsite	3
Informal campsite	2
Gravel pit	2
Improved spring	2
Refuse scatter / possible structure	1
Structural complex	1
Telephone line	1
Multicomponent Sites (n=12)	
Native American lithic scatter / Native American culturally modified trees / Euro-American dendroglyph	2
Native American culturally modified tree / Euro-American inscription	1
Native American lithic and ceramic scatter / Euro-American building foundation	1
Native American lithic and ceramic scatter / Euro-American refuse scatter	1
Native American lithic scatter / Euro-American dendroglyph	1
Native American lithic scatter / Euro-American formal campsite	1
Native American lithic scatter / Euro-American refuse scatter	1
Native American lithic scatter / Euro-American improved spring	1
Native American thermal feature with lithic scatter / Unknown rock feature*	1
Euro-American rock inscription / Unknown pictograph**	1
Native American lithic scatter / Euro-American improved spring / Unknown rock concentration*	1
Total	194

* probably Euro-American
** probably Native American



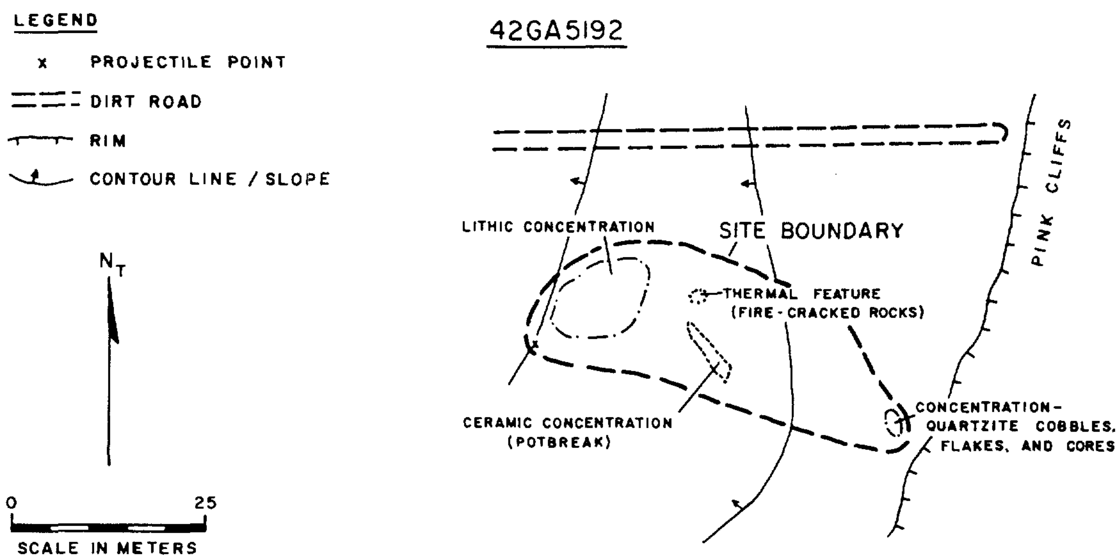


Figure 6.3. *Maps of representative Native American sites in Bryce Canyon National Park.* **Top:** *Site 42GA5190, an early Archaic period flaked lithic artifact scatter.* **Bottom:** *Site 42GA5192, a Numic/Paiute camp.*

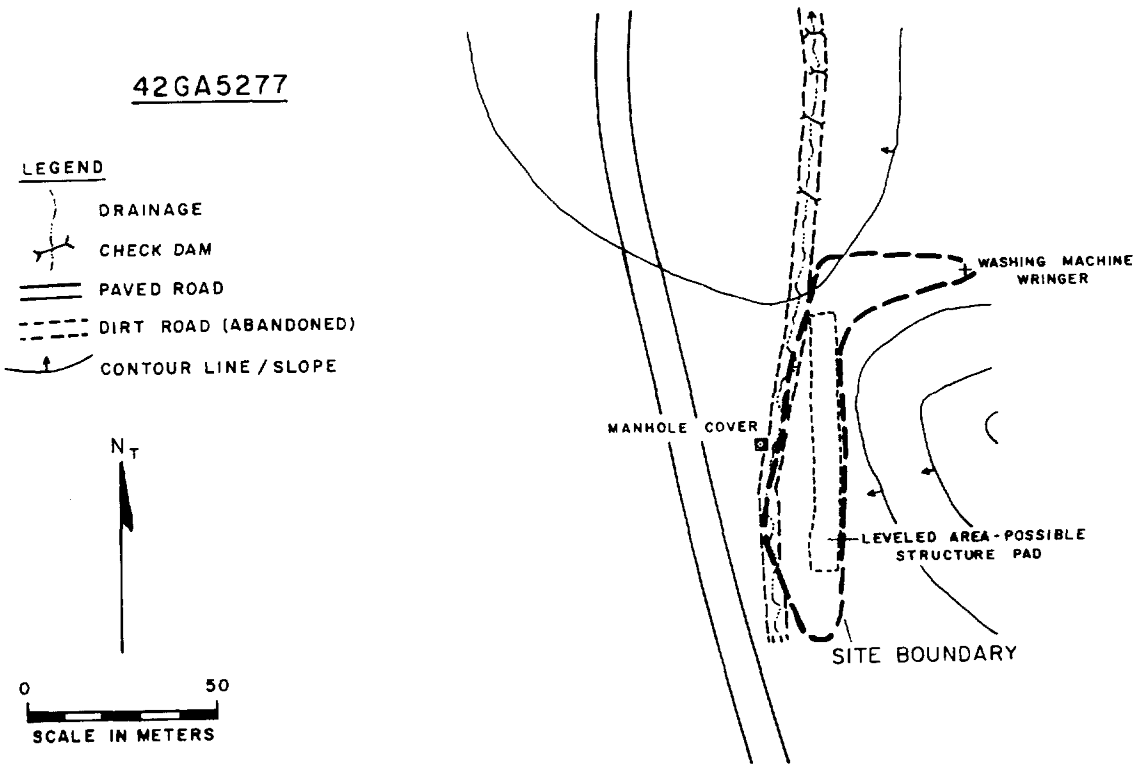


Figure 6.4. ***Map of Site 42GA5277, a Euro-American refuse scatter with a possible architectural feature.***

Table 6.3. ***Sizes of sites.***

	Site Type			
Site Size	Single-Component Native American Sites	Single-Component Euro-American Sites	Multicomponent Sites	Total
2–100 m^2	7	12	2	21
101–500 m^2	31	19	–	50
501–1,000 m^2	17	21	–	38
1,001–2,000 m^2	17	14	3	34
2,001–5,000 m^2	9	16	3	28
5,001–10,000 m^2	4	5	–	9
10,001–100,000 m^2	1	9	3	13
>100,000–154,000 m^2	–	–	1	1
Total	86	96	12	194

Table 6.4. ***Native American component types and cultural affiliations.***

Cultural Affiliation	Component Type: Lithic Scatter	Lithic and Ceramic Scatter	Bark-Stripped Tree	Thermal Feature with Lithic Scatter	Thermal Feature with Lithic and Ceramic Scatter	Pictograph	Total
Native American, unknown affiliation	48	–	–	–	–	–	48
Archaic	21	–	–	–	–	–	21
Late Prehistoric/Formative	7	–	–	–	–	–	7
Late Paleoindian to Late Prehistoric	1	–	–	–	–	–	1
Late Paleoindian to Archaic	2	–	–	–	–	–	2
Archaic to Late Prehistoric/Formative	5	–	–	1	–	–	6
Virgin Anasazi	–	2	–	–	–	–	2
Archaic to Anasazi	–	1	–	–	–	–	1
Archaic/Paiute	2	–	–	–	–	–	2
Numic/Paiute	1	3	4	–	1	–	9
Unknown affiliation, probably Native American	–	–	–	–	–	1	1
Total	87	6	4	1	1	1	100

Description of Native American Components

Archeological material affiliated with Native American cultures is present at 98 sites. This total includes 86 single-component sites and 12 multi-component sites. Overall, 100 Native American components are identified (Table 6.4). Diagnostic artifacts and features at these components indicate late Paleoindian/early Archaic, Archaic, Virgin Anasazi, late Prehistoric/Formative, and Numic/Paiute affiliations.

Component types, like site types, are based on descriptive classifications and reflect the presence of artifact scatters or features. Native American component types include lithic scatters, lithic and ceramic scatters, bark-stripped trees, thermal features in association with artifact scatters, and pictographs. Artifact-scatter components with no associated features overwhelmingly outnumber feature-related components. Lithic-scatter components are predominant (n=87) and lithic and ceramic components are rare (n=6). This is not an unexpected proportion, given the high-elevation setting of the project area and the apparent absence of long-term residential sites. Even components with nonarchitectural features are exceptionally uncommon (n=7). The latter include four bark-stripped tree components, two components with thermal features, and one probable Native American pictograph component. Component types represent lithic reduction, resource procurement, and short-term residential activities, overall suggesting only seasonal use of the plateau.

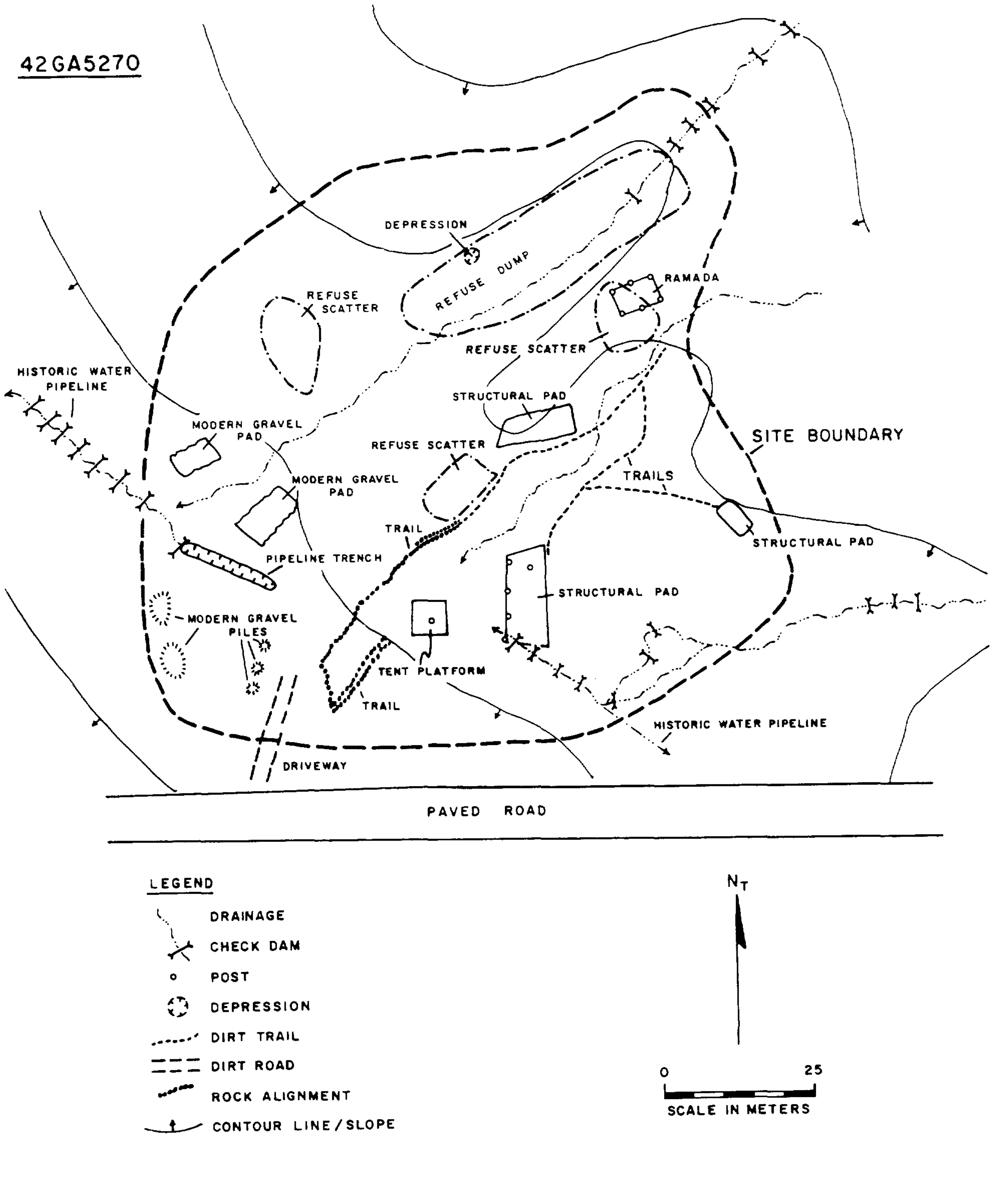


Figure 6.5. Map of Site 42GA5270, a formal Euro-American campsite.

Of the 100 Native American components, many (n=48) lack the types of temporally or culturally diagnostic artifacts or features needed to identify specific cultural affiliation or occupation period. The majority (n=52), however, contain diagnostic features and artifacts that allow the identification of specific Native American affiliations. Forty-one components were assigned cultural affiliation based on the presence of diagnostic projectile points, using both AIS and previously identified points (Dominguez and Danielson 2000; Dominguez et al. 1992). Four components were classified based on ceramics, three based on both ceramics and projectile points, and four based on the presence of Paiute-associated bark-stripped trees. Radiocarbon dates from previous test excavations (Dominguez and Danielson 2000) provided additional information used to determine cultural affiliation at ten of the sites.

Diagnostic artifacts or features indicative of two or more distinct Native American cultural periods are identified at 12 components (called "multioccupation sites" in Chapter 8). These temporally diverse components represent either the reoccupation of the same locale by subsequent culture groups or the practice of later Native Americans curating and reusing the tools of their predecessors. For example, diagnostic projectile point types representing five different culture periods are identified at Site 42GA1903. This site's strategic location in a high meadow, and the abundance of tool and lithic material types in the assemblage, further supports the possibility of repeated occupations over a long period of time. To capture the range of occupation represented by this site and others with temporally diverse diagnostic material, broad cultural affiliation classifications are used in Table 6.4. These include late Paleoindian to late Prehistoric, late Paleoindian to Archaic, Archaic to late Prehistoric/Formative, Archaic to Anasazi, and Archaic/Paiute. Subsequent research at these sites and identification of subsurface materials may help either narrow the all-encompassing time ranges or confirm the presence of multiple occupations at these components.

Native American Features

Native American features are rare; only 21 features are identified at seven components. These features include 16 culturally modified ponderosa pine trees, 2 fire-cracked rock concentrations, 2 unknown rock features, and 1 pictograph panel (Table 6.5). Typically only one or two features are present at a component, but Site 42GA5242 contains a total of nine bark-stripped trees.

Table 6.5. Cultural affiliations of Native American features.

	Cultural Affiliation			
Feature Type	Early Archaic to Late Prehistoric/ Formative	Numic/Paiute	Native American, Unknown	Total
Bark-stripped ponderosa pine	–	16	–	16
Fire-cracked rock concentration	1	1	–	2
Unknown rock concentration	2	–	–	2
Pictograph	–	–	1	1
Total	3	17	1	21

The bark-stripped ponderosa pines are characterized by broad vertical scars created by the removal of bark from the tree trunks. These scars are typically subrectangular in shape and are oriented parallel to the vertical axis of the tree (Figure 6.6). Scar sizes are highly variable, ranging from 43 cm high by 9 cm wide to 271 cm high by 165 cm wide. The majority of the scars, however, measure from roughly 100 to 185 cm high and 50 to 100 cm wide. The scar width rarely exceeds one-third of a tree's circumference. The bottom of the scar is typically within 50 cm of the base of the tree. Axe marks, which appear to be made with steel axes, are noted at all but one of the stripped trees. As many as 56 individual axe marks are noted on a single tree.

These peeled trees are probable evidence of Paiute utilization of the area. The steel axe marks support either a protohistoric or historic temporal affiliation. Outer bark removal would have exposed the cambium layer of the tree, which would then be harvested as a food source. Although cambium and bark products were commonly used in many parts of northern North America, among the Southern Paiute cambium was apparently only used as a starvation resource (Martorano 1981, 1988; Schroeder 1965; Swetnam 1984). All of the bark-stripped trees in the project area lie in the central portion of the park, at the northern end of Whiteman Bench. This area lies in close proximity to the headwaters of Swamp Canyon, below the Pink Cliffs to the east. Swamp Canyon contains several permanent water sources and provides easy access between the plateau top and the canyons below the rim.

Figure 6.6. A probable Numic/Paiute bark-stripped ponderosa pine tree at Site 42GA5242. Scale (at upper left) is 3-cm long.

Fire-cracked rock concentrations at two components represent thermal features such as hearths or roasting pits. No charcoal-stained or ashy soils were observed, although subsurface burned deposits are likely to be present. The fire-cracked rock concentration recorded at Site 42GA5192 is associated with a Paiute-affiliated lithic and ceramic scatter. The other feature, at Site 42GA5240, is associated with an early Archaic to late Prehistoric lithic scatter. Two unknown rock concentrations are also recorded at Site 42GA5240; one consists of 11 small limestone fragments and resembles a possible hearth. The other, comprised of several small sandstone fragments, may be the remains of a shattered grinding slab.

The single pictograph panel recorded at Site 42GA5287 consists of a series of 47 red and black lines (resembling tick marks), small amorphous areas of red pigment, and irregular black lines (Figure 6.7). The tick marks occur in clusters of 4 to 12. A 1891 Euro-American inscription is also present on this panel, which occupies a sloping limestone face at the base of the Pink Cliffs. As previously discussed, this site lies outside the project area but, because it is the first rock painting recorded in the park, the site warranted a special visit. Although the pictograph was recorded as being of "Unknown" affiliation, a Native American affiliation is likely considering the painting's stylistic similarity to other regional Native American pictographs and petroglyphs (Barnes 1982; White and Orndoff 1999).

Native American Artifact Scatters

One hundred nine artifact scatters are recorded among 96 Native American components. Seven components contain multiple scatters, with as many as six distinct scatter areas defined within a component's boundaries. Lithic scatters are the predominant scatter type (n=102). With few exceptions, these consist solely of flaked lithic artifacts (i.e., flaked stone tools and manufacturing debris). Nonflaked and ground stone artifacts are recorded at only 14 lithic scatters and are few in absolute number. Ceramic artifacts are rarer still, being documented at seven scatters, each containing between 1 and 25 sherds. Southern Paiute utility wares and Virgin Anasazi gray wares, red wares, and corrugated wares are identified in the project assemblage. Several artifact scatters contain fragments of mammal bone, but the association of these faunal remains with the artifacts is unknown.

Native American scatter size is highly variable. Components range from fairly extensive, broadly dispersed scatters covering up to 46,300 m^2 to small clusters of artifacts concentrated within a 4-m^2 area. Artifact counts range from 4 to 532 items. The majority of the assemblages are

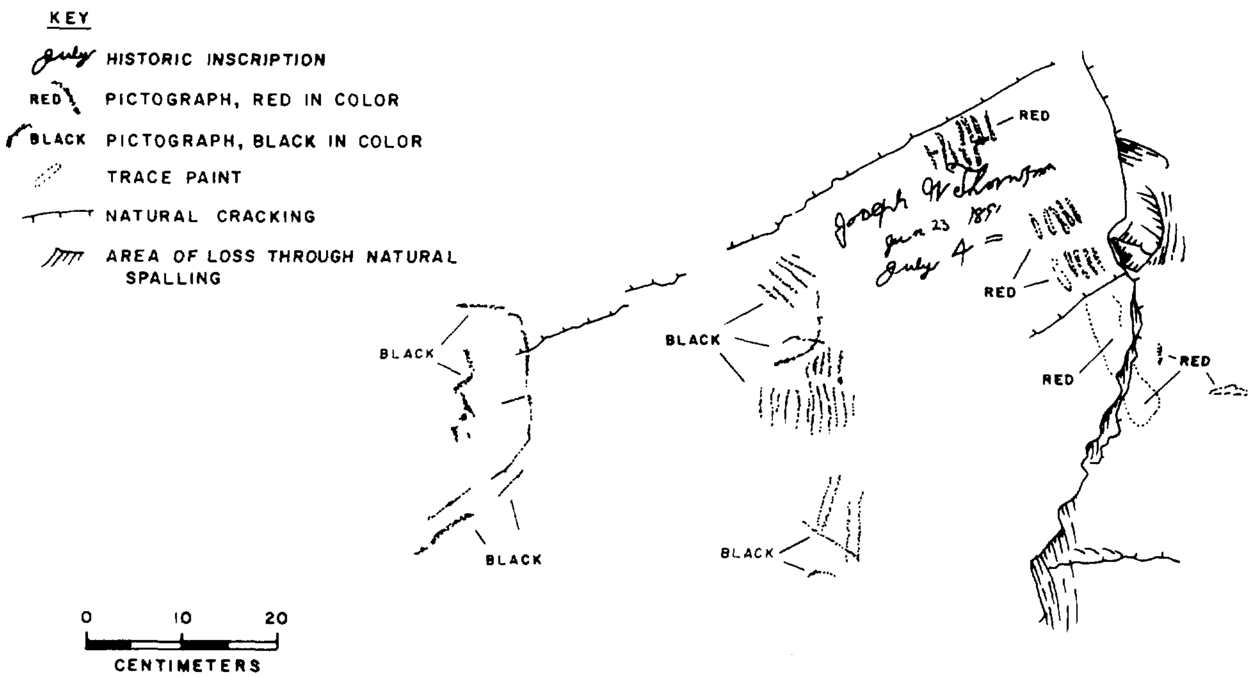


Figure 6.7. ***Illustration of Site 42GA5287, a probable Native American pictograph painted in red and black pigment adjacent to a Euro-American inscription.***

Table 6.6. Native American artifact scatter assemblage sizes.

	Assemblage Size (Total Artifact Count)						
Scatter Type	1–10	11–25	26–100	101–200	201–350	>350	Total
Lithic scatter	39	23	32	3	2	3	102
Lithic and ceramic scatter	1	3	1	1	1	–	7
Total	40	26	33	4	3	3	109

small, however, containing fewer than 100 artifacts. This trend generally coincides with the observations of earlier archeological work in the park, except at a few sites where Dominguez and Danielson (2000) had overestimated sitewide artifact counts by several orders of magnitude. Table 6.6 summarizes Native American artifact scatter assemblage sizes based on both the Bryce Canyon AIS data and information gleaned from previous site-documentation work.

Artifact density is also highly variable, ranging from sporadic, sparsely distributed artifact scatters to localized, high-density concentrations. Density varies from 1 to 25 artifacts per square meter, although 1 to 3 artifacts per square meter is most common (n=66).

The lithic analysis identified 17 different raw material types. Multicolored cherts and chalcedonys are the most common. Coarse quartzites, obsidian, petrified wood, jasper, and sandstone items are also noted but in much lower frequencies. Lithic scatters typically contain one to three different lithic raw material types, although nine different types are present at one scatter.

Over the course of the inventory more than 2,000 lithic artifacts were field-analyzed. These include 1,687 pieces of debitage, 147 bifaces, 72 projectile points, 37 used flakes, and 22 cores. Scrapers, manuports, manos, metates, drills, and hammerstones are also noted but are few in number. Sixty-eight projectile points were collected from 40 sites for laboratory analysis. Twenty-one point types are identified (Chapter 7). These include late Paleoindian/ early Archaic, Archaic, late Prehistoric, and Numic point types. The flaked lithic assemblages at the site components typically contain one to four different technological types. Hard-hammer reduction flakes, angular debris, biface-thinning flakes, and pressure flakes are the most common. At Site 42GA1904, however, ten artifact classes are inventoried, including projectile points, bifaces, scrapers, manuports, a hammerstone, and a variety of debitage types.

Ceramic artifacts constitute a very small proportion of the project area's overall artifact assemblage. Given the high-elevation setting and lack of habitation sites, the scarcity of ceramics is not unexpected. On-site inventories identified 74 ceramic items at seven artifact scatters. Six ceramic types are present among the 13 sherds that were collected for laboratory analysis. Paiute utility ware and Virgin Anasazi wares including Shinarump Gray Ware, Shinarump Red Ware, Shinarump Corrugated Ware, possible St. George Black-on-Gray, and an unidentified Virgin Anasazi black-on-gray are present (Chapter 8). The vast majority of ceramics are Paiute utility wares (n=63). Two possible Paiute utility ware pot drops, represented by small, dense clusters of sherds, are present at Sites 42GA5192 and 42GA5262. These clusters account for most of the recorded sherds. Virgin Anasazi ceramics are uncommon (n=11), with only one to four sherds noted per scatter.

Description of Euro-American Components

A total of 109 Euro-American components is identified at 107 sites in the project area. These components reflect historic activities within the present-day park since the early 1890s and represent a variety of early grazing, tourist, and government-related activities. Ten different Euro-American component types are identified (Table 6.7), the majority of which are defined by the presence of features.

Historic inscriptions, represented by aspen dendroglyphs and a small number of carvings on other features, are the most common Euro-American component type (n=70). Artifact scatters are the next most numerous (n=23); these include 16 refuse scatters and 7 refuse dumps. Six campsite components, representing both long-term, formalized camps and short-term, single-episode camps are present, as are three ranching locales that contain spring developments and water-collection features. Five other component types, noted at only one or two sites each, represent a variety of special-use features and limited-activity areas associated with early commercial development and government administration of the park.

Euro-American components are dated by the presence of temporally diagnostic artifacts and features as well as information gleaned from historic records and unpublished and published literature. The dated inscriptions that are ubiquitous among the aspen dendroglyphs and other historic inscriptions contribute the bulk of historic chronological data. With few exceptions, the inscription dates appear to represent actual carving dates and, therefore, provide a certain marker of the timing of the Euro-American presence in the area. Many of the aspen dendroglyph components contain multiple dates, often decades apart, indicating multiple carving episodes. For example, Site 42GA5232 contains 15 glyphs that range in date from 1893 to 1946. Other sites suggest only a single episode of use.

Table 6.7. Euro-American component types.

Component Type	Count
Dendroglyph/other inscription	70
Refuse scatter	16
Refuse dump	7
Campsite	6
Ranching locus	3
Gravel quarry	2
Unknown rock feature	2
Telephone line	1
Improved spring	1
House foundation	1
Total	109

Many small sites lack any dates with which to temporally place the site. Among the 70 inscription components, legible carving dates range from 1891 to 1948. One dendroglyph panel at Site 42KA5782 contains an "89" glyph that suggests an 1889 date, but due to the condition of this carving its interpretation is not definitive. An "1849" date is carved into the side of a watering trough at Site 42GA5241, but its legitimacy as a carving date is highly questionable. This inscription may instead commemorate an event unrelated to the trough's use.

Euro-American artifacts with time-sensitive attributes are also utilized to determine the temporal range of many components. Certain glass colors, can sizes, can-opening mechanisms, and trademark designs that have known manufacturing dates are the most commonly used temporal indicators. Date assignments based on artifact typologies are typically broad, often spanning several decades. The type and condition of the analyzed artifacts and the limitations inherent to in-field inventory procedures commonly prevent the determination of more definitive date assignments. Most of the diagnostic artifacts indicate component date ranges spanning the first three decades of the twentieth century.

Archival research also provides useful data to develop chronologies for specific components. Local and regional histories and personal memoirs provide a historic context with which to interpret some of the Euro-American components. The Bryce Canyon National Park archives contain correspondence, maps, and unpublished reports that help explain the origins of specific features within the park. Park personnel and long-time local residents also provided information pertaining to some of the more recent historic components.

Euro-American Features

A great number (n=1,214) and a wide variety of Euro-American features are present within the project area. These features are categorized into 24 feature types (Table 6.8). Aspen dendroglyphs are the most numerous feature type encountered: 1,000 dendroglyphs are recorded at 72 components. Features associated with the 9.6-km (6-mi) long telephone line (Site 42GA5288/ 42KA5814) are also numerous: 135 telephone pole remnants and trees with attached wire and insulators were recorded. Other feature types that represent a wide range of nonarchitectural and architectural loci occur in much lower frequencies. These features include camp-related facilities, historic inscriptions, rock concentrations, water-control features, log piles, and trails.

Table 6.8. Euro-American feature types.

Feature Type	Count
Dendroglyph	1,000
Telephone pole / tree with insulator	135
Outhouse depression	11
Rock concentration / scatter	10
Firepit / hearth	9
Historic inscription	6
Log pile / scatter	6
Depression, unknown	3
Leveled pad / platform	6
Spring box / improvement	4
Trail	4
Trough	3
Modified tree	2
Gravel pit	2
Driveway / parking area	2
Construction debris scatter	2
Cairn	2
Wall	1
Rock alignment	1
Earth mound	1
Fence	1
Dam	1
Benchmark	1
Sign post	1
Total	1,214

Dendroglyphs, or aspen tree inscriptions, are the most prevalent Euro-American feature (Figure 6.8). One thousand glyphs are recorded at 72 of the 109 Euro-American components. Most of these features lie along the western edge of Whiteman Bench and in the tributary canyon bottoms and meadows along upper Podunk Creek. The dendroglyphs consist of both text and graphic elements. These glyphs vary in size, complexity, and style, and range from careful, artistically rendered inscriptions to hastily cut carvings with little attention to detail. Names, dates, and initials are the most prevalent elements, although human figures, livestock brands, narrative statements, place names, animals, and unique unidentified designs are also present. Some panels consist of single elements, whereas others represent the efforts of several carvers working over multiple carving episodes. The names of more than 100 individuals and 60 different surnames are documented in the dendroglyph record. Most of these carvers appear to be associated with early homesteading and ranching families from nearby communities. Inscribed dates range from the early 1890s to the 1950s (none of the more recent glyphs were recorded), with most occurring between 1910 and 1940. The cowboys and shepherds who frequented the high country during their seasonal grazing rounds carved many of the glyphs. Others can be attributed to government workers, CCC personnel, and tourists.

Figure 6.8. Aspen dendroglyphs at Site 42GA5230.

In addition to the numerous dendroglyph inscriptions, six other historic inscriptions are identified within the project area. Three are carved on the exposed wood of Paiute bark-stripped ponderosa pines, two are located on the sides of watering troughs, and one is inscribed on a limestone cliff face in a shallow overhang. These non-aspen inscriptions also include names, initials, dates, and simple geometric designs that may represent livestock brands. The rock inscription at Site 42GA5287, which reads "Joseph W. Thompson / June 23, 1891 / July 4" (Figure 6.7), contains the oldest definitive date documented in the park. Joe Thompson's name also occurs at two dendroglyph sites (42KA5784 and 42KA5782) in association with an 1896 date and a possible 1889 date, respectively.

Although it is largely dismantled, numerous features and artifacts are still present along the historic telephone line (Site 42GA5288/42KA5814) that crosses the park. One hundred sixty-one loci (including 135 features and 26 artifact clusters) are recorded along this 9.6-km (6-mi) long corridor. The loci contain features such as poles and stubbed posts (i.e., buried posts serving as pole supports), trees used as poles, lengths of wire, eye hooks, brackets, and insulators. Branch stubs, the result of line-clearing activities, are also visible along the edges of the cleared corridor as it crosses through forested areas. Collapsed poles and stubbed posts, scattered wire fragments, and insulators mark the route of the line across the meadows in the northern portion of the park. None of the poles are standing, and only one of the support posts is standing; all others have fallen or were purposely dismantled after the line was abandoned.

Eight water-control features—four spring improvements, three watering troughs, and a small checkdam—are recorded at five Euro-American components. Spring-improvement features include a concrete spring box at Shaker Spring (Site 42GA5216), a simple metal pipe in the spring at Site 42KA5798, a circular rock alignment at Site 42KA5764, and a cobble-lined sump at Site 42GA5241. A small checkdam is also recorded at Shaker Spring.

The three water troughs are all axe-hewn from large logs. Two are associated with the sump at Site 42GA5241 (Figure 6.9). The third is at Trough Spring (Site 42GA1902), and this feature is likely the spring's namesake facility. None of these troughs are presently functional, and all are suffering extensive deterioration. Dates inscribed on the sides of the troughs at Site 42GA5241 indicate use during the 1910s and 1920s.

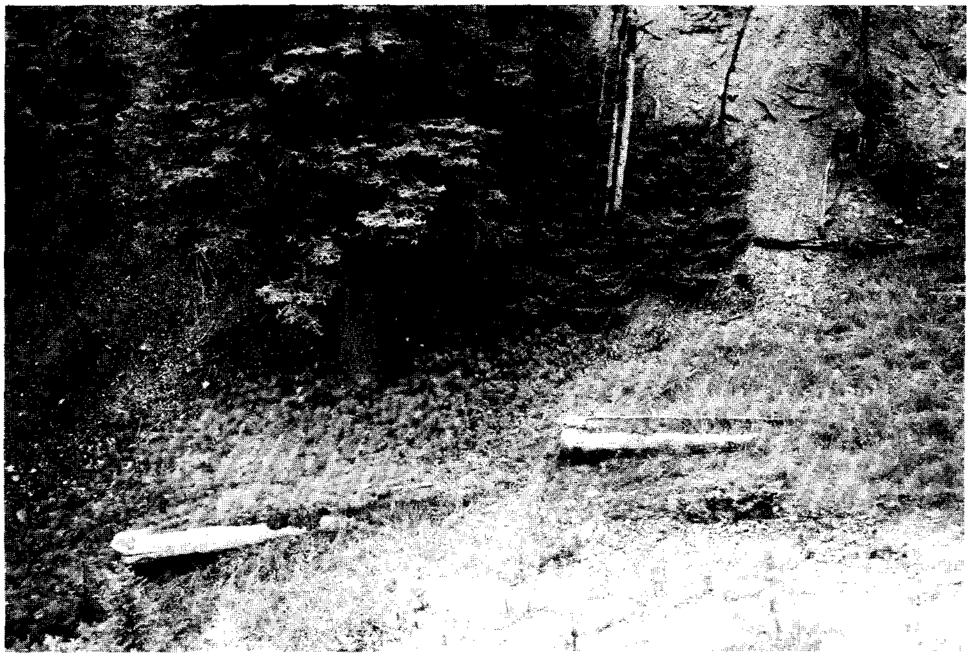


Figure 6.9. ***Livestock watering troughs, hewn from single logs, at a spring near Whiteman Bench (Site 42GA5241).***

Most of the water-control features in the project area were presumably constructed to establish a reliable water supply for livestock. Trough Spring (42GA1902) and Shaker Spring (42GA5216) were part of Ruby Syrett's 1923 water-rights claim. These springs were later used by the National Park Service to provide water for park and commercial use. The spring box and related features at Shaker Spring probably reflect the domestic use of this spring. Although the Trough Spring site shows no similar development on-site, a historic pipeline recorded between the spring and the main lodge area indicates a domestic use of this spring as well.

The only structural feature recorded during the project that even approaches the classification of "standing architecture" is found at the site of a park ranger's cabin (Site 42GA5278, referred to as *HS-1* in the park's List of Classified Structures). This ranger cabin was originally constructed in 1929 but it burned to the ground in 1988. Although the site was cleared of loose debris after the fire, extant features include a rock foundation wall, a rock stairway, a leveled structural pad, a small driveway and parking area, a footpath, and an unknown rock alignment.

The locations of other ephemeral structures in the project area are implied by the presence of six level, graveled platform features at Sites 42GA5270 and 42GA5277. Five of these features, at Site 42GA5270, appear to be part of a formal, planned tourist campsite that was repeatedly used (Figure 6.5). Three of the features at this site, which range from 6 to 16 m (20 to 52 ft) long and 3 to 6 m (10 to 20 ft) wide, appear to be foundation pads for semipermanent structures. Two other smaller leveled areas suggest a possible tent platform and a possible *ramada* (an unwalled, roofed structure) once existed. Three trails, the longest of which extends 22 m (72 ft), connect the various structure foundations.

The other possible structural feature, at Site 42GA5277 (Figure 6.4), is associated with a possible concessionaire utility area. This leveled feature measures about 66-x-7-m (217-x-23-ft) across and appears to represent the location of a dismantled structure or structural complex.

Eleven outhouse depressions are also present at four of the Euro-American components. These privies suggest the presence of long-term, established residential areas. The CCC camp (Site 42GA3561) contains a cluster of seven large depressions surrounded by scattered lumber and logs. Site 42GA5270, the probable tourist camp mentioned above, contains a single depression far from the residential area. Two adjacent privy depressions, framed by wood foundations, are recorded at Site 42GA5219, a possible CCC or road-construction work camp on Whiteman Bench. Site 42GA5257, near the UPC utility area, also contains a scatter of milled lumber around a depression that may also represent an outhouse. This site also contains a fire hearth made of logs and may represent a temporary work camp.

Numerous historic buildings lie within the project area. Other previous projects (e.g., Caywood and Grant 1994; James R. McDonald Architects 1999; Scrattish 1985) focused on documenting the numerous standing structures around the Bryce Canyon Lodge and other tourist and administrative facilities. Most of these historic buildings date to the 1920s and 1930s and are associated with early tourist development and National Park Service administration. These structures are used and maintained as present-day facilities; no archeological deposits or features were observed, and they therefore are not recorded as archeological resources. In areas where historic structures have been dismantled and reclaimed, however, almost all above-ground evidence of the destroyed structures has been erased from the landscape. The UPC utility area site (42GA5263) is an example of a locale that once contained three or more buildings, but which no longer contains any obvious intact structural remains. The site currently consists only of a widespread scatter of construction debris and residential refuse.

Nine fire hearths are identified at five Euro-American components, four of which appear to be short-term or single-episode campsites. One is found at the temporary work camp at Site 42GA5257. Most of these hearths consist of circular rock rings or concentrations of rock piled one to two courses high, but the hearth at Site 42GA5257 was framed by logs. Two piled or stacked rock cairns, consisting of seven stones each, are identified at two sites. Unlike the numerous cairns recorded as IOs along the park boundary segments (see below), the purposes of these cairns are not readily apparent, nor is their size substantial enough to suggest long-term use.

Ten Euro-American features consist of rock concentrations of unknown function. Five rock piles are recorded at Site 42GA5219, a possible road-construction campsite on Whiteman Bench. Each pile contains approximately 300 pieces of limestone and occupies a 2-x-3-m (6.5-x-9.8-ft) area and is 30 cm (12 in) high. The function of these piles is unknown, although they may be associated with historic campsite-clearing activities. Another rock concentration of unknown function is recorded at Site 42KA5798, a multicomponent Native American and Euro-American site. This concentration consists of 35 large sandstone slabs in a somewhat oval configuration measuring 1.6-x-1.3-m (5-x-4-ft) across. Only a few rocks are located in the center of the concentration. The feature appears to be partly buried and may contain some subsurface deposits. Because both Native American and Euro-American material occurs in the vicinity, the rock concentration's affiliation as well as its function is unknown. Given its resemblance to a campfire ring, a Euro-American affiliation seems likely.

Three depressions of unknown function are recorded at four sites. One circular depression at the CCC camp contains a partially buried oil drum and may represent a buried trash pit. A linear depression at a gravel pit site (42GA5224) suggests use as an abandoned trail or a drainage ditch. Other features in the project area that are of unknown function include six log piles and an earthen mound.

The log piles may be associated with forest-clearing activities, raw-material stockpiling, or fence dismantling. The site with the earthen mound, located near the Whiteman Bench construction camp, appears to represent a buried refuse dump.

Gravel quarry pits constitute two Euro-American site components. The pit at Site 42GA5224 covers a 95-x-55-m (312-x-180-ft) area and is bisected by a linear mound that separates two broad depressions. This quarry is probably related to the 1930s construction or historic maintenance of the Rim Road, which lies several hundred yards to the east. A larger, more extensively used pit is present at Site 42KA5811. This 144-x-48-m (472-x-158-ft) pit is cut into the top of a high ridgeline on Whiteman Bench. Known as the Agua Canyon gravel pit, this feature was used as a main source of road-construction material from 1931 to 1943, and it witnessed some periodic use until 1983. Two other features, consisting of piles of asphalt, limestone, and construction debris, are also recorded in the vicinity of this pit.

Other miscellaneous features at Euro-American sites in the project area include a signpost (Site 42GA5269), a land-survey benchmark (Site 42GA1904), and two modified trees—one with a blaze mark (Site 42GA5197) and one with axe marks (Site 42GA1904). Finally, at Site 42GA1902 (Trough Spring), four angle-iron posts and a scatter of wooden posts and barbed wire mark the dismantled remains of a fence that once surrounded the spring.

Euro-American Artifact Scatters

In contrast to the high frequencies of Euro-American features that were encountered, artifact scatters are less abundant. Seventy-five artifact scatters (including 71 refuse scatters and 4 refuse dumps) are recorded at 52 of the 109 Euro-American components (Figure 6.10). Twelve of these components contain multiple scatters, each exhibiting two to five spatially distinct areas of artifact distribution. Euro-American scatters typically consist of mixed subsistence refuse including cans, bottles, and ceramics, whereas miscellaneous debris such as construction material, machine parts, and personal gear is generally less common.

The areas covered by Euro-American artifact scatters are highly variable, ranging from a few artifacts contained within a single square meter, to broadly dispersed scatter areas covering over 150,000 m^2. Most of the scatters, however, cover less than 1,000 m^2 (n=49). Artifact density is also highly variable and ranges from low-density scatters with artifacts widely dispersed across the landscape, to high-density concentrations of trash represented by dump sites and long-term activity areas. Artifact-assemblage counts range from 1 to approximately 4,200 artifacts (Table 6.9), although the majority of the assemblages are typically small, containing less than 250 artifacts (n=65). The site type and length of occupation significantly influenced the quantity and diversity of accumulated refuse at these sites.

Most of the Euro-American artifact scatters date to the early and mid-twentieth century, although a few scatters include artifacts that were first mass-produced in the late 1800s. Many of the scatters are attributed to CCC and later park maintenance and construction activities. Others, particularly in the vicinity of the Bryce Canyon Lodge, represent refuse associated with commercial tourist development.

Figure 6.10. ***A Euro-American artifact scatter at Site 42GA5265.***

Table 6.9. ***Euro-American artifact scatter assemblage sizes.***

	Assemblage Size (Total Artifact Count)									
Scatter Type	1–10	11–25	26–50	51–100	101–250	251–500	501–1,000	1,001–1,500	>1,500	Total
Refuse scatter	20	9	9	11	12	5	2	2	1*	71
Refuse dump	1	–	2	1	–	–	–	–	–	4
Total	21	9	11	12	12	5	2	2	1	75

* CCC camp assemblage size of 4,200 artifacts is based on previous artifact inventories (Dominguez and Danielson 2000:129)

Description of Isolated Occurrences

Overall, 4,860 IOs are recorded in the project area. The IOs include 3,909 erosion-control checkdams and 951 other isolated features and artifact occurrences. In the following discussion, the term "isolated occurrence" refers to the latter types of cultural loci, and checkdams are discussed separately. As previously described in the methodological discussion (Chapter 5), IOs typically include single artifacts, isolated features lacking associated artifacts, sparse artifact scatters, and features of uncertain cultural origin. A summary list of the IOs is presented in Appendix 6.2.

The vast majority of IOs are Euro-American in origin (n=677), but 249 are Native American and 5 are of unknown affiliation (Table 6.10). In addition, 20 IOs are multicomponent, representing isolated artifacts or features of more than one culture

Table 6.10. Cultural affiliations of isolated occurrences.

Cultural Affiliation	Count
Native American	249
Euro-American	677
Unknown affiliation	5
Native American and Euro-American	17
Euro-American and Unknown affiliation	2
Native American, Euro-American, and Unknown affiliation	1
Total	951

group. A total of 972 individual IO components is identified among the 951 recorded IOs. This total includes 697 Euro-American components, 267 Native American components, and 8 components of unknown affiliation.

A wide variety of IO component types is present (Table 6.11). As with the site typology, the IO typology is based on descriptive rather than interpretive classifications. Most of the IOs are represented by artifactual remains (n=593). These IOs include isolated artifacts such as a single projectile points, bifaces, flakes, bottles, or cans, as well as small artifact scatters that do not meet the minimum site criteria. Features are present at 379 IO components, 21 of which occur in association with artifacts. These features consist of both structural and nonstructural remains. Feature-related IOs are of either Euro-American or unknown affiliation, and most are associated with early tourism and park-management activities.

Native American Isolated Occurrences

Native American archeological material is present at 267 IOs (Table 6.11). These IOs include either individual isolated artifacts or small, sparse scatters. No isolated features of Native American affiliation are recorded.

Single lithic artifacts, consisting of individual tools or items of debitage, are the predominant Native American IO type (n=194). The debitage IOs represent all stages of lithic reduction. Lithic tool IOs (n=136) include 76 bifaces (many of which are pressure flaked), 47 projectile points, 4 cores, 4 used flakes, 1 end scraper, 1 mano, 1 possible abrader, 1 unifacial cobble tool, and 1 manuport.

Artifact scatters are recorded at 73 IOs. Thirty-five contain only debitage. Three scatters contain sandstone fragments; none show any definitive evidence of use wear and are conservatively classified as manuports. Thirty-five other scatters are distinguished by the presence of one or more tools in the assemblage. An additional 12 projectile points, 24 bifaces (mostly pressure flaked), 6 used flakes, 2 pieces of ground stone, and 1 core are recorded among the IO artifact scatters.

Cherts are the best represented raw material type, although quartzite, obsidian, chalcedony, and jasper are also present. Fifty-five projectile points were collected for laboratory analysis (Chapter 7). Identified point types include Humboldt, Parowan Basal-notched, Gypsum, Elko Corner-notched, Elko Eared, Desert Side-notched, and Rosegate Stemmed. Middle Archaic through Numic/Paiute culture periods are represented.

Table 6.11. Isolated occurrence types by cultural affiliation.

IO Type	Cultural Affiliation			Total
	Native American	Euro-American	Unknown	
Euro-American refuse scatter	–	166	–	166
Euro-American artifact	–	157	–	157
Lithic tool	136	–	–	136
Road segment	–	85	–	85
Lithic scatter	73	4	1	78
Flake / debitage	58	–	2	60
Dendroglyph(s)	–	57	–	57
Benchmark	–	35	–	35
Telephone / power line locus	–	30	–	30
Boundary segment	–	30	–	30
Cairn(s)	–	25	4	29
Rock pile	–	15	1	16
Fence	–	13	–	13
Blazed tree	–	10	–	10
Pipeline	–	11	–	11
Wood pile	–	14	–	14
Campfire	–	16	–	16
Depression, unknown	–	5	–	5
Sign	–	5	–	5
Borrow pit / rock quarry	–	4	–	4
Rock alignment	–	4	–	4
Foundation pad	–	4	–	4
Trail	–	3	–	3
Modified tree	–	2	–	2
Earthen dam	–	1	–	1
Concrete channel	–	1	–	1
Total	267	697	8	972

Euro-American Isolated Occurrences

Six hundred ninety-seven Euro-American IOs, representing a wide variety of artifact and feature types, are identified (Table 6.11). Unlike the Native American components, many of the Euro-American IOs contain isolated features. Three hundred seventy IOs contain architectural and nonarchitectural features, and 327 IOs contain only artifacts.

Refuse scatters, recorded at 166 IOs, are the most common Euro-American IO type. These scatters include 96 mixed-refuse scatters, 58 can scatters, and 12 bottle scatters. Many of the scatters contain only food-related items, probably indicative of a single meal by a work party. Other scatters consist of nonfood containers and machine parts or hardware, indicating a work site. Some IO scatters, despite their small assemblage sizes, contain a wide variety and high density of artifact types, suggesting the scatters represent single-episode dump sites. Four small flaked lithic scatters are also attributed to Euro-American origins. These scatters lie in the northern portion of the park, in the immediate vicinity of modern residential and maintenance buildings. The locations of these scatters, as well as the assemblage characteristics and the distribution of some artifacts on top of pine duff and logs, suggest the scatters are modern-day flintknapping stations.

Individual artifacts are recorded at 157 IOs. These IOs typically consist of a can, bottle, machine part, or piece of hardware. Their occurrence on the landscape is likely the result of expedient trash disposal, abandonment, or unintended loss. A wide variety of historic artifacts including food and nonfood containers, construction material, machine parts, and domestic and personal items constitute the IO assemblage. Temporally diagnostic attributes indicate dates from the late 1800s through the 1950s, a range that correlates with the dates represented by the site assemblages.

IO features include a wide variety of architectural and nonarchitectural types, materials, and functions. Landscape features such as road traces, pipe lines, fence lines, survey benchmarks, and trails are the most common types. Eighty-five abandoned historic road segments, indicated by roadbeds, two-tracks, and linear depressions, are recorded. Some of these roads may predate the establishment of the park, while others are associated with early park activities related to CCC work areas and National Park Service facility maintenance. The roads were likely abandoned due to changing resource-use patterns within the park. Three abandoned trail segments are also identified. Ranging from 200 to 620 m (656 to 2034 ft) in length, these features probably represent National Park Service-built trails that have subsequently been closed or realigned.

Many of the IO features are associated with the establishment and marking of the park boundaries. The entire length of the western park boundary within the project area exhibits features such as fence lines, signs, blazed trees, rock cairns, and steel posts or pipes that are recorded as IOs. Thirty-five brass benchmarks in the project area are also recorded as IOs. All but four are associated with the National Park Service boundary line. The dates stamped on these benchmarks indicate installation dates ranging from 1938 to 1944. In many cases, rock cairns or piles are associated with the benchmarks. Bearing or witness trees are noted in the vicinity of seven benchmarks. These trees exhibit large blazes on their lower trunk, and inscriptions are commonly carved on the exposed wood. The inscriptions include cadastral and other survey-related information (e.g., "T36S R4W S36 B2," "BCNP B4,"or "S20B7").

Cairns and blazed trees are recorded in other parts of the project area as well. For example, seven cairns mark the route of an abandoned dirt road crossing a ridge near the Agua Canyon gravel pit. Other cairns are scattered in isolated locations across the landscape and may have been established as informal markers associated with early government, grazing, or tourist activities. One IO consists of a cluster of 17 cairns arranged in a grid-like pattern; this cluster may be of fairly recent origin and may represent some type of National Park Service study plot. Elsewhere, 28 blazed trees line the side of another abandoned dirt road on Whiteman Bench, and other blaze marks are scattered throughout the park.

Aspen dendroglyphs, numerous among the Euro-American sites, are also well represented as IO features. Dendroglyph IOs typically consist of one or two carved trees (clusters of up to three trees were considered IOs if no definitive historic dates were present). Fifty-seven dendroglyph IOs containing 75 carved trees are identified. As with the dendroglyph panels at sites, carvings on the IOs include initials, names, dates, and graphic elements. Many of the names and initials are the same as those represented at dendroglyph sites. Carved dates range from 1900 to 1937.

Sixteen campfire locations of historic or unknown age are noted in various locations throughout the project area. Some campfire areas are represented by solitary rock rings; others are represented by groupings of two or three rock rings along with sparse refuse scatters and wood piles. Hole-in-cap cans and sun-colored purple glass at two of these IOs suggest late nineteenth- or early twentieth-century ages. At other IOs, the surficial nature of the fire rings and the types of artifacts present suggest more recent (mid-twentieth century) use.

Many of the IO features are associated with early park development and facility construction. A variety of telephone and power line features are recorded in the northern portion of the park. These loci include fallen poles, sawed-off pole stubs, trees with mounted insulators or intact wire, loose wire segments, and scattered insulators. These utility-line features do not appear to be associated with the main telephone line identified as Site 42GA5288/42KA5814. This distinction is based on feature locations, different insulator types, and archival information indicating that power and telephone lines were once common in the area of the lodge, which lies well away from the main north-south line recorded as a site.

Eleven pipeline features, indicated by linear depressions, vault boxes, intact pipes, and wooden and concrete pipe-support pylons, are also identified as IOs. One of the historic pipelines at the southern end of the park still supplies water to the comfort station at Rainbow Point. The other pipeline features that cross the northern portion of the park (around Trough Spring and in East Creek Meadow) were originally installed in the 1920s to supply water to the tourist and lodge facilities and the CCC camp. Other water-system features recorded as IOs include a concrete trench (possibly related to the UPC sewer system) and a large earthen dam and diversion ditch associated with the Rim Road.

IO features of unknown function include rock piles, wood piles, depressions, and rock alignments. Most of the rock piles appear to be the result of construction clearing or stockpiling activities. Wood piles typically consist of stacks of cut logs, and may represent log stockpiles for checkdam construction (see below).

Isolated Occurrence Types of Unknown Affiliation

Eight IO components are classified as being of unknown affiliation due to a lack of culturally or temporally diagnostic attributes. Four rock cairns and one pile of limestone and dirt are classified as "unknown," because either a Native American or Euro-American affiliation seems possible. These features differ from the numerous Euro-American rock cairns and piles in that their collapsed condition and the accumulation of sediment around the rocks suggest the possibility of prehistoric origins.

A small artifact scatter consisting of three chert flakes is also classified as being of unknown affiliation. This scatter occupies a disturbed area modified by leveling and gravel dumping. The characteristics of the flakes and their location suggest that they may have been brought into the area with the road gravel. Two other IOs, consisting of unmodified chert cobbles, are also of questionable origin. No cultural modification of the cobbles is apparent, but their presence in an area lacking any other chert indicates they are introduced items. Both of these IOs lie in areas of historic and recent development and probably represent recent manuports.

Checkdams

Checkdams represent an IO type that is present in overwhelming numbers (n=3,909). These features dot nearly every plateau-top meadow north of Whiteman Bench. Most checkdams lie in the meadows along East Creek, and nearly all dams are associated with the fine quaternary alluvial soils that fill the broad plateau-top valleys.

Checkdams are constructed of logs and stone, typically with several saw-cut logs stacked in the bottom of the erosion channel, perpendicular to the direction of stream flow (Figure 6.11). The topmost log often exhibits a notched central spillway that channels water onto an apron of rocks piled below the notch. Steel spikes frequently anchor the logs to the ground or to adjacent logs, and rocks are sometimes piled against the log ends.

Many of the checkdams occupy natural erosional gullies, but most were built along erosional channels created by abandoned road alignments or pipeline depressions. Historic records indicate that the CCC built the earliest checkdams in the late 1930s as part of a park-wide erosion control program. After the CCC was disbanded the park developed a Soil & Moisture Control (SMC) program to continue the work. Extensive historic park records and photographs from the late 1930s through the 1960s document that the park's staff repaired the CCC's checkdams and built thousands of new dams during this period, in addition to reseeding, gully

Figure 6.11. A series of erosion-control checkdams filling a gully in southern East Creek Meadow. Checkdam IO 233 is in the lower right corner.

backfilling, and other tasks. Two extensive log scatters in East Creek Meadow contain many partially built checkdam remnants. These scatters probably represent centralized dam-construction work stations.

The SMC operated through at least 1969, although by about 1957 the project began to focus on erosion problems below the Pink Cliffs. Bryce Canyon National Park's General Management Plan (NPS 1987:27) also notes that several checkdams were built as recently as 1980 and 1981. Many dams are presently functional, and although extreme erosion is no longer a threat, the checkdams still act to stabilize the fragile meadows in which they are built.

Conclusion

The Bryce Canyon AIS documented a great number and variety of archeological sites, features, scatters, and artifacts. Although the areas identified as "sites" will constitute the focus of many of the remaining discussions and interpretations presented in this report, the isolated artifacts and features scattered throughout the park constitute an important and much more numerous type of archeological resource. The Bryce Canyon AIS project staff documented all visible archeological material in the survey area, regardless of perceived significance, to create an enduring record of the past human influences on the landscape of the Paunsaugunt Plateau.

7

Projectile Points

Donald C. Irwin

The Bryce Canyon AIS project documented Native American sites and IOs spanning the late Paleoindian/early Archaic transition to the protohistoric or historic periods on the Paunsaugunt Plateau. This chapter reports the analysis of projectile points collected during the survey and uses the recorded data to address key questions about Native American use of the Bryce Canyon area. The collected projectile points are a primary source of data for addressing questions about the chronology and cultural affiliation of project sites. Additionally, questions concerning prehistoric adaptations, economies, and culture change are addressed.

This chapter first presents a temporal evaluation of the park's sites as indicated by the types of recovered projectile points. Relevant data from previous archeological investigations in the park are also used for this evaluation. A preliminary temporal framework for the park sites is established by classifying the projectile points into types that have been documented in well-dated stratigraphic contexts elsewhere in the Great Basin and Colorado Plateau (e.g., Brown 1988; Brown et al. 1993; Holmer 1978, 1986; Schroedl 1976; Thomas 1981).

Once the preliminary temporal framework for the park's occupational periods is established, several additional questions are preliminarily addressed. These include questions regarding resource and land use in the park and how these aspects of prehistoric settlement and economy changed through time. Issues such as prehistoric cultural affiliation and exchange or mobility strategies are also addressed using the data generated by the projectile point analysis.

Analysis Methods

The projectile points analyzed during this study were collected during the 2000 and 2001 field seasons of the Bryce Canyon AIS project. During laboratory analysis, 21 attributes were coded for each projectile point. The coding format may be found in Appendix 7.1. The variables are introduced below and all recorded analysis data are presented in Appendix 7.2.

Nominal Variables

Nominal variables include nine attributes that categorize the nonmetric aspects of the projectile points. These include projectile point type, raw material, portion, presence or absence of thermal alteration, type of thermal alteration, presence or absence of patination, blank form, base shape, and presence or absence of serration.

The *projectile point type* variable places each projectile point into a provisional type category according to an identification key (Figures 7.1 and 7.2). The type analysis employs established projectile point typologies from the Great Basin and Colorado Plateau (e.g., Brown 1988; Brown et al. 1993; Holmer 1978, 1986; Irwin 2001; Schroedl 1976; Thomas 1981) to investigate temporal trends and other characteristics of the Bryce Canyon projectile point assemblage.

The *raw material* variable categorizes the type of stone used to manufacture each of the projectile points. Raw materials were initially encoded during laboratory analysis according to variations in texture and color. Chert materials included a variety of color variations and were coded separately from chalcedonys. Varieties of quartzite, obsidian, siltstone, and petrified wood were also encoded separately. During the data analysis phase these materials were grouped according to potential source areas.

The *portion* variable distinguishes the condition and portion of the analyzed projectile point. Categories include complete, base, tip, mid-section, and nearly complete. These states can occur alone or in combination, and they characterize the nature and degree of breakage for each point. During the analysis phase this variable was grouped into a condition variable that summarized point condition into complete, nearly complete, and broken forms.

The *thermal alteration* variable identifies the presence or absence of thermal alteration for each of the projectile points. It does not distinguish among intentional heat treatment, the effects of forest fires, or the potential effects of freezing. The *thermal alteration type* attribute documents the kinds of thermal alteration observed. Thermal alteration types include crazing, waxy luster, color change, and pot-lid fractures. These thermal alteration types are not mutually exclusive. Crazing describes minute surface cracks, often cross-hatched, caused by either rapid heating or cooling. Waxy luster refers to changes in the surface reflectivity resulting from thermal alteration. Waxy luster resulting from heat treatment is difficult to discern from the natural luster of some siliceous materials, and this attribute was used conservatively and principally on specimens where luster differences between facets was visible. Color change refers to changes in the color of materials resulting from heating. Lithic materials containing certain trace elements, such as iron, will change color when oxidized. For example, forms of jasper frequently turn from yellow-brown to red when heated. Pot-lid fractures are concave flake scars on a lithic item caused by the removal of plano-convex flakes. These flakes result from rapid heating or freezing that causes moisture within the material to vaporize or crystallize and explode outward. Any of these attributes may indicate either intentional heat treatment of raw materials during the manufacturing process or natural processes, such as wildfire, that affected the artifacts after they were deposited at sites.

The *patination* variable identifies the presence or absence of patination and its degree of development. Four states are characterized: none, minimal, moderate, and heavy. Patina can be segregated into three general groups: desert varnish, gloss, and white discoloration (Geib et al. 1999:5.4). Only the white discoloration form of patina was noted on the Bryce Canyon specimens. This form of patina generally appears on high-quality silicates, such as chert or chalcedony, and generally forms during desilicification, when silica near the surface is dissolved by aqueous solutions (Geib et al. 1999:5.4). The desilicification process is indicative of surface exposure and may provide a relative chronological indicator at surface lithic sites.

The *blank form* variable categorizes the overall form of each projectile point blank. Three forms are identified: triangular, lanceolate, and willow-leaf shaped. Forms that were not distinguishable are coded as unknown. Identifying the initial blank form can aid the classification of points into types. For example, Elko Corner-notched points can be distinguished from White Dog Basketmaker II points because the former points were manufactured from a blank with an isosceles triangular form while the latter employed a lanceolate blank form.

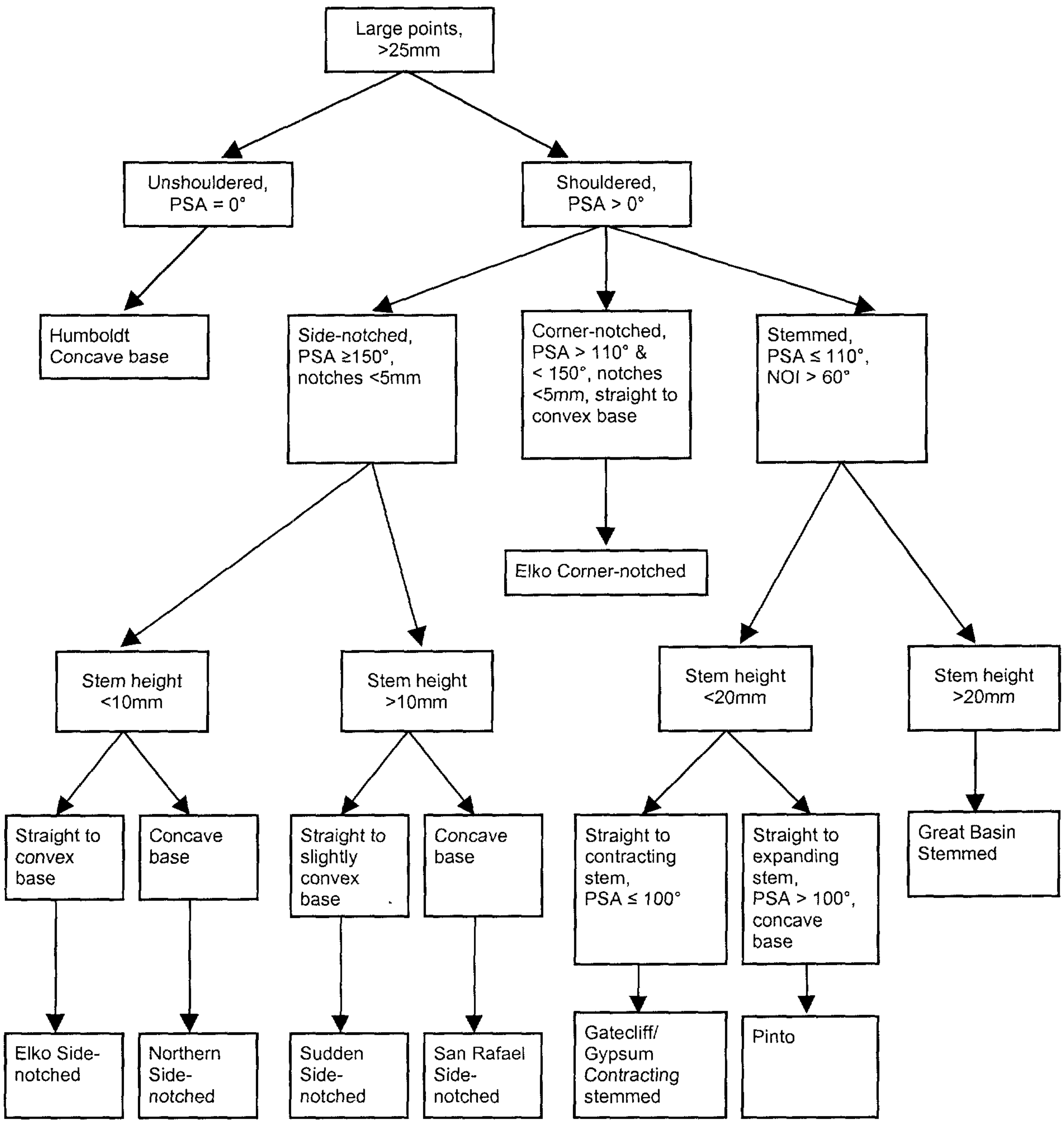


Figure 7.1. Classification key for large projectile points collected during the Bryce Canyon Archeological Inventory Survey project.

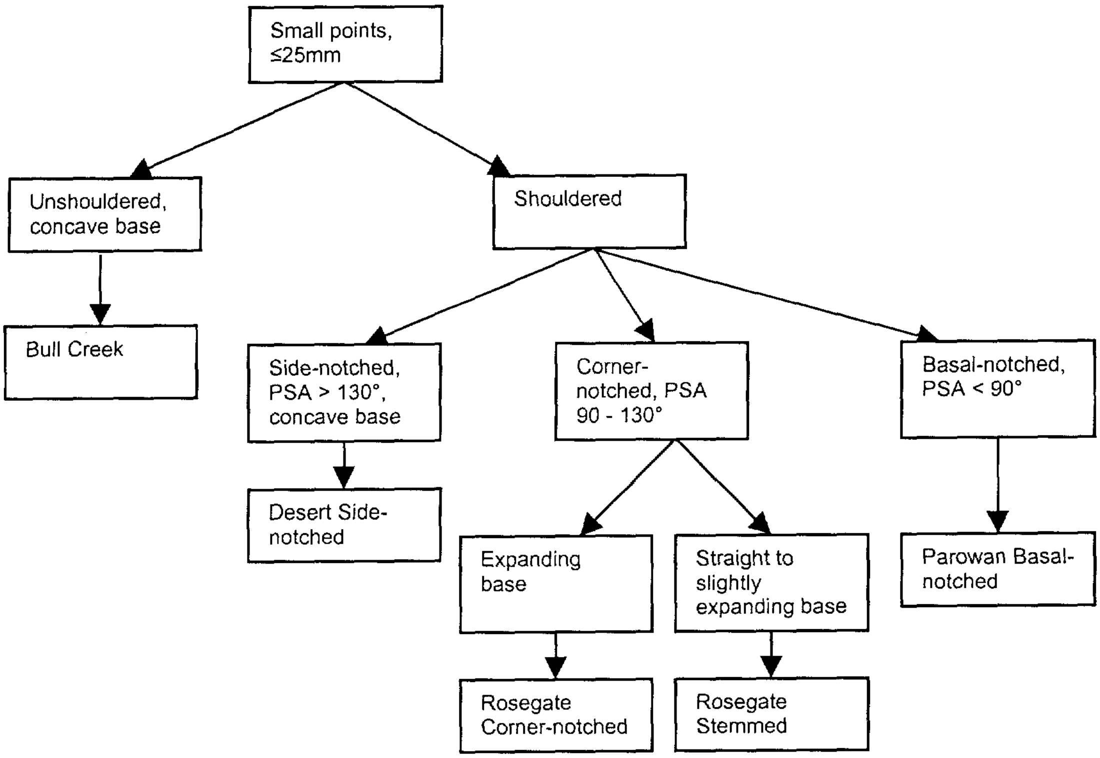


Figure 7.2. ***Classification key for small projectile points collected during the Bryce Canyon Archeological Inventory Survey project.***

The *base shape* variable categorizes the outline of the point base as either straight, concave, notched, convex, or unknown. The *serration* variable codes the presence or absence of intentional serration of projectile point margins. Three states are distinguished: absent or no serration, present with minute serration, and present with large serration (i.e., toothed).

Metric Variables

Twelve additional variables were measured. These metric variables include length, width, thickness, proximal shoulder angle (PSA), distal shoulder angle (DSA), notch opening index (NOI), notch width, notch depth, stem height, base or stem width, shoulder width, and weight (see Thomas 1981:Figure 3).

The *length* measurement records the maximum existing length of each point. Length was measured using digital calipers and recorded in millimeters. A secondary field was used to record points with incomplete length measurements. The maximum *width* of each point was measured using digital calipers and recorded in millimeters. Points with incomplete width measurements were recorded in a secondary field. The *thickness* of each point was measured at the juncture of the blade and the haft element. Thickness was measured using digital calipers and recorded in millimeters.

The *proximal shoulder angle* (PSA) variable measures, in degrees, the angle between the side of the projectile point base and an artificial line perpendicular to the tool's long axis. The *distal shoulder angle* (DSA) variable measures, in degrees, the angle between the projectile point shoulder margin and an artificial line perpendicular to the tool's long axis. Only shouldered and notched points were measured. Each base or stem was measured with a goniometer according to methods established by Thomas (1981:11–14). PSAs vary between 0 and 270 degrees. DSAs vary between 90 and 270 degrees.

The *notch opening index* (NOI) variable measures the angle of the notch opening and follows definitions outlined by Thomas (1981:14). The NOI was measured using a goniometer and recorded in degrees. Only shouldered and notched points were measured. The *notch width* variable measures the width of the notch at its opening. The *notch depth* variable measures the depth of the notch from its opening to its termination. Notch widths and depths were measured using digital calipers and recorded in millimeters.

The *stem height* variable measures the length of the point's haft element from the base to the shoulder. Only shouldered or notched points were measured. The *stem or base width* variable measures the width of the base or stem at the proximal end of the haft element; only points with complete bases were measured. The *shoulder width* variable measures the width of each point at the shoulder; only points with complete shoulders were measured. These measurements were collected using digital calipers and recorded in millimeters. The *weight* measurement records the existing weight of each point. Weight was measured using an Ohaus® digital scale and recorded to the nearest decigram.

Analysis Results

During the survey, 123 projectile points were collected: 68 from sites and 55 from isolated contexts. These projectile points are classified into metric attribute-based types (Figures 7.1 and 7.2) as outlined in identification keys developed by Thomas (1981), Brown (Brown et al. 1993), and Irwin (2001). The goal of this phase of analysis was to classify the points found during the survey into regionally recognized projectile point types, thereby establishing a preliminary temporal framework for sites in the Bryce Canyon AIS project area (Table 7.1). The validity of the temporal framework is based on the assumption that aspects of point morphology reflect stylistic or functional variation that undergoes patterned change through time (e.g., Irwin-Williams 1973; Thomas 1981).

Large Projectile Points

Medium-to-large sized points constitute 71.5 percent (n=90) of the collected point assemblage. These points, which measure greater than 25 mm in length, are believed to represent the stone tips of atlatl darts. Of these points, 60 are classifiable into the established types described below. Thirty large points are too fragmentary for classification or do not fit the established type descriptions and are classified as unknown points.

Large Stemmed Projectile Points

A variety of large stemmed projectile points was found during the Bryce Canyon AIS. Stemmed point types include Great Basin Stemmed, Pinto Shouldered, Gatecliff Contracting Stem/Gypsum points, and other unknown stemmed forms that indicate potential late Paleoindian through late Archaic use of the project area.

Great Basin Stemmed

One large stemmed point (Field Specimen [FS] 1; Figure 7.3a) is classified as a Great Basin Stemmed point (e.g., Holmer 1978, 1986). This point is manufactured of white chert and has a long (20 mm), straight to contracting stem (PSA=88°), a convex base, and sloping shoulders (DSA=152°). This complete but resharpened point weighs 6.0 g and is 46 mm in length, 26 mm in width, and 5.6 mm in thickness. The entire point shows moderate patination and does not appear to have been more recently reworked.

Table 7.1. ***Projectile point types collected from sites and isolated contexts.***

Point Type	Date Range	Time Period	Count of Sites	Count of Isolates	Total
Great Basin Stemmed	8000–6000 B.C.	Late Paleoindian / Early Archaic	1	0	1
Unclassified Stemmed, Dart	7850–4200 B.C.	Late Paleoindian / Early Archaic	2	0	2
Pinto Shouldered	6300–4200 B.C.	Early Archaic	5	0	5
Sudden Side-notched	4400–2400 B.C.	Middle Archaic	1	0	1
Northern Side-notched	5200–2400 B.C.	Middle Archaic	1	0	1
Humboldt	5650–4140 B.C.	Middle Archaic	0	1	1
Gatecliff Contracting Stem / Gypsum	2500 B.C.–A.D. 500	Late Archaic	5	10	15
San Rafael Side-notched	2600–400 B.C.	Late Archaic	1	0	1
Elko Corner-notched	6000 B.C.–A.D. 1000	Undated (Archaic)	8	10	18
Elko Eared	6000–1400 B.C.	Archaic	8	4	12
Elko Side-notched	6000 B.C.–A.D. 1000	Undated (Archaic)	1	0	1
Unclassified Corner-notched, Dart	–	Undated (Archaic)	5	7	12
Unclassified Side-notched, Dart	–	Undated (Archaic)	3	1	4
Unknown, Dart	–	Undated (Archaic)	7	5	12
Rosegate Corner-notched	A.D. 300–925	Late Prehistoric / Formative	1	0	1
Rosegate Stemmed	A.D. 300–925	Late Prehistoric / Formative	2	2	4
Parowan Basal-notched	A.D. 900–1200	Late Prehistoric / Formative	1	1	2
Bull Creek	A.D. 1050–1300	Late Prehistoric / Formative	1	0	1
Desert Side-notched	A.D. 1200–1700	Late Prehistoric to Protohistoric	3	4	7
Unclassified Corner-notched, Arrow	–	Late Prehistoric / Formative	2	5	7
Unclassified Side-notched, Arrow	–	Late Prehistoric / Formative	3	1	4
Unknown, Arrow	–	Late Prehistoric / Formative	3	4	7
Total*			40*	54*	94*

* Actual count of collection locations (i.e., sites or isolates containing multiple points are counted only once).

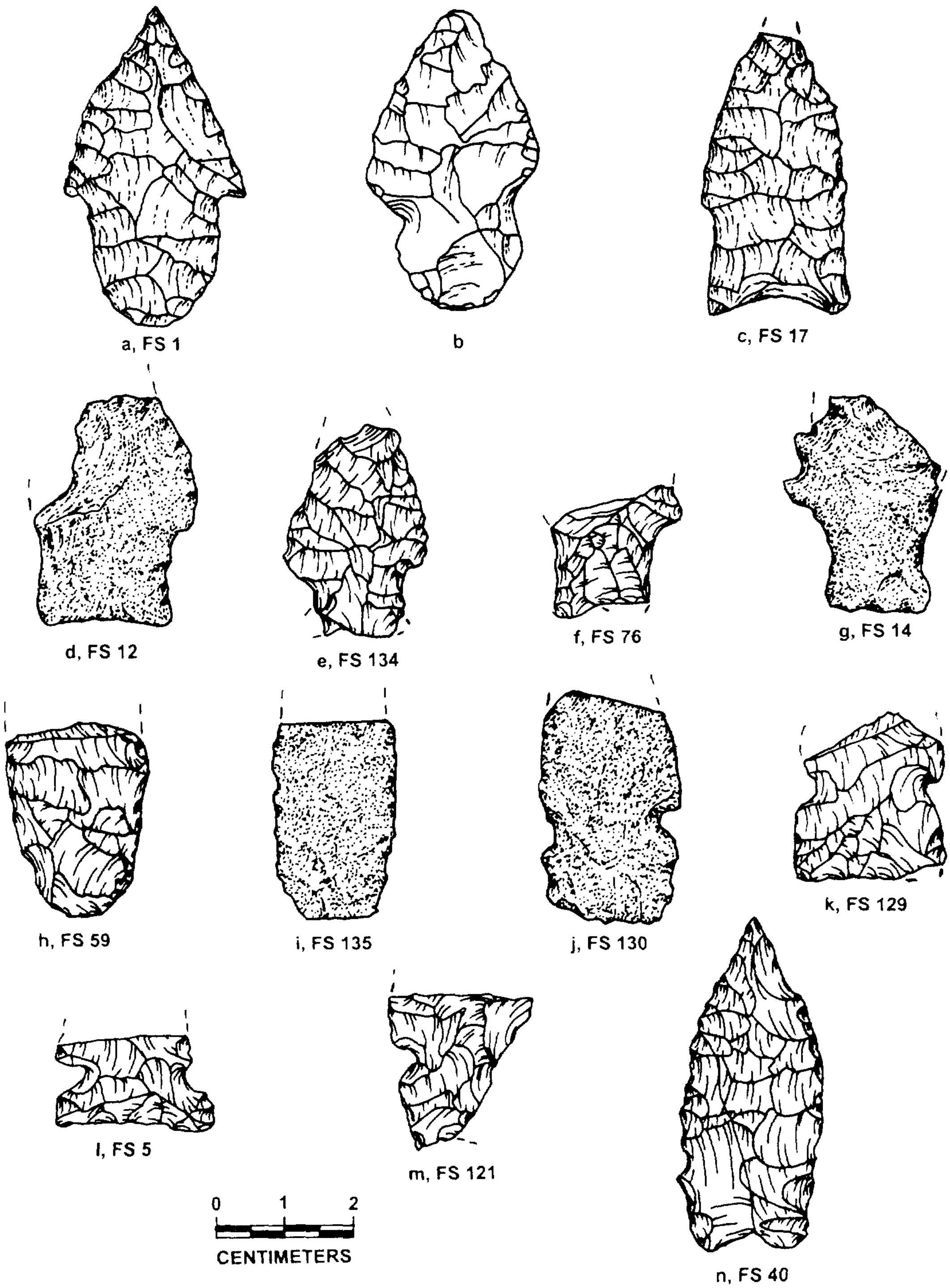


Figure 7.3. ***Late Paleoindian and Archaic period projectile points:*** **(a-b)** ***Great Basin Stemmed (b redrawn from Dominguez et al. 1992:Figure 16f),*** **(c-g)** ***Pinto Series,*** **(h-i)** ***unclassified large stemmed,*** **(j-k)** ***Sudden Side-notched,*** **(l)** ***Northern Side-notched,*** **(m)** ***San Rafael Side-notched, and*** **(n)** ***Humboldt.***

A previous park study (Dominguez et al. 1992:Table 9, Figure 16f) also documented what appears to be a Great Basin Stemmed point from an isolated context in the vicinity of Shaker Spring (IF#30; Dominguez and Kramer 1988:Figure 2c). This point (Figure 7.3b) is morphologically similar to the item collected during the Bryce Canyon AIS and has a long, straight stem, a convex base, and sloping shoulders.

Pinto Shouldered

The stems of Pinto Shouldered points are generally straight to expanding (Brown 1988). The straight to expanding stem is reflected by a PSA greater than or equal to 90° and less than 110° and an NOI greater than 60°.

Five projectile points are classified as Pinto Shouldered (Figure 7.3c-g). One (FS 17; Figure 7.3c) appears to have been extensively used and resharpened, but not more recently reworked. This gray siltstone point is nearly complete, although it has a broken tip; it has somewhat parallel oblique flaking, a serrated blade, and is basally ground. The point has a concave base and slightly expanding stem (PSA=95°). This point weighs 5.3 g and measures 40 mm in length, 21 mm in width, and 5.8 mm in thickness. Another partial Pinto Shouldered point is made of white and pink chert (FS 12; Figure 7.3d). This point is transversely broken but has one convex edge margin remaining (PSA=92°) and a rounded, retouched tip displaying a large degree of secondary modification. This incomplete point weighs 5.0 g and measures 34 mm in length, 24 mm in width, and 5.8 mm in thickness. Both of these points resemble some illustrated variants of Pinto Shouldered points from the region (e.g., Canaday 2001), but these Bryce Canyon points lack the pronounced bifurcated base that is typically associated with Pinto Shouldered points (Holmer 1978, 1986; Thomas 1981) and the basal grinding and flaking patterns are more typical of Paleoindian point technology than Archaic point technology.

Another of the Pinto Shouldered points (FS 134; Figure 7.3e) is nearly complete, but the corners of the base exhibit minor breaks that prevent accurate measurement. This point is categorized as Pinto Shouldered, but the basal breakage makes this classification tentative. This item is manufactured of chert and has a straight to slightly expanding stem with a slightly concave base. This point weighs 4.0 g and measures 31 mm in length, 21 mm in width, and 6.1 mm in thickness. This point has a heavy patina and the tip is broken and reworked. A basal fragment of another point (FS 76) is also classified as Pinto Shouldered (Figure 7.3f). This point fragment is manufactured of clear, white, and red chalcedony and is too fragmentary to measure accurately for size attributes. It has one sloping shoulder (DSA=210°) and a straight to slightly expanding stem (PSA=108°) with a concave base. Finally, another point (FS 14; Figure 7.3g) may also be a variant of the Pinto type, but again is not typical of other illustrated examples of Pinto points. It is a broken, reworked point manufactured of white and pink chert that shows heavy patination. This point has a sloping shoulder (DSA 210°) and slightly expanding stem (PSA 108°) with a straight base. One margin of the blade is toothed (i.e., large serrations) while the other side is broken and retouched. This partial point weighs 4.2 g and is 31 mm long, 21 mm wide, and 6.1 mm thick.

Collectively, these three points (FS 14, 76, and 134) are potential Pinto style variants, but they lack the pronounced bifurcated base that is typical of this type, as defined by Holmer (1978). Still, these points do bear similarities to the Pinto points from Hogup Cave illustrated by Aikens (1970:42) and Jennings (1978:Figure 51c, g). A Pinto point previously documented in Bryce Canyon National Park at Site 42GA1903 (Dominguez and Danielson 2000:Figure 13e) has a slightly expanding stem with a straight base that is similar to FS 134. Five other previously collected examples of Pinto points from this same site (Dominguez and Danielson 2000) exhibit the bifurcated base that is more typical of this type.

Gatecliff Contracting Stem/Gypsum

The stems of Gatecliff Contracting Stem points usually contract markedly, but straight to slightly expanding stems also occur in this series (Brown 1988). The straight to contracting stem is reflected by a PSA less than or equal to 100° and an NOI greater than 60° (Thomas 1981:23). Brown (1988:324) found Gatecliff Contracting Stem points from the Ghost Rock area of Emery County, Utah to possess a NOI range from 62° to nearly 180°. Using these classification criteria, 16 Gatecliff Contracting Stemmed/Gypsum points are identified in the Bryce Canyon AIS assemblage (Figure 7.4a-p).

The Gatecliff Contracting Stem/Gypsum points from Bryce Canyon have contracting stems, primarily triangular forms, and well-defined shoulders. These points are manufactured from a variety of materials including chert, jasper, and chalcedony. These points have moderately short, contracting stems (μ[population mean] =6.1 mm, σ [standard deviation] =1.5 mm) with a PSA range between 61° and 84° (μ=70.1°, σ=7.3°) and a DSA between 150° and 211° (μ=177.3°, σ=23.9°). The NOI ranges between 49° and 147° (μ=97.3°, σ=30.4°) for these points. Complete and nearly complete Gatecliff Contracting Stem/Gypsum points range between 39 and 45 mm in length (σ=42.5 mm, σ=3.5 mm), 17 and 23 mm in width (μ=19.9 mm, σ=2.4 mm), and 3.6 to 5.9 mm in thickness (μ=4.8 mm, σ=.6 mm). Weights for complete or nearly complete specimens range between 3.5 and 4.5 g (μ=3.9 g, σ=.43 g). Approximately 56 percent (n=9) of the Gatecliff Contracting Stem/Gypsum points are serrated.

Gypsum points are common throughout southwestern Utah and have been previously documented at sites (e.g., 42GA1903, 42GA1904, 42GA3383) and isolated surface contexts in Bryce Canyon National Park (Dominguez and Danielson 2000; Dominguez et al. 1992). The Gatecliff Contracting Stem/Gypsum points collected during the survey compare favorably with previous examples found within the park. Previously documented Gatecliff Contracting Stem/Gypsum points all exhibit a triangular form and a markedly contracting stem with a convex base.

A poorly provenienced, isolated point was informally collected by park employees several years prior to the survey on a high ridge southwest of Yovimpa Pass. This point, stored in the park archive (Cat. #398–3882), may also be classifiable as a Gatecliff Series type, but it differs substantially from the Gatecliff Contracting Stem/Gypsum points collected during the survey project. This large point (Figure 7.4q) has a triangular to lanceolate form with a slightly contracting to straight stem and a straight base. Similar points have been documented in southeastern and central Utah (Brown 1988; Irwin 2001).

Unclassified Large Stemmed Points

Two projectile points do not fit easily into established categories and are, therefore, lumped into an unclassified large stemmed point category. These points may represent late Paleoindian forms and warrant further description.

The two fragments categorized as unclassified large stemmed points apparently represent broken lanceolate points. One is an obsidian basal fragment (FS 59; Figure 7.3h) that exhibits a moderately well-established parallel-oblique flaking pattern and heavily ground lateral and basal edges. The second (FS 135; Figure 7.3i) is made of quartzite and also exhibits a somewhat parallel flaking pattern and a heavily ground basal corner. These two point fragments somewhat resemble Plains Paleoindian points such as Haskett points (Butler 1978; Russell 1993) or Agate Basin and Hell Gap types (Frison 1978). The presence of basal and lateral grinding is common among Paleoindian points. Grinding is also a common technique used to strengthen edges during biface reduction, and these specimens may instead reflect bifaces broken and discarded during the manufacturing process, but there is no direct evidence to confirm this proposition. These point fragments are similar to a possible Paleoindian lanceolate point base that has been previously documented at Site 42GA1903 within the park (Dominguez and Danielson 2000:100, Figure 13h). The previously collected specimen has a lanceolate form, a weakly developed parallel-oblique flaking pattern, and a straight, basally thinned base with edge grinding.

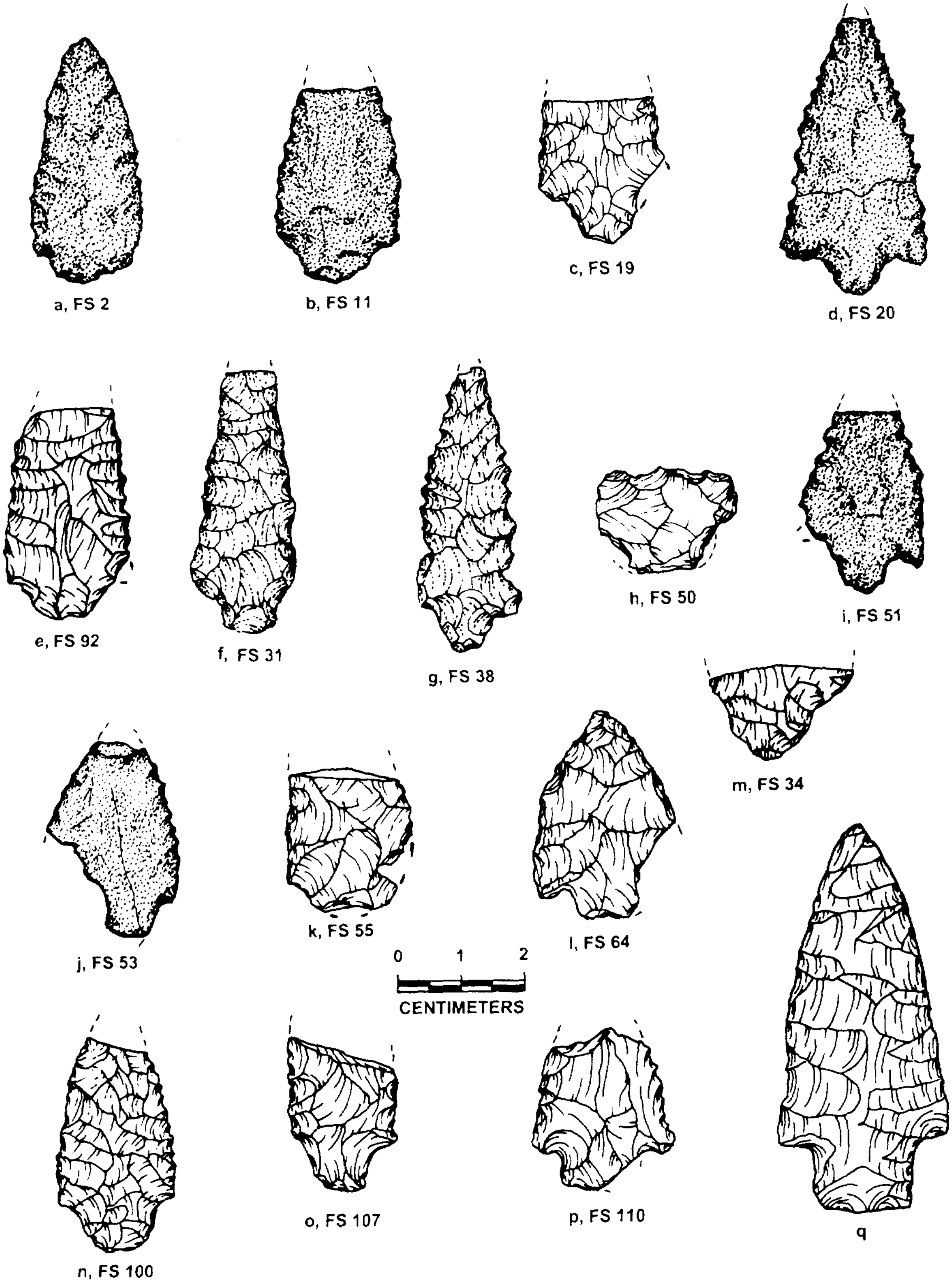


Figure 7.4. ***Gatecliff Contracting Stem/Gypsum projectile points:*** (a-p) ***from Bryce Canyon Archeological Inventory Survey project;*** (q) ***from park collection (Cat. #398–3882).***

Elko Series Points

Elko Series points are found throughout the Great Basin and the Colorado Plateau. Three variants are recognized: the Elko Corner-notched, Elko Side-notched, and Elko Eared types (Holmer 1978). These points have triangular forms with deep, narrow notches and blade widths that exceed the width of the base.

Elko Corner-notched

Nineteen projectile points are classified as Elko Corner-notched points (Figure 7.5). The Elko Corner-notched type is triangular with straight to slightly convex blades (Holmer 1978:35). According to Thomas (1981:20–21), Elko Corner-notched points have a basal width greater than 10 mm and a PSA measuring between 110° and 150°. Brown (Brown et al. 1993:386) notes that the notches on Elko Corner-notched points are less than 5 mm wide and are generally 4 mm or more in depth.

Elko Corner-notched points in the Bryce Canyon AIS assemblage are manufactured from a variety of materials including chert, jasper, chalcedony, and obsidian. These points have expanding bases with a mean base height of 8 mm (σ=1.8 mm), a PSA ranging between 110° and 144° (μ=123.9°, σ=11.1°), and a DSA between 142° and 198° (μ=158.9°, σ=13.2°). The NOI ranges between 26° and 72° (μ=45.1°, σ=15.1°). The notches on these points are narrow, ranging from 3 to 5 mm (μ=3.9 mm, σ=.9 mm). Complete and nearly complete Elko Corner-notched points have a mean weight of 4.0 g (σ=1.7 g) and a length range between 27 mm and 46 mm (μ=36.6 mm, σ=7.8 mm). Point width varies between 16 and 28 mm (μ=21.9 mm, σ=3.8 mm) and thickness varies between 3.7 and 5.5 mm (μ=4.7 mm, σ=.5 mm). Approximately 28 percent (n=5) of the Elko Corner-notched points have serrated blades.

Elko Corner-notched points have been previously documented at sites (e.g., 42GA905, 42GA1902, 42GA1903, 42KA3289, and 42GA3383) and isolated surface contexts in Bryce Canyon National Park (Dominguez and Danielson 2000; Dominguez et al. 1992; Hartley 1980a). The previous examples of this type are similar to those collected during the survey and have a medium to large triangular form, narrow corner-notches, and a straight or convex base.

Elko Eared

Elko Eared points also have a triangular form and display corner notches but a pronounced basal concavity or notch typifies these points. Tangs are rare on Elko Eared points, and the DSA often approaches 180° (Holmer 1978:38).

Thirteen Elko Eared points manufactured of chert and chalcedony are present in the survey assemblage (Figure 7.6a-m). These points have a PSA ranging between 112° and 145° (μ=128.8°, σ=8.9°) and a DSA of 142° to 199° (μ=160.2°, σ=15.9°). The NOI ranges between 22° and 53° (μ=34.8°, σ=11.7°). Complete Elko Eared points have a mean weight of 3.2 g (σ=1.1 g) and a length range between 34 and 42 mm (μ=37.7 mm, σ= 4.1 mm). Point width varies between 18 and 23 mm (μ=19.5 mm, σ=1.97 mm). Thickness ranges between 3.9 and 6.3 mm (μ=4.6 mm, σ=.6 mm). Approximately 62 percent (n=8) of the Elko Eared points are serrated.

Three potential Elko Eared points have been previously documented in the park (Dominguez and Danielson 2000; Hartley 1980a). These points are reported from isolated contexts and sites (e.g., 42GA905 and 42GA1903). The previous examples of Elko Eared points are similar to the examples collected during the survey and exhibit the triangular form and concave base that is typical of this type.

Elko Side-notched

One Elko Side-notched point is identified in the Bryce Canyon AIS assemblage. This point type typically grades into the variability range of Elko Corner-notched points, and some researchers (e.g., Holmer 1978, 1986) argue that

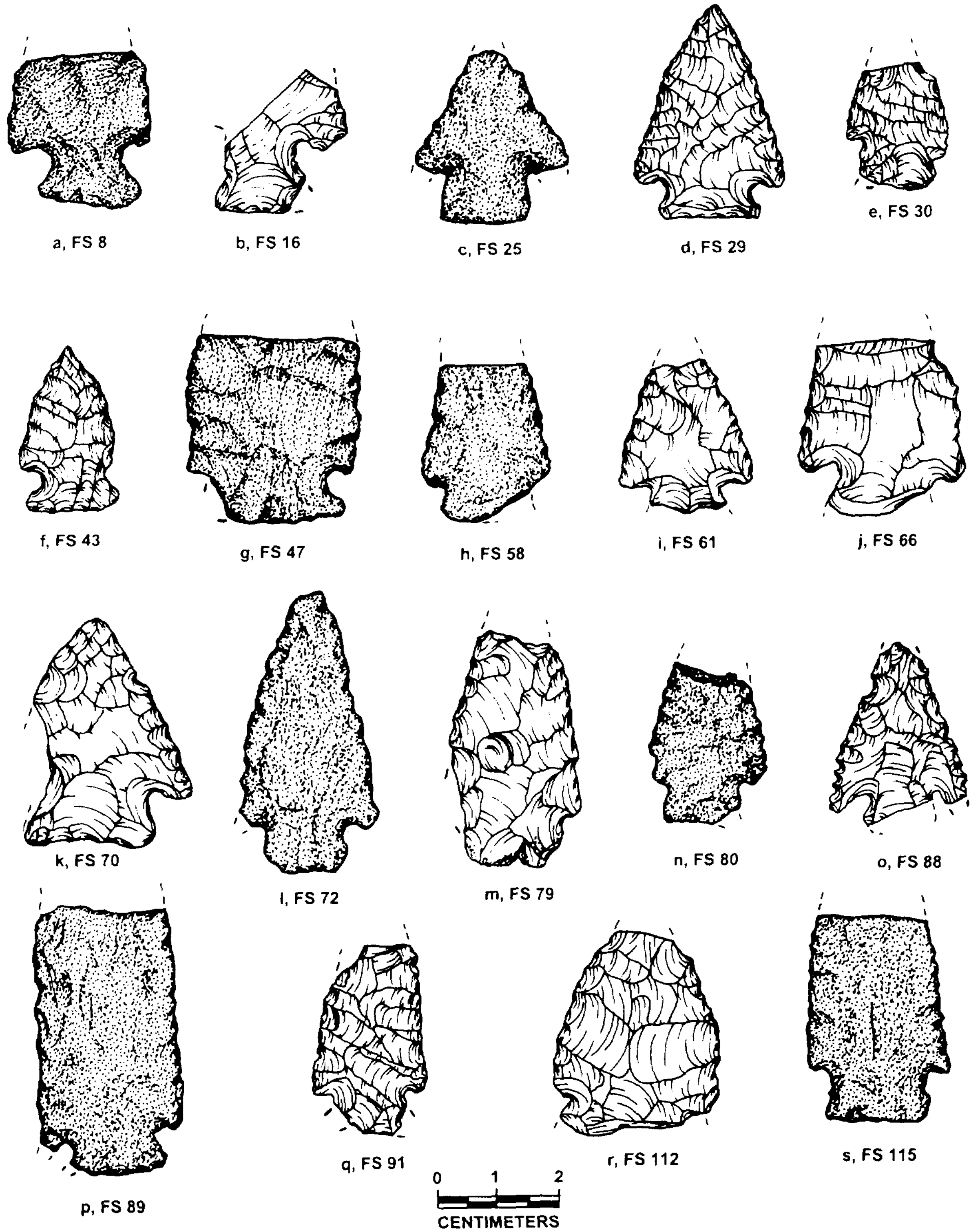


Figure 7.5. Elko Corner-notched projectile points.

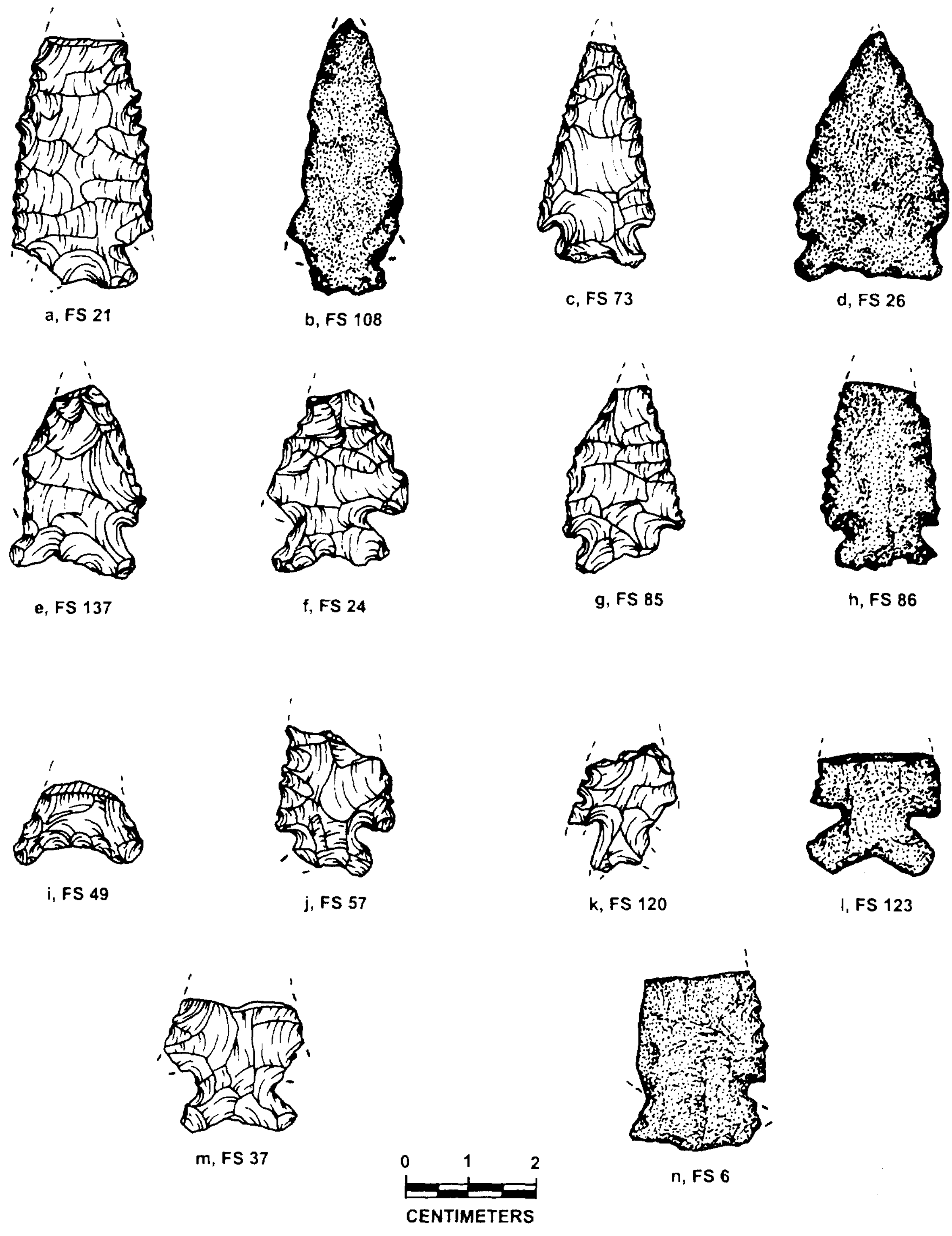


Figure 7.6. *Elko Series projectile points:* (a-m) *Elko Eared and* (n) *Elko Side-notched.*

they represent the same type. The maximum stem width is approximately equal to the maximum blade width, tangs are rare, and the distal notch angle frequently approaches 180°, lending a shouldered appearance to the blade. Brown (Brown et al. 1993:386) notes that Elko Side-notched points have narrow side notches (<5 mm) and a PSA greater than 150°.

The Elko Side-notched point from the Bryce Canyon AIS (FS 6; Figure 7.6n) is manufactured of chert and exhibits an NOI of 23°, a PSA of 164°, and a DSA of 186°; the base width is 19 mm and the base height is 10 mm. This point is incomplete, but measures 28 mm in length, 20 mm in width, and 4.8 mm in thickness.

Three potential Elko Side-notched points have been previously documented in the park (Dominguez and Danielson 2000; Dominguez et al. 1992). These points were collected from Sites 42GA1903 and 42GA3383 and are similar to the example collected during the survey. They exhibit triangular forms and straight bases.

Large Side-notched Points

Large side-notched projectile points with horizontal notches positioned moderately high on the blade, such as Northern, Sudden, and Rocker Side-notched points, are typical of the middle Archaic period on the western and northern Colorado Plateau (Holmer 1978, 1986; Schroedl 1976). San Rafael Side-notched points appear during the late Archaic period after 2400 B.C.

Sudden Side-notched

Two broken Sudden Side-notched points were collected from the same site (42KA5798) during the survey. Sudden Side-notched points have narrow, horizontal notches placed moderately high on the side of the point (Holmer 1978). Brown (Brown et al. 1993) notes that these points have a PSA greater than 150° and a stem height greater than or equal to 10 mm.

Both Sudden Side-notched points are made of chert. One of the Sudden Side-notched points (FS 130; Figure 7.3j) is a base and midsection fragment with a shallow (2.3 mm), moderately wide (4.6 mm), horizontal notch (PSA 153°, DSA 200°) placed high on the blade (base height = 15 mm). The second Sudden Side-notched point (FS 129; Figure 7.3k) is a basal fragment with moderately shallow and wide notches measuring 4.5 mm wide and 2.2 mm deep. The horizontal notch (PSA 162°, DSA 204°) is placed high on the blade (base height = 15 mm). Neither of the Sudden Side-notched points is serrated.

Northern Side-notched

One broken Northern Side-notched point is identified in the survey assemblage (FS 5; Figure 7.3l). Northern Side-notched points have a concave base and narrow, horizontal notches located moderately high on the side of the point (Holmer 1978).

The Northern Side-notched point is a basal fragment, made of chert, with a moderately deep (3.9 mm) and wide (4.2 mm) horizontal notch (PSA 156°, DSA 185°). The notch is not placed particularly high on the blade (base height = 8.6 mm), but the point does have a concave base typical of this point style. The maximum width of the point is equal to the base width; both measure 23 mm. This point lacks serration.

San Rafael Side-notched

One San Rafael Side-notched point, made of chert, was collected from the project area (FS 121; Figure 7.3m). San Rafael Side-notched points are triangular with high horizontal notches that form a parallel-sided, concave-based stem that is equal in width to the blade (Holmer 1978). Brown et al. (1993) note these points have a PSA greater than 150° and the stem height is greater than or equal to 10 mm.

The San Rafael Side-notched point is a basal fragment with a straight-sided, concave base and a high side notch. One intact notch is 2.5 mm deep and 3.3 mm wide and has an NOI of 24°. The horizontal side notch (PSA 158°, DSA 178°) is positioned high on the blade, reflected by a base height of 15 mm. No serration is present on the remnant blade portion of this point.

Other Large Projectile Points

Other large projectile points in the assemblage include a Humboldt point, unclassified corner-notched points, unclassified side-notched points, and unknown point types. Unclassified projectile points primarily represent broken specimens that were not sufficiently complete for classification. A small number of complete points that were not classifiable into existing types are included in the unknown category.

Humboldt

One large lanceolate projectile point with a pronounced concave base is manufactured of white chert (FS 40; Figure 7.3n). This point is classified as a Humboldt point (Holmer 1978, 1986; Jennings 1978). This point weighs 7.3 g and measures 49 mm in length, 22 mm in width, and 6.7 mm in thickness. This point's tip is burinated and resharpened and is rounded from use in graving or drilling activities. This item is similar to examples of Black Rock concave base points from Hogup Cave that are illustrated by Jennings (1978:Figure 52g-l). This point lacks serration.

Unclassified Large Corner-notched Points

Unclassified large corner-notched points constitute approximately nine percent of the survey point assemblage (n=12; Figure 7.7a-l). These points are manufactured from chert, chalcedony, and obsidian. These fragmented points exhibit shoulder, base, and tip fractures that prohibit accurate measurement and typological classification. Approximately 46 percent (n=5) of these points exhibit serrations.

Although these points are broken, most could be subjectively placed into the Elko Corner-notched type. One nearly complete point (FS 13; Figure 7.7b) appears to be an Elko point that was broken and reworked. This point exhibits a reworked convex blade with a rounded shoulder and a broad notch on one margin. The opposite margin has an intact, but reworked, nearly horizontal shoulder (DSA=177°) and a broad (7 mm wide), shallow (3.4 mm deep) notch that illustrates the effects of recycling a broken point.

Unclassified Large Side-notched Points

Four large unclassified side-notched points made of chert and obsidian are present in the survey assemblage (Figure 7.7m-p). This category includes one fragment that was not classifiable into a known type and three complete or nearly complete points that do not fit the established type descriptions. None of these points are serrated.

One of the complete unclassified side-notched points (FS 82; Figure 7.7m) is lanceolate with moderately broad (4.3 mm wide), shallow (2 mm deep) side notches. This ignimbrite point is 39 mm long, 16 mm wide, and 5 mm thick. A second nearly complete obsidian specimen (FS 105; Figure 7.7n) is similar, but has narrow (2.8 mm wide), shallow (1.3 mm deep) notches. This unclassified side-notched point is 30 mm long, 13 mm wide, and 5.3 mm thick.

A third unclassified side-notched point (FS 75; Figure 7.7o) appears to be expediently manufactured, but is morphologically similar to a Rocker Side-notched point. Holmer (1978:54) describes Rocker Side-notched points as a middle Archaic point type (4850–3350 B.C.) with a wide lanceolate form and moderately high horizontal side notches that form a stem that approaches a semicircular shape. The edges above and below the notches form a continuous smooth curve, broken only by the presence of the notches. FS 75 exhibits a pronounced convex base that is 12 mm high. The notches on this nearly complete specimen are relatively narrow (3.7 mm) and moderately shallow (2.2 mm). The PSA measures 165°, the DSA 202°, and the NOI 68°.

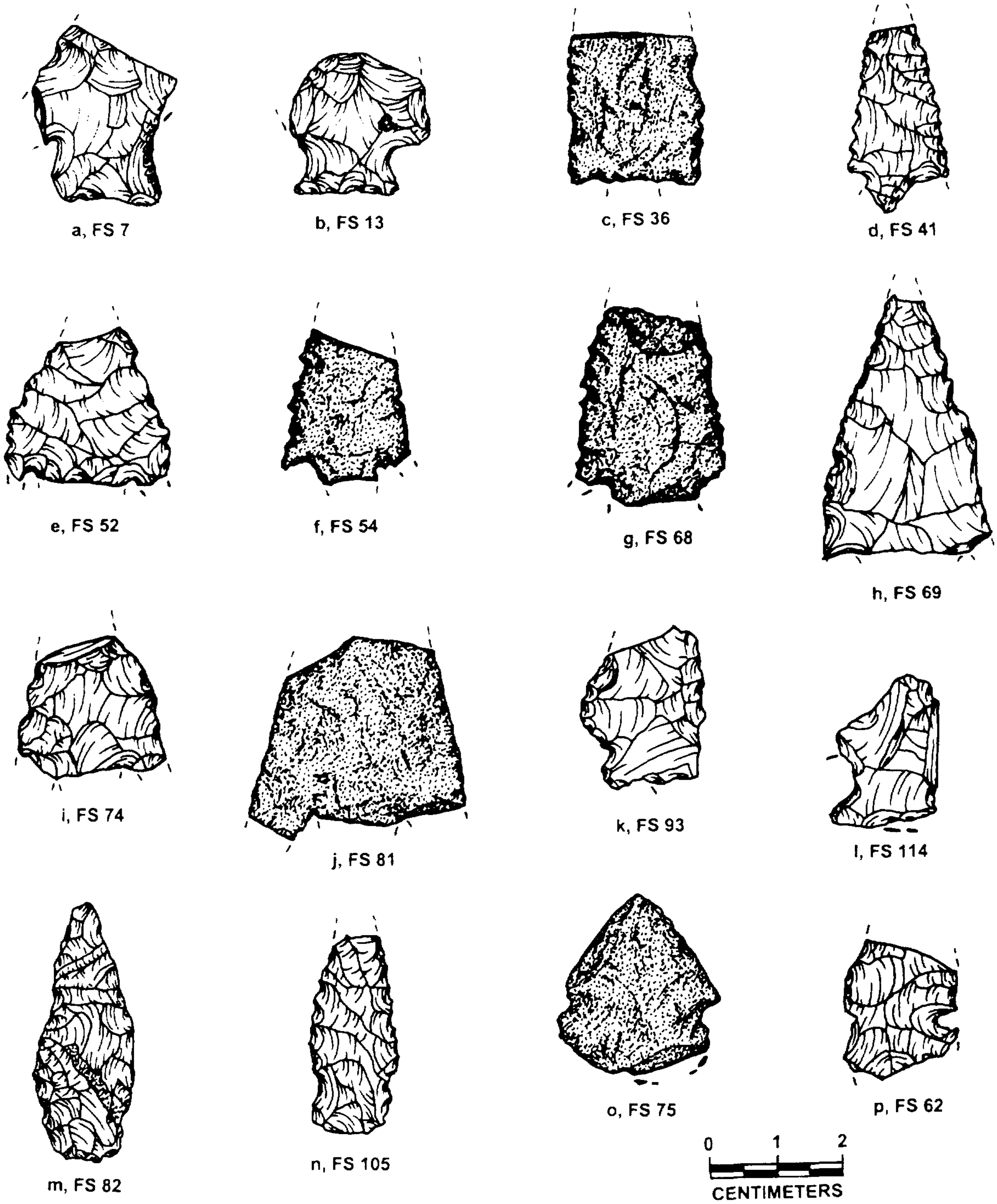


Figure 7.7. *Unclassified large projectile points:* (a-l) *corner-notched and* (m-p) *side-notched.*

The fourth unclassified side-notched specimen (FS 62; Figure 7.7p) exhibits narrow (3.5 mm) horizontal notches, but the broken base prohibits classification. The remaining portion of the base is 10 mm high, possibly indicating that it had high-on-the-side notches typical of the Sudden or San Rafael types.

Unknown Large Points

Unknown large projectile points constitute 9.8 percent (n=12) of the survey point assemblage. These points are primarily point fragments that are not sufficiently complete for classification, but three are nearly complete points that do not fit with the established type categories. Seven of the points (Figure 7.8a-g) are midsection fragments with shoulder remnants that suggest they may be broken Elko Series points. Of these, FS 3 (Figure 7.8a) has a convex edge with pronounced serrations and may have been used as a knife. Another point midsection with pronounced serrations (FS 15; Figure 7.8h) appears to be a fragment of a stemmed point and may represent a Gatecliff Contracting Stem/ Gypsum type.

One nearly complete untyped point (FS 60; Figure 7.8i) is lanceolate with a concave base. It is made of obsidian and is 31 mm long, 11 mm wide, and 4.3 mm thick. The point has a burinated tip and one serrated edge. The point exhibits a pronounced twist in its cross section, suggesting the point was resharpened while hafted, which may have produced its narrow width and inconsistent serration. A second untyped lanceolate point (FS 45; Figure 7.8j) has a broken base. This chert point has an incomplete length of 54 mm and is 20 mm wide and 4.9 mm thick. The point exhibits a moderately well-established parallel-oblique flaking pattern and moderate patination.

Two of the unknown points appear to be willow-leaf or lanceolate forms. One (FS 97; Figure 7.8k) is manufactured of black-and-mahogany obsidian and has convex, serrated blades, and a broken base. This item has an incomplete length of 30 mm and is 14 mm wide and 5.1 mm thick. The second willow-leaf point (FS 84; Figure 7.8l) is made of chert and has a broken base and tip. This item is 33 mm long, 14 mm wide, and 5.3 mm thick.

Small Projectile Points

Thirty-three small points constitute 28.5 percent of the survey point assemblage. These points are typically less than 25 mm in length and represent the stone tips of arrows. Stemmed, corner-notched, side-notched, and triangular types are present in the assemblage.

Rosegate Series Points

Following Thomas (1981) and Holmer (1986), the small triangular stemmed and corner-notched points that have been traditionally classified as Rose Springs and Eastgate types are classified as Rosegate points. Regional studies of these points (Holmer 1978; 1986; Thomas 1981) have demonstrated that substantial morphological and chronological overlap exists between the Rose Springs and Eastgate types, suggesting that they should be combined.

Rosegate Corner-notched

One Rosegate Corner-notched point is identified in the survey point assemblage (FS 124; Figure 7.9a). Rosegate Corner-notched points have an expanding base with a PSA ranging between 90° and 130° (Thomas 1981:19). The Rosegate Corner-notched point fragment is made of petrified wood and weighs 1.6 g. This point has an incomplete length of 21 mm and is 12 mm wide and 4.6 mm thick. This item has a PSA of 128°, a DSA of 210°, and an NOI of 72°. This point is not serrated.

A Rose Springs Corner-notched point was previously reported in the park at Site 42GA3383 along the Pink Cliffs south of Fairyland Point by Dominguez et al. (1992:37, 102f), although in that report it appears more similar to Parowan Basal-notched points documented in this analysis. The Rosegate Corner-notched point collected during the survey has an expanding base, while the previously

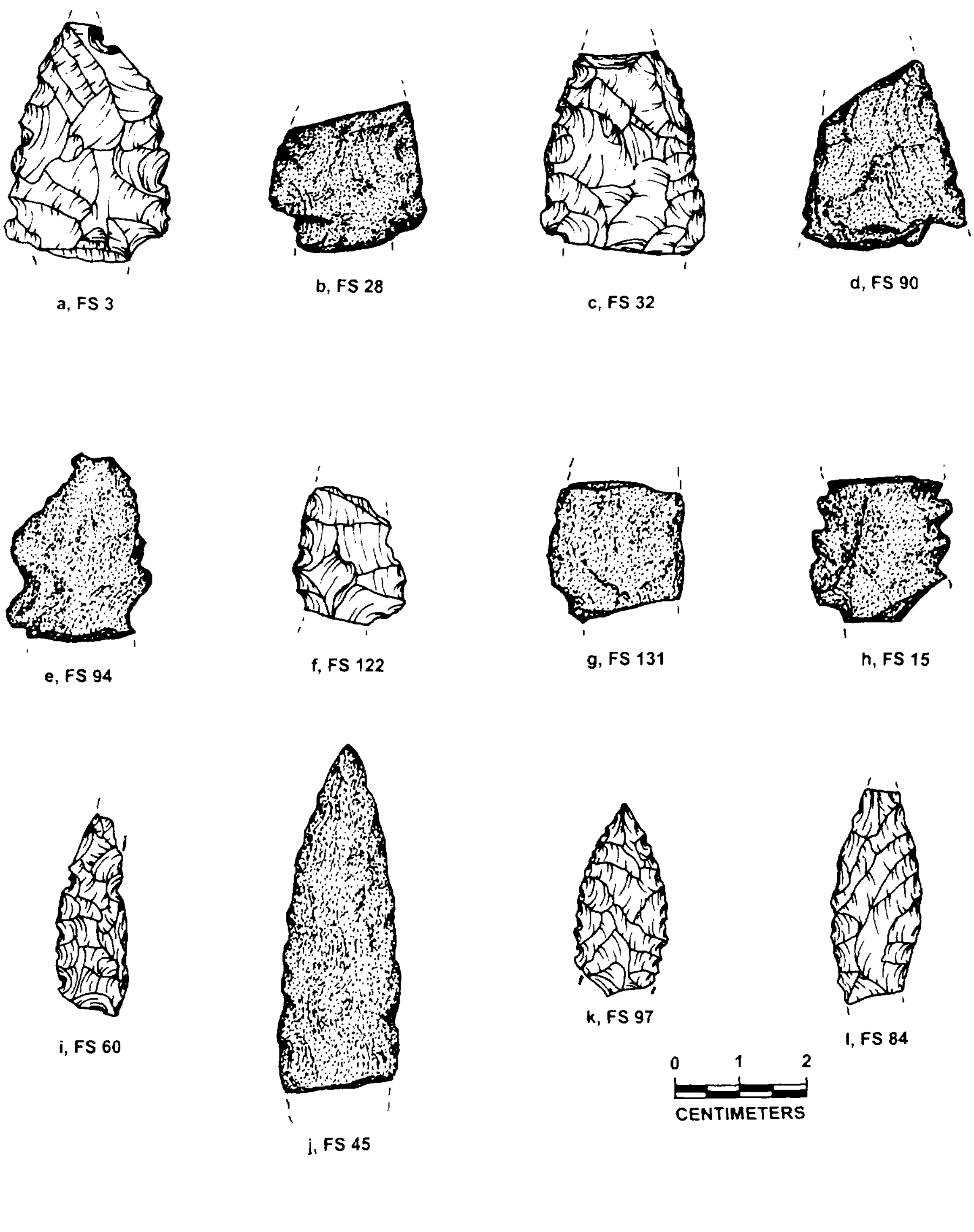


Figure 7.8. Unknown or untyped large projectile points.

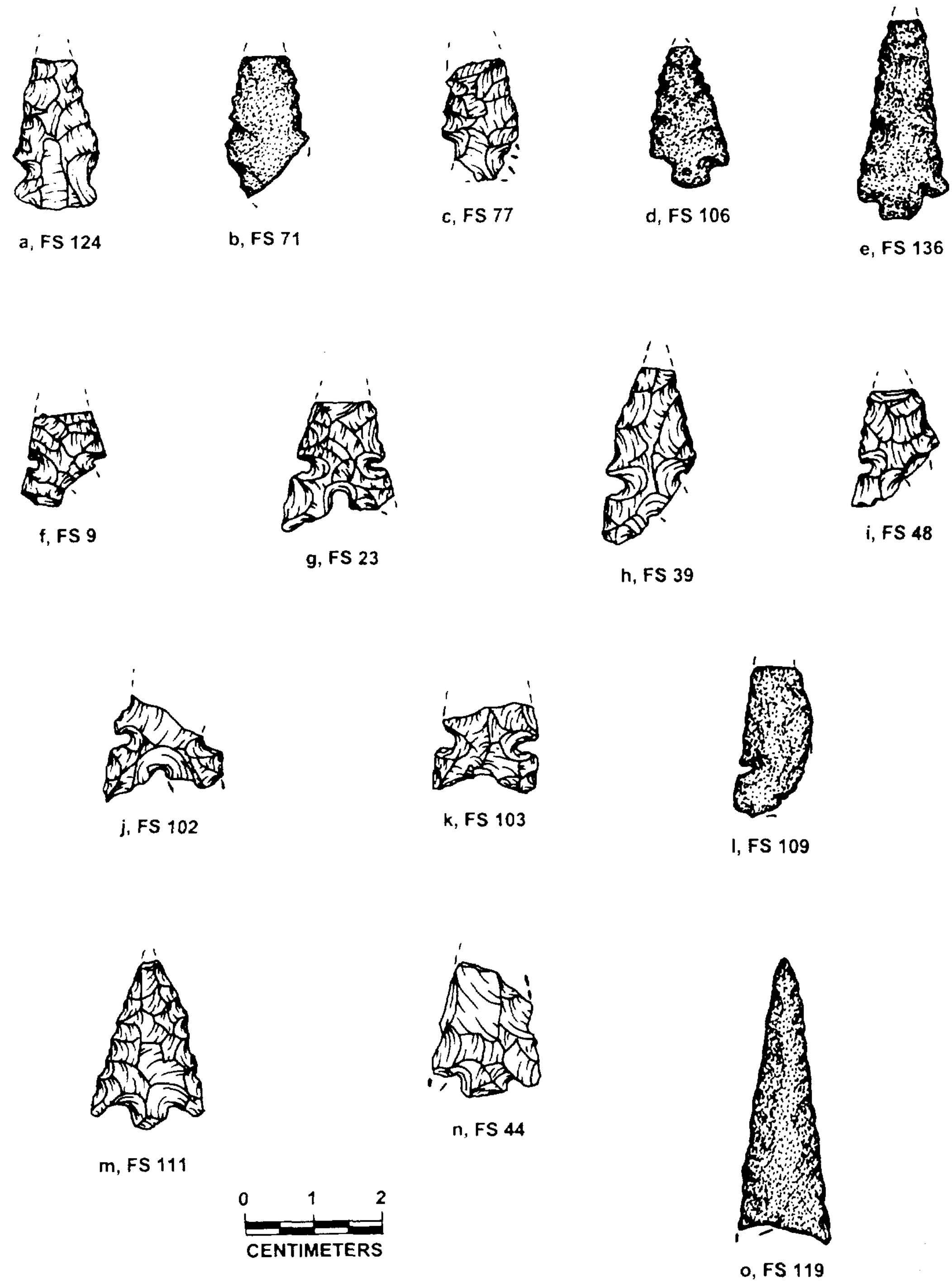


Figure 7.9. ***Late Prehistoric/Formative and Numic projectile points:*** **(a)** ***Rosegate Corner-notched,*** **(b-e)** ***Rosegate Stemmed,*** **(f-l)** ***Desert Side-notched,*** **(m-n)** ***Parowan Basal-notched, and*** **(o)** ***Bull Creek.***

documented point has a small, slightly contracting stem and pronounced tangs.

Rosegate Stemmed

Four Rosegate Stemmed points are present in the assemblage; all of these points exhibit either broken tips or bases (Figure 7.9b-e). The Rosegate Stemmed points are manufactured of chert and obsidian and have a PSA between 80° and 88° (μ =85°, σ =3.5°), a DSA between 154° and 198° (μ =179°, σ =19.4°), and an NOI between 50° and 63° (μ =58.3°, σ =7.2°). These fragmentary points have a mean weight of .9 g (σ =.14 g). Length and width measurements are not summarized for these fragmentary points, but thicknesses range between 2.7 and 3.3 mm (μ =3.1 mm, σ =.3 mm). Fifty percent (n=2) of the Rosegate Stemmed points are serrated.

Small Side-notched Points

Seven side-notched arrow points were collected during the Bryce Canyon AIS. These points are typed as Desert Side-notched points, a type that is commonly associated with Numic occupation in the region.

Desert Side-notched

Small triangular side-notched points with concave or notched bases are commonly classified as Desert Side-notched points (Holmer 1986; Holmer and Weder 1980; Irwin 2001; Thomas 1981). Thomas (1981) suggests these points have a PSA of 130°; Brown (Brown et al. 1993) suggests these points have a PSA greater than or equal to 130° and typically have a stem height greater than or equal to 8 mm.

Seven Desert Side-notched points were found in sites and isolated contexts at Bryce Canyon (Figure 7.9f-l). These points are manufactured from chert, chalcedony, and obsidian. All are broken, and their thickness ranges between 2.1 and 3.5 mm (μ =2.5 mm, σ =.45 mm). Desert Side-notched points have a PSA between 158° and 175° (μ =161.7°, σ =5.9°), a DSA between 178° and 190° (μ =185.8°, σ =4.9°), and an NOI between 20° and 29° (μ =23.6°, σ =3.6°). The base height of these points ranges between 6.5 and 10.2 mm, with a mean base height of 8 mm (σ =1.4 mm). One point exhibits a serrated blade.

Desert Side-notched points have been previously documented at Bryce Canyon at Sites 42GA905 and 42KA3289 (Dominguez and Danielson 2000; Dominguez et al. 1992; Hartley 1980a). The Desert Side-notched points collected during the survey are similar to the previously reported specimens, which have triangular forms, shallow side-notches, and a basal notch.

Other Small Projectile Points

Two of the arrow points are classified as Parowan Basal-notched points and one is classified as a Bull Creek point. The remaining small projectile points are unclassified or unknown point types. These points are described below.

Parowan Basal-notched

Two Parowan Basal-notched points were collected during the Bryce Canyon AIS. Parowan Basal-notched points are small triangular points with a narrow contracting stem formed by two shallow basal notches (Holmer 1986; Holmer and Weder 1980).

Both of the Parowan Basal-notched points are manufactured from chalcedony. One of the Parowan Basal-notched points (FS 111; Figure 7.9m) is complete and has serrated margins. This point weighs 1.6 g and measures 24 mm in length, 16 mm in width, and 4.2 mm in thickness. This item has a PSA of 79°, a DSA of 128°, and an NOI of 49°. The second point (FS 44; Figure 7.9n) has an incomplete length of 20 mm, an incomplete width of 16 mm, and is 3.3 mm thick. This point weighs 1.2 g and has a PSA of 83°, a DSA of 139°, and an NOI of 59°.

As noted above, a possible Parowan Basal-notched point has been previously found at Site

42GA3383, but it was typed as Rose Springs Corner-notched (Dominguez et al. 1992:Figure 10c). This previously documented point has a small, slightly contracting stem and pronounced tangs. It is morphologically similar to the examples of Parowan Basal-notched points collected during the survey.

Bull Creek

One projectile point, made of chert, is classified as a Bull Creek point (FS 119; Figure 7.9o). Bull Creek points are small triangular points with a pronounced concave base (Holmer and Weder 1980). Their length is generally at least twice their width, giving them an elongated triangular form.

This nearly complete point weighs 2.1 g and is 42 mm long, 15 mm wide, and 4.2 mm thick. A small break is present on one corner. This point exhibits the elongated triangular form and pronounced concave base typical of this type. This point is not serrated.

Dominguez and Danielson (1993) have previously documented a Bull Creek point from Site 42GA1904. It is similar to the Bull Creek point collected during the survey, with an elongated triangular form and a concave base.

Unclassified Small Side-notched Points

Four broken points are categorized as unclassified side-notched arrow points. These points are manufactured from chert and chalcedony. Three of these points lack serrations; one has a serrated blade. One (FS 35; Figure 7.10a) is a midsection fragment with an elongated triangular form, fine serrations, and a shallow (1 mm) side notch. Another (FS 78; Figure 7.10b) is triangular with shallow (1.1 mm) side notches and an expanding, concave base (PSA 139°). This tool's thick (4.8 mm) and roughly diamond-shaped cross-section suggests that it may be a drill rather than a projectile tip. The third point (FS 10; Figure 7.10c) is a small triangular point with a narrow (1.5 mm) horizontal side notch (PSA 166°, DSA 180°) and corner fractures that removed most of the base. This point is similar to the Desert Side-notched points in the survey collection, but the base fracture removed the diagnostic attributes that would indicate this type. Another of these points (FS 42; Figure 7.10d) is a midsection fragment with an irregular outline, a shallow (1.8 mm) side notch, and a PSA of 156°.

Unclassified Small Corner-notched Points

Seven points are categorized as unclassified small corner-notched points; all exhibit fractures that prevent accurate classification. These points are made of chert and chalcedony. Two of these points are well made and probably represent broken Rosegate Corner-notched points (Figure 7.10e-f). The remaining five have pronounced shoulder barbs that resemble the Parowan Basal-notched points in the survey collection (Figure 7.10g-k).

Unknown Small Points

Seven points, made of chert, chalcedony, and obsidian, are categorized as unknown arrow points (Figure 7.10l-r). All but one are midsection fragments that cannot be accurately typed. Only one of these points exhibits serration. The single complete unknown point (FS 4; Figure 7.10l) is triangular with an expanding concave base (PSA 122°) and shallow (2.1 mm), wide (6.0 mm) notches. This point weighs 1.2 g and is 26 mm long, 12 mm wide, and 3.7 mm thick. This point is similar to Elko Eared points, but its size suggests that it is an arrow point, possibly of the Eastgate Split Stem type.

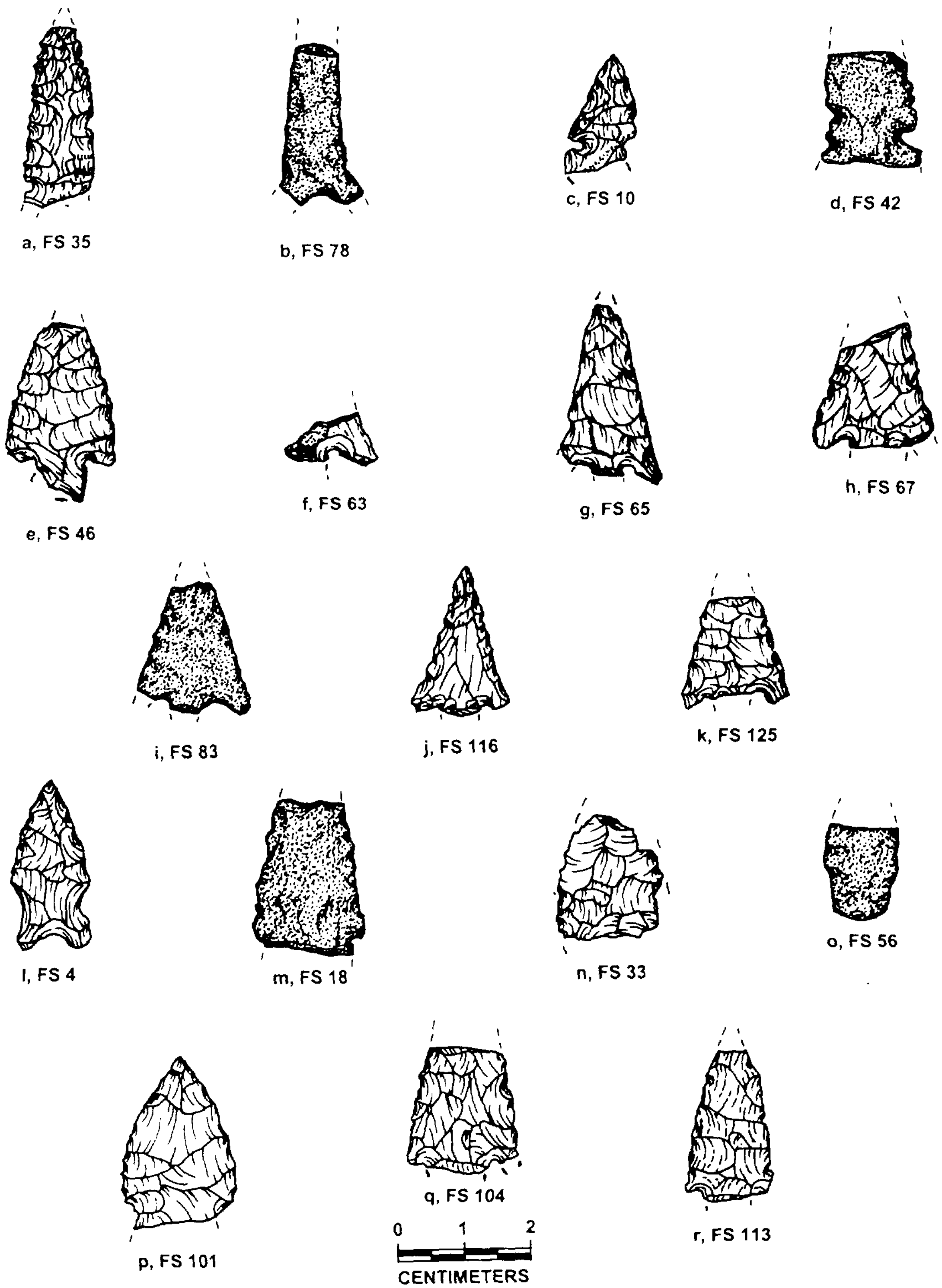


Figure 7.10. ***Unclassified or unknown small projectile points:*** **(a-d)** ***side-notched,*** **(e-k)** ***corner-notched, and*** **(l-r)** ***unknown.***

Chronology and Cultural Affiliation

The projectile points identified in the project area have been classified into regionally recognized types according to methods developed by Thomas (1981) and others (e.g., Brown et al. 1993; Holmer 1978, 1986) to establish a preliminary temporal framework for sites in the Bryce Canyon project area. Typologically, the projectile points represent a broad span of time from the late Paleoindian/early Archaic to protohistoric or historic periods (Table 7.1).

Projectile Point Types

The earliest use of the project area is indicated by two Great Basin Stemmed points, and possibly also by three unclassified stemmed point bases. The Great Basin Stemmed point in the survey collection is very similar to Lake Mojave and Silver Lake points of the Great Basin Western Pluvial Lake Tradition that dates between 8000 and 6000 B.C. (Holmer 1986). A previous study (Dominguez et al. 1992) also documented a Great Basin Stemmed point from an isolated context in the park. While these points are generally associated with a hunting and gathering tradition that utilized the shrinking lake shore environments of the Great Basin, these points may also be part of a hunting and gathering complex that focused on upland resources. Alternatively, a similar point that was classified as a Jay point has been documented at Natural Bridges National Monument in southeastern Utah (Irwin 2001). The Jay point is an early Archaic type belonging to the Oshara Tradition of the San Juan Basin that dates between 5500 and 4800 B.C. Jay points are morphologically similar to the Great Basin Stemmed point collected during the Bryce Canyon AIS, but the distribution of Jay points is generally not recognized to extend into south-central Utah.

Two points in the survey assemblage that are categorized as unclassified stemmed points exhibit basal and lateral grinding. These tools may represent Paleoindian point fragments. These point fragments appear to be broken lanceolate points that are similar to a possible Paleoindian lanceolate point base previously documented at Site 42GA1903 (Dominguez and Danielson 2000: Figure 13h). The Bryce Canyon points resemble Haskett, Agate Basin, or Hell Gap types (Frison 1978; Russell 1993). Haskett points have been documented in northern Utah in contexts that date between 8050 and 7900 B.C. (Russell 1993), while Agate Basin and Hell Gap points are found in Plains contexts that date roughly between 8500 and 8000 B.C. (Frison 1978).

Archaic projectile points suggest a continued use of the project area that peaked during the late Archaic period. Early Archaic use of the project area is suggested by five Pinto Shouldered points collected during the survey and six Pinto points from previous projects. Pinto Series points are found in regional contexts that date between 6300 and 4200 B.C. (Holmer 1978, 1986). Although the points collected during the Bryce Canyon AIS lack the pronounced bifurcated base that is typical of this type (Holmer 1978), they do bear similarities to the Pinto points from Hogup Cave illustrated by Aikens (1970:42) and Jennings (1978:Figure 51c, g), as well as to a specimen from Cedar Breaks National Monument (Canaday 2001) and a Pinto point documented in the park at Site 42GA1903 (Dominguez and Danielson 2000:Figure 13e). Five previous examples of Pinto points from Site 42GA1903 exhibit the bifurcated base that is more typical of this type. Two of the un-bifurcated survey points classified as Pinto Shouldered points (FS 12 and 17) exhibit basal grinding and flaking patterns suggestive of a possible Paleoindian derivation. Although these points bear some resemblance to late Paleoindian variants found on the Plains, such as Alberta-Cody Complex points (7850 to 7050 B.C.), the Bryce Canyon points have slightly expanding concave bases while Alberta-Cody Complex points have straight-sided stems with a straight base (Frison 1978). These two stemmed points also strongly resemble Archaic San Jose points of the eastern Colorado Plateau's Oshara Tradition (Agogino and Hester 1956; Bryan and Toulouse 1943; Irwin-Williams 1973; Mohr and Sample 1959; Moore 1982; Turnbow 1997). San Jose points date roughly between 3000 and 1800 B.C. (Irwin-Williams 1973). Some researchers

(Geib et al. 2001:196; Moore and Brown 2002) suggest that there is morphological overlap between stemmed Oshara Tradition points (i.e., San Jose) and Pinto points. In spite of the similarity between the two Bryce Canyon Pinto points and the Oshara Tradition types, it is unlikely that the Bryce Canyon points are affiliated with the Oshara Tradition. Although San Jose points have been documented in southeastern Utah east of the Colorado River (Mohr and Sample 1959), little evidence supports the use of south-central Utah by Oshara groups.

Middle Archaic occupation of the project area is indicated by Sudden Side-notched and Northern Side-notched points, a Humboldt point, a previously recorded Hawken point (Dominguez and Danielson 2000), and a possible Rocker Side-notched point. Sudden Side-notched points are found throughout southern and central Utah (Brown 1988; Irwin 2001; Jennings 1978; Schroedl 1976; Tipps 1988). Holmer (1986:104) indicates that Sudden Side-notched points date from approximately 4400 to 2400 B.C. and that Northern Side-notched points date from approximately 5200 to 2400 B.C. Sudden and Northern Side-notched points have not been previously documented at Bryce Canyon, but these points have been reported from neighboring regions such as the Kaiparowits Plateau (Geib et al. 2001). Humboldt points found in the region also suggest a potential middle Archaic date between 5650 to 4140 B.C., although in the central and western Great Basin they occur between 3050 and 1850 B.C. (Holmer 1978:67). Rocker Side-notched points were recovered along with Sudden Side-notched points in strata at Sudden Shelter dated between 4850 and 3350 B.C. (Holmer 1978:68). Schroedl (1976) indicates that Rocker Side-notched, Sudden Side-notched, and Hawken Side-notched points typify the Castle Valley phase of the northern Colorado Plateau Archaic (dating between 4250 and 2550 B.C.), but by approximately 3050 B.C. these point types decrease in frequency in favor of Humboldt Series and lanceolate point forms (Schroedl 1976:64). Previous researchers identified a Hawken Side-notched point at Site 42GA1903 (Dominguez and Danielson 2000) that dates to the middle Archaic period and is roughly contemporaneous with Sudden Side-notched points (Holmer 1986:104).

Late Archaic period occupation of the project area is indicated by a San Rafael Side-notched point and numerous Gatecliff Contracting Stem/Gypsum points. Schroedl (1976:66) indicates that San Rafael Side-notched points appear along with Gypsum points (i.e., Gatecliff Contracting Stem) during the early portion of the Green River phase (2550 to 1350 B.C.) of the Colorado Plateau Archaic period at Cowboy Cave. At Sudden Shelter, Sudden Side-notched points are replaced by San Rafael Side-notched points by 2400 B.C. (Holmer 1986:104), but regionally these points are found in contexts that date between 2600 and 400 B.C. (Holmer 1978). In central and southeastern Utah, San Rafael Side-notched points have been found at Sudden Shelter (Holmer 1978; Schroedl 1976), Natural Bridges National Monument (Irwin 2001), near Canyonlands (Tipps 1988), Ghost Rock (Brown 1988), and on the Kaiparowits Plateau (Geib et al. 2001). Canaday (2001:76) illustrates a Northern Side-notched point from nearby Cedar Breaks National Monument, although this point appears more typical of San Rafael Side-notched forms.

Gatecliff Series (Gypsum) points occur throughout the western Colorado Plateau and Great Basin, where they are indicative of late Archaic occupations dating between 3000 and 1300 B.C. in the Great Basin and 2500 B.C. and A.D. 500 on the western and northern Colorado Plateau (Brown 1988; Holmer 1986; Schroedl 1976; Thomas 1981). The Gypsum point style, subsumed by Thomas (1981), Holmer (1986), and Brown (1988) into the Gatecliff Series, occurs at Sudden Shelter and Cowboy Cave in well-dated late Archaic contexts (Holmer 1986; Schroedl 1976). Gypsum points are common throughout southwestern Utah and have been previously documented at sites (e.g., 42GA1903, 42GA1904, 42GA3383) and isolated surface contexts in Bryce Canyon National Park (Dominguez and Danielson 2000; Dominguez et al. 1992), at Cedar Breaks National Monument (Canaday 2001:70–71), and on the Kaiparowits Plateau (Geib et al. 2001).

Elko Series points constitute approximately one-quarter of the points collected during the survey. These types have also been previously documented at sites (e.g., 42GA905, 42GA1902, 42GA1903, 42GA3383, and 42KA3289) and isolated surface contexts in Bryce Canyon National Park (Dominguez and Danielson 2000; Dominguez et al. 1992), at Cedar Breaks National Monument (Canaday 2001:70–71), and on the Kaiparowits Plateau (Geib et al. 2001). Elko Series points are among the most plentiful and least diagnostic of point types, occurring across a broad area of the Colorado Plateau and Great Basin in contexts ranging in age from 6000 B.C. to A.D. 1000 (Holmer 1978, 1986). The 7,000-year duration of Elko Series points does not appear to be continuous, however, and Holmer's (1986:101) analysis indicates three periods of florescence punctuated by two hiatuses occurring between 4200 and 3000 B.C. and 1400 B.C. and A.D. 200. The earliest florescence corresponds to the early to middle Archaic period, dating to the period roughly between 6000 and 4200 B.C. During this florescence, Pinto points dominate the early part of the period while Elko Series points and Northern Side-notched points dominate the latter portion of the florescence. The second period of florescence corresponds to the period from 3000 to 1400 B.C. During this period, Elko Series points tend to occur along with Gatecliff Series points early in the period, but Elko Series points drop out of use during the later portion of the period. It is noteworthy that at Hogup and Cowboy Caves, Elko Eared points fell out of use by approximately 1400 B.C., suggesting this type may be a more reliable indicator of Archaic occupations than Elko Corner-notched and Side-notched types (Holmer 1986:102). The final period of florescence dates roughly between A.D. 200 and 1000 and corresponds to the Basketmaker II or early Formative period. During the earliest portion of this period, Elko Corner-notched points dominate, but later they co-occur with Rosegate Series points. Irwin (2001), Brown (Brown et al. 1993), and Geib (Geib 1996b; Geib et al. 2001) have discussed the morphological similarities between Basketmaker II projectile points and Elko Series points. The Elko Series encompasses the range of variability represented by the Basketmaker II point types, creating regional analytical and interpretive difficulties when assigning points to these types (e.g., Matson 1991; Morris and Burgh 1954). Geib (Geib et al. 1999:5.34) describes four possible specimens from the Kaiparowits Plateau that bear similarity to White Dog Basketmaker II points, but Geib notes that these points are not "unequivocal good candidates" for early agricultural-period points. Similarly, no points in the Bryce Canyon AIS collection are definite Basketmaker II forms; however, four of the points (FS 8, 47, 72, 89 [Figure 7.5a, g, l, and p]) approach the form of White Dog Basketmaker II points and are similar to those described by Geib (Geib et al. 2001). Considering the morphological overlap between Elko Series and Basketmaker II points, it is difficult to ascertain if the park was utilized by early agriculturalists, although this seem unlikely given the plateau's elevation. Given the difficulties in interpreting the temporal significance of Elko Series points, they are interpreted as a general Archaic period indicator at Bryce Canyon sites.

Based on this typological analysis, it appears that dart points dating from the late Paleoindian through the Archaic periods are affiliated with Great Basin-affiliated groups who used the upland plateaus of south-central Utah. Bryce Canyon National Park occupies a transitional area between the Great Basin and the American Southwest archeological culture areas, but it appears that early Native Americans from the desert Southwest did not range as far north or west as Bryce Canyon. In fact, little evidence of Archaic traditions belonging to the hunting and gathering people of the San Juan Basin has been documented anywhere in south-central or southeastern Utah (Canaday 2001; Geib et al. 1999, 2001; Irwin 2001). Early lifeways on the western Colorado Plateau had more in common with the Great Basin than the Southwest, despite the fact that this area is ecologically dissimilar to many other Great Basin settings (in that it lacks lacustrine marshes, etc., see Chapter 2).

A generalized late Prehistoric or Formative period occupation of the park is indicated by

Rosegate Corner-notched and Rosegate Stemmed points (and a possible Uintah Side-notched point [Dominguez et al. 1992]). Rosegate Series points generally date between A.D. 300 and 925 in the region (Holmer 1986). Although Rosegate Series points first appear in preceramic strata at Cowboy Cave, these points are generally considered a Fremont type in the western Colorado Plateau (Holmer and Weder 1980). However, small corner-notched and stemmed arrow points have also been documented at sites on the Kaiparowits Plateau that clearly have Puebloan ceramics (Geib et al. 1999:5.42). Stemmed arrow points similar to the Bryce Canyon Rosegate Stemmed points are also commonly found at Basketmaker III and Pueblo I sites throughout the Four Corners region (e.g., Brew 1946; Smiley 1995; Tipps 1988; Walling 1985), while later Pueblo II and Pueblo III sites contain a variety of point types including Rosegate Corner-notched, Bull Creek, and Parowan Basal-notched points.

Two Parowan Basal-notched points and five unclassified corner-notched arrow points that appear to be broken Parowan Basal-notched points indicate a late Formative period occupation of the park. Regionally, Parowan Basal-notched points are found at Formative period sites dating roughly from A.D. 900 to 1200 (Holmer 1986; Holmer and Weder 1980). A possible Parowan Basal-notched point was previously reported at Bryce Canyon (Site 42GA3383) but was typed as Rose Springs Corner-notched by Dominguez et al. (1992: Figure 10c). Other Parowan Basal-notched points are known from Cedar Breaks National Monument (Canaday 2001) and on the Kaiparowits Plateau (Geib et al. 2001). Holmer and Weder (1980:64) summarize the spatial distribution of Parowan points in the Fremont area and suggest that sites with these points can be divided into two groups based on ceramic associations. One group of sites includes the Virgin River, Santa Clara River, and Johnson Canyon areas of southwestern Utah. Sites in these areas contain high percentages of Virgin Anasazi ceramics (98 percent) along with small numbers of Kayenta and Mesa Verde Anasazi ceramics and Sevier Fremont ceramics. At these sites, Parowan points constitute 63 percent of the total arrow points and are found in temporal contexts that cluster between approximately A.D. 900 and 1200. The second group of sites is found slightly to the north, in the Parowan Valley, part of the Sevier River drainage, and part of southeastern Nevada. These sites contain predominantly Sevier Fremont ceramics with dates that cluster around A.D. 950 to 1150. Parowan points constitute 55 percent of the total arrow points at these sites. Fremont ceramics have not been documented in Bryce Canyon National Park. The presence of Virgin Anasazi ceramics in the study area suggests a Virgin Anasazi cultural affiliation for these Parowan Basal-notched points, with an A.D. 900 to 1200 date range.

One Bull Creek point was also found in the project area, and Dominguez and Danielson (1993) previously documented an incomplete Bull Creek point at Site 42GA1904. Holmer and Weder (1980:61) also summarize the distribution of these points and find that the spatial distribution of these points in the Fremont area is limited to the southeastern corner of Utah, but Bull Creek points extend south of the Colorado River into the Mesa Verde and Kayenta Anasazi areas. According to Holmer and Weder (1980:61), Bull Creek points have never been recovered from sites that have high percentages of both Fremont and Mesa Verde Anasazi ceramics. Bull Creek points are only present at sites that contain exclusively Kayenta/Mesa Verde or Kayenta/Fremont ceramic mixtures. Holmer and Weder (1980) indicate that Bull Creek points are consistently found in temporal contexts that fall between A.D. 1050 and 1300 and emphasize that these points are almost always associated with Kayenta ceramics. Geib (1996b:107) indicates that Bull Creek points found north and west of the Colorado River tend to be greater than 45 mm long, while those deriving from the Kayenta Anasazi region south and east of the Colorado River are generally less than 40 mm long. The length of the Bull Creek point (42 mm) collected during the Bryce Canyon AIS, along with the absence of Kayenta ceramics in the park, suggests that this point is probably affiliated with a western (Virgin) Anasazi rather than a Kayenta Anasazi occupation.

Finally, seven Desert Side-notched points were collected during the survey. Desert Side-notched points are indicative of late Prehistoric to protohistoric or historic period occupations dating roughly between A.D. 1200 and 1700. These points are generally associated with Numic groups in the Great Basin and southeastern Utah (Holmer 1986; Holmer and Weder 1980). These points have been previously documented at Bryce Canyon (Dominguez and Danielson 2000; Dominguez et al. 1992; Hartley 1980a), at Cedar Breaks National Monument (Canaday 2001), and on the Kaiparowits Plateau (Geib et al. 2001).

Patination

Patination of artifacts provides a potential secondary source of information that can be used for relative dating of stone tool assemblages. In the present analysis, the presence or absence of patination is recorded for each of the projectile points (Table 7.2). Approximately one-quarter of the points in the collection exhibit some degree of patination. With the exception of a small number of arrow points, patination is most common among the dart points. Three-quarters of the potentially early points in the collection (i.e., the Great Basin Stemmed and unclassified large stemmed points) exhibit patination, but approximately three-quarters of the other dart points lack patination. It is likely that this pattern of patination is the result of differing depositional and erosional contexts rather than strict temporal patterns. Additionally, the differential effects of wildfire on patination cannot be excluded. Geib et al. (1999:5.6) suggest that fires commonly turn high-quality silicates milky white in color, hampering an analyst's efforts to identify patinated artifacts. These factors suggest that the degree of patination of stone projectile points is of limited utility for evaluating temporal variability at sites in the project area.

Settlement and Subsistence

Projectile points also provide a source of information for examining Native American land-use patterns on the Paunsaugunt Plateau. Native American use of the park spans from the late Paleoindian/early Archaic through the historic periods, and diachronic changes in the distribution of sites and IOs with typed points may reveal temporal changes in the economic use of the resources on the plateau.

Raw Material Use

Stone artifacts are one of the primary sources of information available from the project area for evaluating prehistoric Native American resource and land use. Raw materials used in the manufacture of projectile points provide a key source of data for investigating prehistoric land and resource use (Table 7.3). Because the Paunsaugunt Plateau has few toolstone sources, most, if not all of the materials were imported. Determining the sources of stone materials can reveal information on the regions where the occupants of Bryce Canyon originated and the territory they may have exploited. The preceding typological section suggests that early in prehistory, groups from the neighboring Great Basin area utilized the plateau.

During analysis and encoding, 23 variants of stone were identified. These material types are combined into potential source-specific groups for this discussion. Based on an examination of comparative collections of raw materials and discussions with Chris Wenker (personal communication to Irwin, 2002), these 23 variants are grouped into eight categories.

Table 7.2. ***Patination on projectile points.***

Projectile Point Type	Degree of Patination: None	Minimal	Moderate	Heavy	Total
Great Basin Stemmed	–	–	1* 100.0†	–	1 .8‡
Humboldt	1 100.0	–	–	–	1 .8
Elko Corner-notched	16 84.2	1 5.3	–	2 10.5	19 15.4
Elko Eared	10 76.9		2 15.4	1 7.7	13 10.6
Elko Side-notched	–	–	–	1 100.0	1 .8
Pinto Shouldered	1 20.0	–	–	4 80.0	5 4.1
Gypsum	12 75.0	2 12.5	1 6.3	1 6.3	16 13.0
Sudden Side-notched	2 100.0	–	–	–	2 1.6
Northern Side-notched	1 100.0	–	–	–	1 .8
San Rafael Side-notched	1 100.0	–	–	–	1 .8
Unclassified Corner-notched, Dart	6 50.0	3 25.0	2 16.7	1 8.3	12 9.8
Unclassified Side-notched, Dart	3 75.0	1 25.0	–	–	4 3.3
Unclassified Stemmed, Dart	1 50.0	1 50.0	–	–	2 1.6
Unclassified, Dart	9 75.0	–	1 8.3	2 16.7	12 9.8
Rosegate Corner-notched	1 100.0	–	–	–	1 .8
Rosegate Stemmed	4 100.0	–	–	–	4 3.3
Parowan Basal-notched	2 100.0	–	–	–	2 1.6
Bull Creek	1 100.0	–	–	–	1 .8
Desert Side-notched	7 100.0	–	–	–	7 5.7
Unclassified Corner-notched, Arrow	6 85.7	1 14.3	–	–	7 5.7
Unclassified Side-notched, Arrow	4 100.0	–	–	–	4 3.3
Unclassified, Arrow	4 57.1	3 42.9	–	–	7 5.7
Total	92 74.8	12 9.8	7 5.7	12 9.8	123 100.0

* Count.
† Row Percentage.
‡ Column Percentage.

Table 7.3. Lithic raw materials of projectile points.

Projectile Point Type	Raw Material								Total
	Brian Head Chert	Brian Head Chalcedony	Other Chert	Jasper	Quartzite	Obsidian*	Siltstone	Petrified Wood	
Elko Corner-notched	10†	2	3	2	–	2	–	–	19
	52.6‡	10.5	15.8	10.5		10.5			15.4∞
Elko Eared	9	–	3	1	–	–	–	–	13
	69.2		23.1	7.7					10.6
Elko Side-notched	1	–	–	–	–	–	–	–	1
	100.0								.8
Gypsum	8	2	3	3	–	–	–	–	16
	50.0	12.5	18.8	18.8					13.0
Pinto Shouldered	2	2	–	–	–	–	1	–	5
	40.0	40.0					20.0		4.1
Sudden Side-notched	–	–	2	–	–	–	–	–	2
			100.0						1.6
San Rafael Side-notched	1	–	–	–	–	–	–	–	1
	100.0								.8
Unclassified Corner-notched, Dart	8	2	–	–	–	2	–	–	12
	66.6	16.6				16.6			9.8
Unclassified Side-notched, Dart	2	–	–	–	–	2	–	–	4
	50.0					50.0			3.3
Unclassified Stemmed, Dart	–	–	–	–	1	1	–	–	2
					50.0	50.0			1.6
Unclassified, Dart	6	1	1	1	–	3	–	–	12
	50.0	8.3	8.3	8.3		25.0			9.8
Northern Side-notched	1	–	–	–	–	–	–	–	1
	100.0								.8
Desert Side-notched	3	2	–	–	–	2	–	–	7
	42.9	28.6				28.6			5.7
Rosegate Corner-notched	–	–	–	–	–	–	–	1	1
								100.0	.8
Rosegate Stemmed	3	–	–	–	–	1	–	–	4
	75.0					25.0			3.3
Parowan Basal-notched	–	2	–	–	–	–	–	–	2
		100.0							1.6
Unclassified Corner-notched, Arrow	3	2	1	1	–	–	–	–	7
	42.8	28.6	14.3	14.3					5.7
Unclassified Side-notched, Arrow	2	1	1	–	–	–	–	–	4
	50.0	25.0	25.0						3.3
Unclassified, Arrow	2	2	1	–	–	2	–	–	7
	28.6	28.6	14.3			28.6			5.7
Bull Creek	1	–	–	–	–	–	–	–	1
	100.0								.8
Great Basin Stemmed	1	–	–	–	–	–	–	–	1
	100.0								.8
Humboldt	1	–	–	–	–	–	–	–	1
	100.0								.8
Total	64	18	15	8	1	15	1	1	123
	52.0	14.6	12.2	6.5	.8	12.2	.8	.8	100.0

* Obsidian category includes one item that may be ignimbrite (FS 82).

† Count.

‡ Row Percentage.

∞ Column Percentage

Table 7.3 illustrates that the principal raw material used for the manufacture of points is chert, specifically Brian Head chert. Brian Head chert constitutes approximately 64 percent of the assemblage, while Brian Head chalcedony (a transparent variant of the chert) constitutes roughly 15 percent. Brian Head chert occurs naturally in a widespread distribution in south-central Utah, although this formation does not occur within Bryce Canyon National Park itself. Brian Head chert encompasses a wide range of variability from transparent to opaque, from vuggy to homogenous, and from lustrous and cryptocrystalline to somewhat coarse and microcrystalline. It includes clear, white, pink, red, yellow, black, tan, brown, and gray-blue colors. Although Brian Head chert is not naturally available within the park, probable sources are reported from as close as 10 km (6 mi), near Flake Mountain to the northwest (Dominguez and Danielson 2000:41). Other sources of this material are known from Casto Canyon and the terraces of the Sevier River, approximately 24 km (15 mi) from the park to the north and west, and 48–64 km (30-40 mi) west at Panguitch Lake and Cedar Breaks National Monument. Materials classified as "Other chert" constitute 12 percent of the assemblage. This "Other chert" category includes tan, gray, and other colors of chert that may derive from the Brian Head formation or from other unidentified sources.

Obsidian constitutes approximately 12 percent of the assemblage. The X-ray fluorescence (XRF) analysis of 15 obsidian points (Appendix 7.3) provides source-specific information for these materials. The XRF analysis reveals that all but two of the obsidian artifacts derive from Wild Horse Canyon in the Mineral Mountains, which lie approximately 112 km (70 mi) northwest of Bryce Canyon National Park. One item was sourced to Panaca Summit, located roughly 192 km (119 mi) to the west in Nevada. One specimen included in the obsidian XRF analysis could not be correlated with a known source. It is possible that this unsourced specimen is actually ignimbrite from one of the regional Brian Head outcrops (Doelling 1975). Although there is a known obsidian source 104 km (65 mi) to the north along the Sevier River valley near Marysvale (Chronic 1990), there is no evidence that prehistoric groups from Bryce Canyon utilized the Marysvale source. Instead, obsidian was brought in from two distant sources to the west and northwest, suggesting the occupants of the Paunsaugunt Plateau ranged far to the west into Nevada, or at least interacted with groups living in the eastern Great Basin.

Jasper is another material that is represented in the assemblage. Jasper constitutes 6.5 percent of the collection; all of the specimens are Archaic or undated dart points. Although the source for this material is unknown, it is probable this material derives from nearby locations east or west of the park. A variety known as Boulder jasper is reported from the Escalante River drainage to the east (Geib et al. 2001) and Zion jasper derives from the area south of Zion National Park to the west (Matt Betenson, Zion National Park, personal communication to Chris Wenker, 2002).

Quartzite constitutes only .8 percent of the projectile point materials, with only one fine-grained orange-and-white specimen noted. Coarse quartzite can be found within the park, but the appearance and quality of the single projectile point indicates that it is not made of locally available material. Marion Jacklin of the Dixie National Forest reports that a fine-grained quartzite source is present to the south near Kanab, Utah (Chris Wenker, personal communication to Irwin, 2002), but it is not currently possible to confidently identify the material source for this specimen.

Finally, one gray siltstone and one petrified wood specimen are noted in the assemblage. The sources of these materials are not known, but they probably derive from the myriad sedimentary beds that outcrop near the park.

Patterns of raw material use support the directionality of regional cultural influences indicated by the projectile point typology. The projectile point typology indicates that groups from the Great Basin used the Paunsaugunt Plateau. Likewise, raw material source data suggest that there is a strong reliance on a resource catchment area to the north and west, extending many miles to the obsidian sources in the eastern Great Basin.

Resource and Land Use

The distribution of projectile points also provides a primary source of data for investigating land and resource use at Bryce Canyon National Park. Through an examination of the distribution of projectile points that are representative of different time periods, synchronic and diachronic patterns of land use may be elicited.

The earliest human use of the area, which occurred during the late Paleoindian or early Archaic period, is indicated by the Great Basin Stemmed point found at a site (42GA1903) along the East Creek headwaters. Additionally, potential late Paleoindian points, categorized as unclassified stemmed points, were found at sites in the vicinity of Rainbow Point (n=1 site) and at the southern end of Whiteman Bench (n=1 site). Previous researchers have documented a Great Basin Stemmed point from an isolated context near a spring on the eastern flank of Whiteman Bench (Dominguez and Kramer 1988:Figure 2a; Dominguez et al. 1992:Table 9, Figure 16f), in an area now known to contain abundant Native American sites of many time periods. Another possible late Paleoindian lanceolate point is also previously documented from Site 42GA1903 (Dominguez and Danielson 2000). This distributional pattern suggests that the primary focus of the late Paleoindian occupations may have been the upland meadows. Resources such as large game (and possible marshes) would have been present in these settings, as well as easy access to transportation corridors leading to lower-elevation zones.

Early Archaic period use of the park is indicated by 11 Pinto Shouldered points from six sites. Pinto points are found at sites scattered throughout East Creek Meadow and along the East Creek headwaters (n=4 sites, one site alone contained six points). Other sites lie at the southern end and eastern edge of Whiteman Bench (n=2). These locations collectively suggest a potential upland hunting focus with camps established near prominent drainages that provided water, meadow environments, and access to transportation corridors leading to lower-elevation zones.

Middle Archaic period points from Bryce Canyon suggest a low intensity use of the park area. The middle Archaic occupation is indicated by several Sudden Side-notched, Northern side-notched, Hawken Side-notched, and Humboldt points. All of the side-notched points are found at two sites: one in the East Creek headwaters and one along Podunk Creek. The isolated Humboldt point was found in a low-elevation plateau-top setting in the northern end of the project area. This distribution suggests a low-level use of the park area during the middle Archaic period, with a continued focus on upland drainages with water, transportation routes, and meadow resources.

Late Archaic use of the Paunsaugunt Plateau increased from the proceeding periods. Gatecliff Contracting Stem/Gypsum and San Rafael Side-notched points are found at a greater number of sites and isolated contexts. Late Archaic sites are found on top of Whiteman Bench (n=3), in the East Creek drainage (n=2), and along the Pink Cliffs south of Fairyland Canyon (n=1). The late Archaic range is further expanded into upland settings by the presence of isolated points in the Rainbow Point area. Increased use of the park upland areas for hunting is suggested by the widespread distribution of points, but the strong late Archaic presence along East Creek suggests that water and meadow resources continued to be important. Further study of the associated tools and flaking debris at sites of this age may help resolve the site functions in this settlement system (Chapter 8).

Interpreting the implications of the distribution of Elko Series points is problematic, and additional chronometric data are required to fill in the Archaic period settlement pattern. Elko Corner-notched points and the sole Elko Side-notched point are found in a variety of contexts including upland and meadow settings. Elko Corner-notched points are found at sites at Yovimpa Pass (n=2), on an upland ridge overlooking Podunk Creek (n=1), on Whiteman Bench (n=3), along the East Creek headwaters (n=3), and in low-elevation settings at the northern end of the park (n=3). Elko Eared points may be more reliable indicators of Archaic occupations than the corner or side-notched varieties, but they also fail to provide sufficient temporal resolution for placing sites in specific Archaic periods (e.g. Holmer 1986). Elko Eared points are found at sites on top of Whiteman Bench (n=3), at Yovimpa Pass (n=1), in the East Creek drainage (n=1), and near Bryce Point (n=1). This broadly distributed pattern of land use is reinforced when the Elko points recorded in isolated contexts are considered. The distribution of Elko Series points suggests a focus on upland hunting with a secondary emphasis on access to drainage transportation routes and potentially the use of upland meadow resources. This pattern is most similar to late Archaic period use of the park, but unfortunately, these points provide little temporal resolution and only indicate a generalized pattern of broad spectrum use by Archaic hunting and gathering groups.

Late Prehistoric/Formative period use of the park is widespread. Use of the area during this period is indicated by Rosegate Series, Bull Creek, Parowan Basal-notched, and possible Uintah Side-notched points, as well as a variety of unclassified arrow points. These points are found at sites near Yovimpa Pass (n=1), on Whiteman Bench (n=1), and in the East Creek drainage (n=3), but many of these sites are clustered in low-elevation settings at the northern end of the park (n=4). In general, a low-elevation plateau-top hunting focus is implied by the distribution of these points, although a secondary focus on the use of meadow resources in the East Creek drainage is also implied.

The distribution of Desert Side-notched points, indicative of Numic occupation, suggests an upland hunting focus with a secondary focus oriented toward the exploitation of meadows, water sources, and transportation corridors. These points are found at sites near Yovimpa Pass (n=1), high on Whiteman Bench (n=1), in the East Creek drainage (n=1), and in northern, low-elevation plateau-top settings (n=2). When isolated points are considered, the low-elevation hunting pattern is strengthened and expanded to include the hills around the Bryce Canyon Lodge, on East Creek Ridge, and near Bridge Canyon.

Discussion: Settlement and Subsistence

The distributional patterns described above indicate that the principal focus of prehistoric groups using the Bryce Canyon area was the exploitation of montane resources, presumably large game species such as ungulates. This focus may partially explain the high percentage of serrated points (approximately 30 percent) present in the survey assemblage. Approximately 33 percent of the dart points and 20 percent of the arrow points have serrated edges. Serrations may help the points lodge when they strike large game, they may facilitate bleeding, or they may indicate multifunction points that were also used to dress and process carcasses from large game.

A long history of use is also represented at sites in the East Creek drainage and near other intermittent waterways in the park's meadows. It is possible that the riverine or meadow areas may have contained marshy environments and available water. These factors would have made the meadows of East Creek a prime occupation area and transportation corridor for prehistoric occupants.

The earliest use of the park appears to have concentrated along East Creek and other areas with access to transportation corridors to lower-elevation settings, while the following occupations are principally, though not exclusively, oriented toward upland settings. It is clear, though, that the sites in the East Creek drainage were used repeatedly, spanning the time from the late Paleoindian/early Archaic to the protohistoric or historic periods. Middle Archaic use of Bryce Canyon is sparse and primarily focused on upland drainages with water, transportation routes, and meadow resources. Late Archaic settlement and subsistence reflects an intensified use of the park area and an increasingly diverse economy based on upland hunting in addition to the exploitation of meadows and use of transportation corridors. Late Archaic points are four times as common as middle Archaic points. The number of points found across Whiteman Bench, at Rainbow Point, and in the northern portion of the park suggests that the late Archaic occupants' range expanded greatly over the preceding periods.

The late Prehistoric/Formative period also witnessed widespread use of the park in a diverse range of settings. While the upland drainage settings continued to be of importance to the late Prehistoric/Formative land-use system, use of low-elevation plateau-top settings became more important for hunting during this period. This is suggested by the distribution of late Prehistoric/ Formative sites and isolates that appear to be clustered in low-elevation settings at the northern end of the park. Late Prehistoric/Formative point types as a group are fairly numerous, but if the points are divided into early and middle/late types, early-period components may be distinguished by the presence of Rosegate Series points and middle/late components are indicated by Parowan and Bull Creek points. When considered in this light, it is apparent that the late Prehistoric/Formative period use of the park decreased from the preceding late Archaic period. However, throughout the entire late Prehistoric/Formative period, this low-intensity use of the park appears to have remained constant.

Finally, the protohistoric/historic period Numic occupation exhibits a similar focus as the preceding period, though the frequency of sites with Desert Side-notched points is lower than in the preceding period. These points are found on Whiteman Bench and in low-elevation settings in the northern areas of the park, suggesting a widespread, but low-intensity use of the entire plateau. Desert Side-notched points are also found along East Creek, reinforcing the continued use of this area.

Summary

This analysis of 123 projectile points from sites and isolated contexts in Bryce Canyon National Park has contributed to our understanding of aspects of cultural affiliation, chronology, settlement, and subsistence. The temporal analysis of projectile points in the project area indicates a greater time depth of human use than was previously reported for the Bryce Canyon area. Great Basin Stemmed and other potential late Paleoindian points (categorized as unclassified stemmed points) suggest that human use of the plateau may have been initiated during the late Paleoindian period. Early Archaic use of the area is suggested by the presence of Pinto points and possible Pinto variants. Clearly, additional regional research is needed to understand the range of variability for early stemmed dart point morphology and to improve the existing typologies available to researchers working in southern Utah. Middle Archaic period components are few, but are indicated by Sudden Side-notched, Northern Side-notched, and Humboldt point types. Late Archaic points are well represented. Late Archaic points are primarily Gatecliff Contracting Stem/Gypsum style points, but one San Rafael Side-notched point is also present in the survey assemblage. Late Prehistoric/Formative points include Rosegate Corner-notched and Stemmed varieties, Parowan Basal-notched, and a Bull Creek point. Finally, Desert Side-notched points, indicative of late Prehistoric or protohistoric/historic period use of the area, are well-represented.

The late Paleoindian use of the area appears to have focused on exploitation of upland drainage areas with access to meadow resources, water, and transportation corridors. Archaic projectile point styles suggest a continued use of the project area through the early, middle, and late Archaic periods. Although early and middle Archaic use of the area remained low and showed a similar focus on access to upland drainages, a marked increase in the number of late Archaic sites and isolates indicates a broadening use of the resources across the plateau. Late Archaic points are found in more diverse settings, indicating an increased emphasis on upland hunting in addition to the drainage-focused pattern of the preceding periods. Late Prehistoric/Formative use of the plateau appears to have continued this pattern of generalized land use, but there was an increased emphasis on hunting in low-elevation plateau-top settings. Finally, the Numic occupation followed similar land-use patterns as the preceding period, but this occupation appears to have been less intensive.

8

Native American Archeology on the Paunsaugunt Plateau

Chris T. Wenker

The preceding chapter by Donald Irwin presents a temporal assessment of projectile points collected from sites recorded during the Bryce Canyon AIS project. Using this information, in conjunction with previously reported projectile points from the park, Irwin outlines the time depth of the park's occupation that is suggested by these temporally diagnostic tools. This chapter builds on Irwin's temporal assessment by incorporating other lines of evidence from ceramic analysis, feature descriptions, and radiocarbon data (available from Dominguez and Danielson's [2000] test excavations) to assign the recorded sites and site components to their probable period or periods of occupation. The range of artifact and feature types is outlined at a general level, technological aspects of artifact assemblages are considered, and the site-assemblage characteristics are then evaluated to place all sites in a functional typology. These observations are then used to reconstruct the patterns of land use during different time periods. Comparisons with diachronic patterns of occupational intensity and land use in surrounding areas are also presented to set this portrayal of past lifeways on the Paunsaugunt Plateau in a regional context.

This chapter generally pursues interpretive avenues suggested in the project's research design (Chapter 5), although no formal, testable model has been developed. Rather, these analytical sections investigate project data through exploratory data analysis (e.g., Hartwig and Dearing 1979), meaning that the project data are manipulated with various computer programs and the significance of interesting patterns is evaluated. The interpretations of selected data patterns and the integration of the inventory data with other regional survey results, are presented below.

Periods of Native American Occupation and Residential Intensity

Ninety-eight archeological sites recorded during the inventory project contain Native American components. Two of these sites are multicomponent sites, each containing two identifiable Native American components, producing an overall total of 100 components. Many of the other sites contain temporally diagnostic material also suggestive of multiple occupation periods, but because the presumed occupations could not be spatially segregated, these sites were not recorded as multicomponent sites in the field. Instead, in the following discussion these sites are referred to as "multioccupation" sites. As with multicomponent sites, the multioccupation sites are distinguished from the truly single-component sites, which are those that show no sign of more than one occupation. Single-component sites are interpreted as locations that were only occupied once or that were occupied repeatedly but during only a single time period.

Of the 98 sites included in this analysis, 19 were previously recorded, surface collected, or test excavated. Two sites lie outside the project area proper (one was re-recorded and one was newly recorded during the inventory). These two sites are included in the sample because updated, reliable data are available. No current, usable information exists for the other previously known sites outside the project area that were not re-recorded during the inventory (n=23, see Table 4.2 and Figure 4.2), and these sites are not considered further in this discussion. All of the type assignments for projectile points that were not collected and analyzed during the inventory rely on previous determinations or descriptions by Dominguez and Danielson (2000), Dominguez et al. (1992), and Hartley (1980a). Using the range of available information, the following section outlines the time periods during which the park's sites were occupied and explores the trends in apparent occupational intensity (a relative measure of the duration and frequency of human habitation or use).

When projectile points are used as markers of temporal periods, point types that are associated with chronometrically dated deposits or features that provide a discrete range of dates provide the best resolution. In Chapter 7, Irwin notes that some named Great Basin and Colorado Plateau projectile point types are useful for this purpose and some are not. To make the best use of the data available from this survey and previous park projects, this chapter will consider as many projectile points as possible when estimating periods of site occupancy. This approach will require several assumptions, the primary of which is a distinction between arrow and dart points (following the criteria outlined in Chapter 7). Dart points, being larger (>25 mm in length), are associated with the use of the atlatl, which is commonly regarded as a marker of an Archaic lifeway. Arrow points are those smaller (<25 mm long) projectile tips associated with the post-Archaic use of the bow and arrow. The following discussion will use the presence of otherwise unidentified or unknown points in these size categories to assign sites to generalized Archaic or post-Archaic time periods. Irwin (Chapter 7) also discusses the inutility of most Elko Series points as discrete temporal markers, but for the purposes of the following discussion, Elko points will be used as generalized Archaic period markers.

Overall, 49 sites have yielded one or more varieties of data usable for dating their period or periods of occupation (Table 8.1). Forty-one sites contain projectile points that can be assigned to a temporally diagnostic type or to a dart/arrow category, as defined above. Furthermore, seven sites, all recorded during the inventory, contain ceramic artifacts. Three of the ceramic-bearing sites also contain projectile points, which in some cases confirm a ceramic-period age for the site but in some cases demonstrate that the site witnessed multiple occupations. Four of the project sites also contain temporally diagnostic Native American features in the form of bark-stripped pine trees with steel axe marks, indicating a protohistoric or historic period use. Finally, Dominguez and Danielson (2000) also present radiocarbon dates for seven sites in the project area. Although none of the dated carbon samples were recovered from cultural deposits, the samples were interpreted to date forest-fire events that were depositionally related to the periods of site occupation. In most cases, the chronometric dates match well with recovered projectile point styles, but two of the radiocarbon-dated sites contain no other temporally diagnostic cultural material.

Table 8.1. ***Dated Native American archeological sites.***

Site	Time Period									Site Area (m^2)
	Late Paleoindian/ Early Archaic	Early Archaic	Middle Archaic	Late Archaic	General Archaic	All Archaic	Late Prehistoric/ Formative	Puebloan	Paiute	
42GA1896	–	–	–	–	X	X	–	–	–	4,759
42GA1899	–	–	–	–	X	X	X	–	–	5,640
42GA1901	–	–	–	–	X	X	X	–	–	1,600
42GA1902	–	–	–	X	X	X	–	–	–	1,769
42GA1903	X	X	X	X	X	X	X	–	–	30,402
42GA1904	–	–	–	X	X	X	X	–	X	21,704
42GA2634	–	–	–	–	–	–	–	–	X	1,306
42GA3383	–	–	–	X	X	X	X	–	–	3,645
42GA3387	–	–	–	–	–	–	–	–	X	861
42GA3388	–	–	–	X	–	X	–	–	–	4,199
42GA3488	–	–	–	–	–	–	–	–	X	308
42GA3558	–	–	–	–	X	X	–	–	–	420
42GA3559	–	–	–	–	X	X	–	–	–	250
32GA3560	–	–	–	–	–	–	X	–	–	14,746
32GA3561	–	–	–	–	X	X	–	–	–	9,400
42GA5177	–	X	–	–	–	X	–	–	–	367
42GA5182	–	X	–	–	–	X	–	–	–	1,323
42GA5190	–	X	–	–	X	X	–	–	–	3,444
42GA5192	–	–	–	–	–	–	–	–	X	623
42GA5193	–	–	–	–	–	–	X	–	–	547
42GA5200	–	–	–	–	X	X	–	–	–	1,348
42GA5201	–	–	–	–	X	X	–	–	X	5,432
42GA5202	–	–	–	–	–	–	X	–	–	1,011
42GA5203	–	–	–	–	–	–	X	–	–	786
42GA5205	–	–	–	–	–	–	X	–	–	3,434
42GA5209	–	–	–	–	X	X	–	–	–	373
42GA5210	–	–	–	X	–	X	–	–	–	758
42GA5213	–	–	–	X	X	X	–	–	–	1,543

Table 8.1 ***(continued)***

Site	Late Paleoindian/ Early Archaic	Early Archaic	Middle Archaic	Late Archaic	General Archaic	All Archaic	Late Prehistoric/ Formative	Puebloan	Paiute	Site Area (m^2)
	Time Period									
42GA5215	–	–	–	–	X	X	X	–	–	2,457
42GA5218	X	–	–	–	X	X	–	–	–	1,699
42GA5223	–	–	–	–	X	X	–	–	–	5
42GA5235	–	–	–	–	X	X	–	–	–	554
42GA5237	–	X	–	–	X	X	–	–	–	2,128
42GA5240	–	X	–	–	–	X	X	–	–	1,361
42GA5242	–	–	–	–	X	X	–	–	X	71,581* 39,375†
42GA5244	–	–	–	–	–	–	–	X	–	1,180
42GA5245	–	–	–	–	–	–	–	–	X	1,227
42GA5262	–	–	–	–	–	–	–	–	X	858
42GA5278	–	–	–	–	–	–	–	X	–	80
42GA5281	–	–	–	–	–	–	–	–	X	2
42GA5284	–	–	–	–	X	X	–	–	–	120
42KA1989	–	–	–	–	–	–	X	–	–	400
42KA3284	X	–	–	X	–	X	–	–	–	272
42KA3288	–	–	–	–	X	X	–	X	–	936
42KA3289	–	–	–	–	X	X	–	–	X	320
42KA5756	–	–	–	–	–	–	X	–	–	9
42KA5773	–	–	–	–	X	X	–	–	–	294
42KA5798	–	–	X	–	–	X	–	–	–	4,050
42KA5813	–	–	–	–	X	X	–	–	–	392

* Area of lithic scatter component.
† Area of bark-stripped tree component.

Archaic Period Occupation

Sites containing Archaic period material significantly outnumber all other datable sites (Table 8.1; Figure 8.1). Thirty-three sites contain Archaic-style projectile points, although only 15 of these sites can be attributed to the early, middle, or late Archaic periods. Three of these sites have also yielded radiocarbon dates that correspond with their projectile point styles. The remaining 18 sites are assigned to the general Archaic period based on the presence of Elko Series points or large untyped dart points.

Twenty-two of these sites contain only Archaic material; the remaining 11 also possess artifacts or radiocarbon samples indicative of a post-Archaic occupation. Of the 15 sites for which occupation during either the early, middle, or late Archaic period can be determined, 13 represent single-period sites and 2 represent multiple Archaic period occupations. One single-period site dates to the late Paleoindian/early Archaic period transition, five date to the early Archaic period, one dates to the middle Archaic period, and six date to the late Archaic period. Of the multioccupation sites, one contains materials from all Archaic periods, from the Paleoindian/early Archaic period transition to the late Archaic period (as well as late Prehistoric/Formative material, see below). The other multi-occupation site contains a Paleoindian/early Archaic period point and a late Archaic period point.

Late Paleoindian/Early Archaic Period Sites

Three sites recorded during the project and one previously recorded IO (Dominguez et al. 1992) document the use of the park during this early period. The higher frequency of strictly early Archaic period material, discussed below, suggests that these Paleoindian-style stemmed points may actually represent use during the early Archaic period rather than during the late Paleoindian period. At two of these sites, a fragment of a large, untyped stemmed projectile point with basal grinding was found among other generalized dart points. The assignment of these sites to the Paleoindian period is provisional. The third site contains a Great Basin Stemmed point, a certain marker of this time period (Beck and Jones 1997). This site (42GA1903, located at the head of East Creek) also contains abundant material from the early Archaic period through the late Prehistoric/Formative periods, suggesting that later inhabitants could have introduced this early stemmed point to the site as a curated item (although it shows no later reworking). Another probable Great Basin Stemmed point was previously found nearby in an isolated context on a ridge above East Creek (Dominguez and Danielson 2000), strongly suggesting that this area of the park did in fact witness use during this late Paleoindian/early Archaic period transitional period.

Notably, several other regional surveys also report similar early stemmed projectile points, further indicating that a generalized low-level use of the region may have occurred during the terminal Paleoindian period. For example, Christensen et al. (1983:51) report two "Bajada Complex" points from isolated locations in the Kolob-Alton area, just south and southwest of Bryce Canyon National Park. These points (Christensen et al.1983:Figure 14E, F) appear remarkably similar to the Great Basin Stemmed point collected during the Bryce Canyon project, and they probably represent Great Basin points rather than points of the Oshara Tradition. Keller (1987:77–78; Figure 11c-e) also reports five Silver Lake stemmed points from the Alton area but attributes them to an early or middle Archaic occupation. All of the points from south of the park are substantially smaller than the Great Basin Stemmed point collected during the Bryce Canyon inventory. Kearns (1982:193) also reports a large stemmed point resembling a Jay or Lake Mohave point from the Kaiparowits Plateau area.

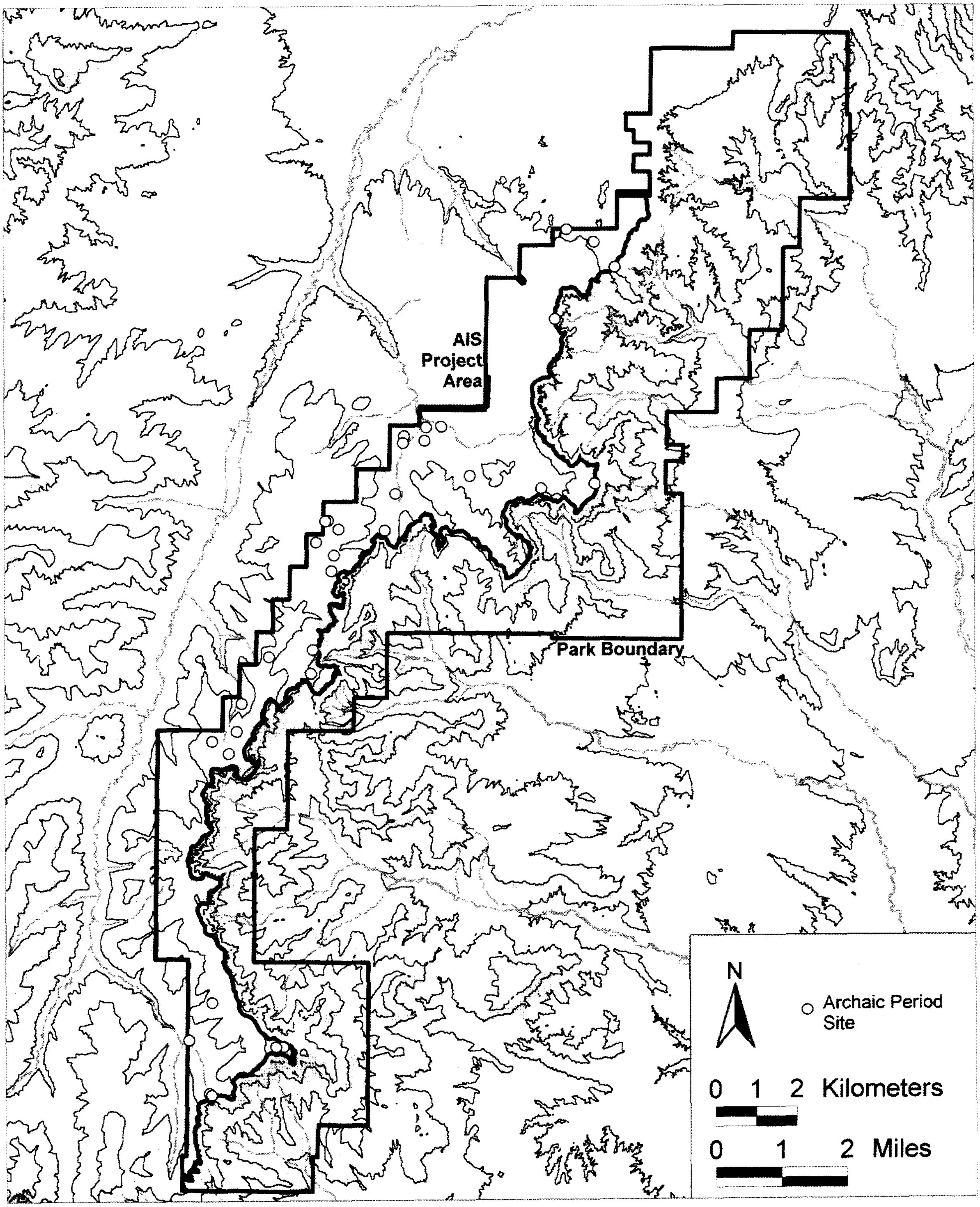


Figure 8.1. Locations of all sites containing Archaic period material recorded in the project area.

Early Archaic Period Sites

The early Archaic period occupation of Bryce Canyon National Park is evidenced by six sites containing a total of 11 Pinto projectile points. Site 42GA1903 alone contains six Pinto points as well as the Great Basin Stemmed point mentioned above. Further, this site contains evidence of use throughout the entire Archaic period as well as later periods, discussed below. Two of the other early Archaic period sites contain only Pinto points, two contain Pinto points with other generalized untyped dart points, and one contains a Pinto point as well as a late Prehistoric/Formative period point.

The spatial distribution and density of projectile points at early Archaic period sites increases dramatically over that of the preceding time period. The occupational intensity of these time periods can be evaluated by comparing the rates of projectile point loss and deposition (e.g., Rhode 1990:Figure 6). This calculation plots the count of projectile point types recovered in the project area (including IOs) against the length of the time interval during which each point type was in use (Chapter 7). The overall deposition rate for each projectile point type is presented in Figure 8.2, which shows older point types on the left and more recent types on the right. Figure 8.3 illustrates the overall deposition rates of all projectile points in each time period, using the

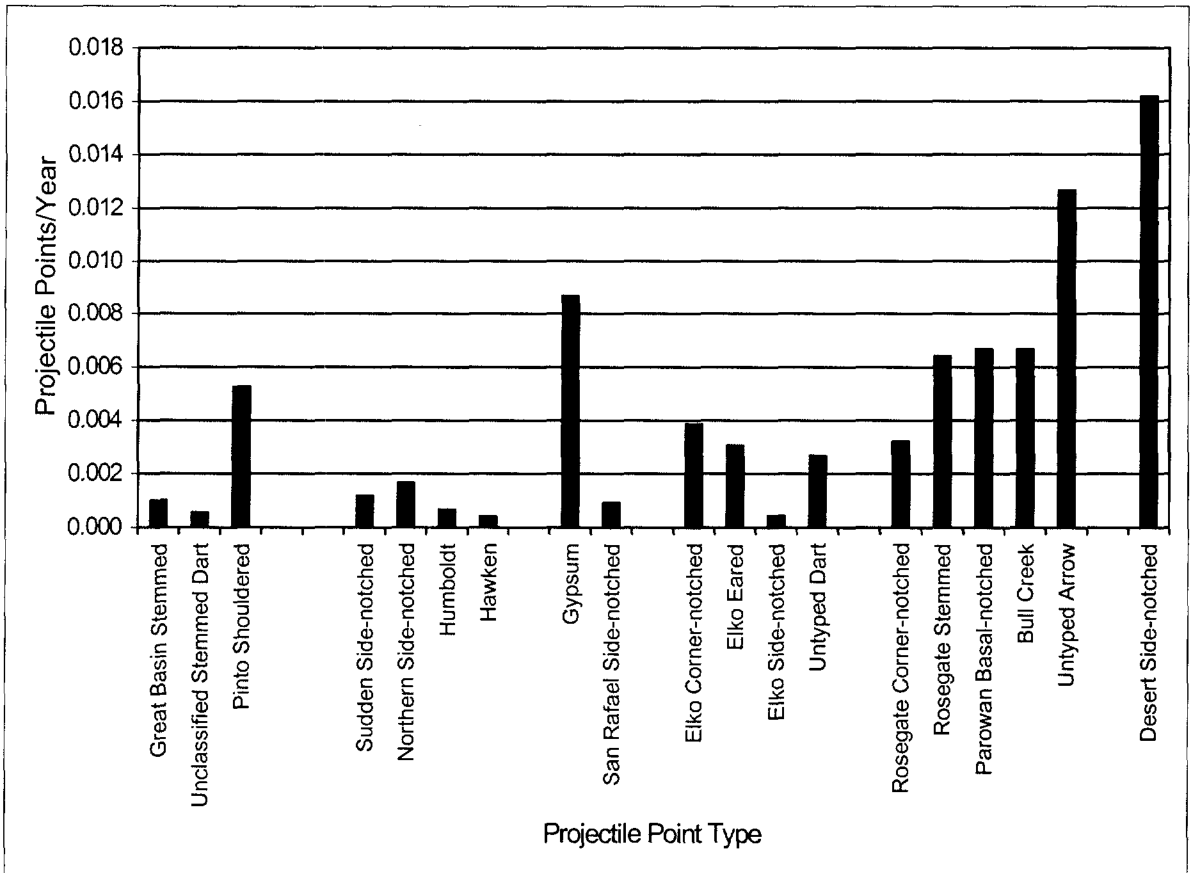


Figure 8.2. ***Deposition rates of projectile point types at all project sites (see Figure 7.1 for periods of point type production).***

total number of points divided by the length of the time interval assigned to the entire period (Chapter 3).

Figure 8.2 shows that Pinto points were more commonly used than other early stemmed types. If the Great Basin Stemmed and other stemmed points truly represent a late or transitional Paleoindian occupation, the Paleoindian period witnessed one of the park's lowest occupation intensities. Conversely, all of these stemmed points overlap in their date ranges and could have been used contemporaneously during the early Archaic period. In Figure 8.3, all early stemmed point types are conservatively treated as early Archaic period material. This graph further emphasizes the low occupational intensity of the early Archaic period despite the prevalence of Pinto points. Only the following middle Archaic period shows a lower occupational intensity, although site burial and scavenging also surely affect the absolute counts of points from these early periods.

An alternative approach to quantifying occupational intensity is to determine the total area covered by all sites in each time period as well as the average site area. These calculations are illustrated in Figures 8.4 and 8.5. Multioccupation sites are included for each time period in which they were occupied, but because the portions of the sites that were used during discrete time periods cannot be determined, the entire site area is used to calculate each time period's total area. The area covered by one multicomponent site that contains a Paiute bark-stripped tree cluster

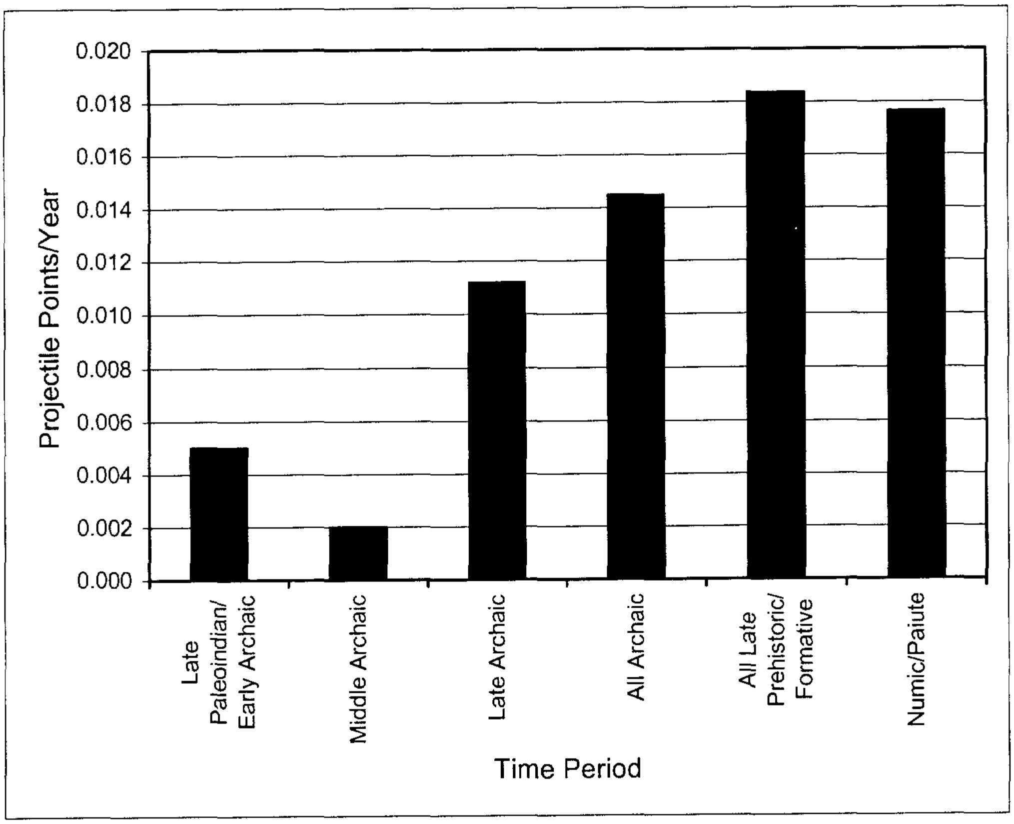


Figure 8.3. Overall projectile point deposition rates grouped by time period at all project sites.

and an Archaic period lithic scatter was subdivided by time period for this graph. The significant positive skew introduced to Figure 8.4 by the large multioccupation site 42GA1903 (>30,000 m^2) is offset by the fact that this site's area is included in the sums for all time periods from the late Paleoindian/early Archaic through the late Prehistoric/Formative.

As in Figure 8.3, Figures 8.4 and 8.5 combine the sites with late Paleoindian and early Archaic period materials. These charts further emphasize the low level of occupation in Bryce Canyon National Park during the early Archaic period. In fact, similar patterns of occupational intensity throughout the Archaic period are apparent in both Figures 8.3 and 8.4. Significant differences between these two measures of occupational intensity only become apparent when Archaic and post-Archaic sites are compared. Those observations will be discussed in a later section.

Middle Archaic Period Sites

Middle Archaic period sites are exceptionally uncommon in Bryce Canyon National Park. Only two sites, each with two points, and one IO are known. Their spatial distribution provides little insight into occupational preferences, and all measures consistently show this period with a low level of occupational intensity. The total site area occupied during this time (Figure 8.4) is inflated by the large multiple-occupation site 42GA1903, which also vastly skews the average in Figure 8.5. If this large site were excluded, the area of the single remaining site of this period (4,050 m^2) would be comparable to the overall Archaic period average.

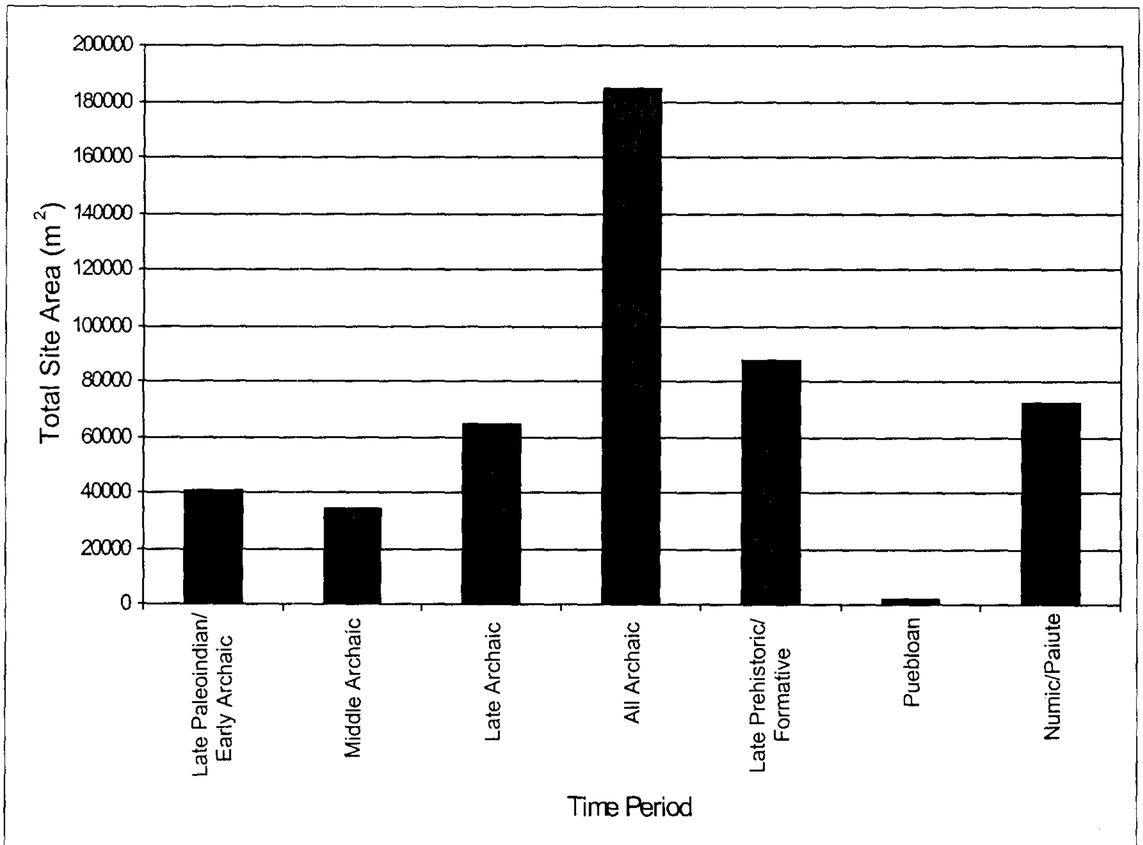


Figure 8.4. Total area covered by sites of known time periods or affiliations.

Middle Archaic period sites and materials are infrequently observed throughout much of the Great Basin, and as indicated in Chapter 3, this phenomenon has often been interpreted to either indicate a decline in overall regional population levels or to indicate an exceptionally ephemeral land-use pattern. Interestingly, Geib et al. (2001:Tables 6.2 and 7.3) do not report a similarly low middle Archaic period occupation level on the Kaiparowits Plateau east of the park. Rather, that survey recorded nearly as many middle Archaic period sites and projectile points as early Archaic period sites and points. Similarly, Kearns (1982:265–266) reports relatively low counts of early Archaic period sites and substantially higher counts of middle and late Archaic period sites in the Kaiparowits and Aquarius Plateau areas to the east and northeast. The low frequency of middle Archaic period material on the Paunsaugunt Plateau presently remains unexplained.

Late Archaic Period Sites

The late Archaic period witnessed an occupational florescence in Bryce Canyon National Park. Although only eight sites containing late Archaic period material are recorded (just two more than in the early Archaic period), these sites contain a total of 17 projectile points. Furthermore, 11 isolated late Archaic period points have also been found in the project area. This total of 28 late Archaic period points is nearly three times greater than the count of early Archaic points. This increased occupational intensity is further illustrated by a higher deposition rate (Figures 8.2 and 8.3) as well as by a similarly proportioned increase in total and average occupied site area (Figures 8.4 and 8.5).

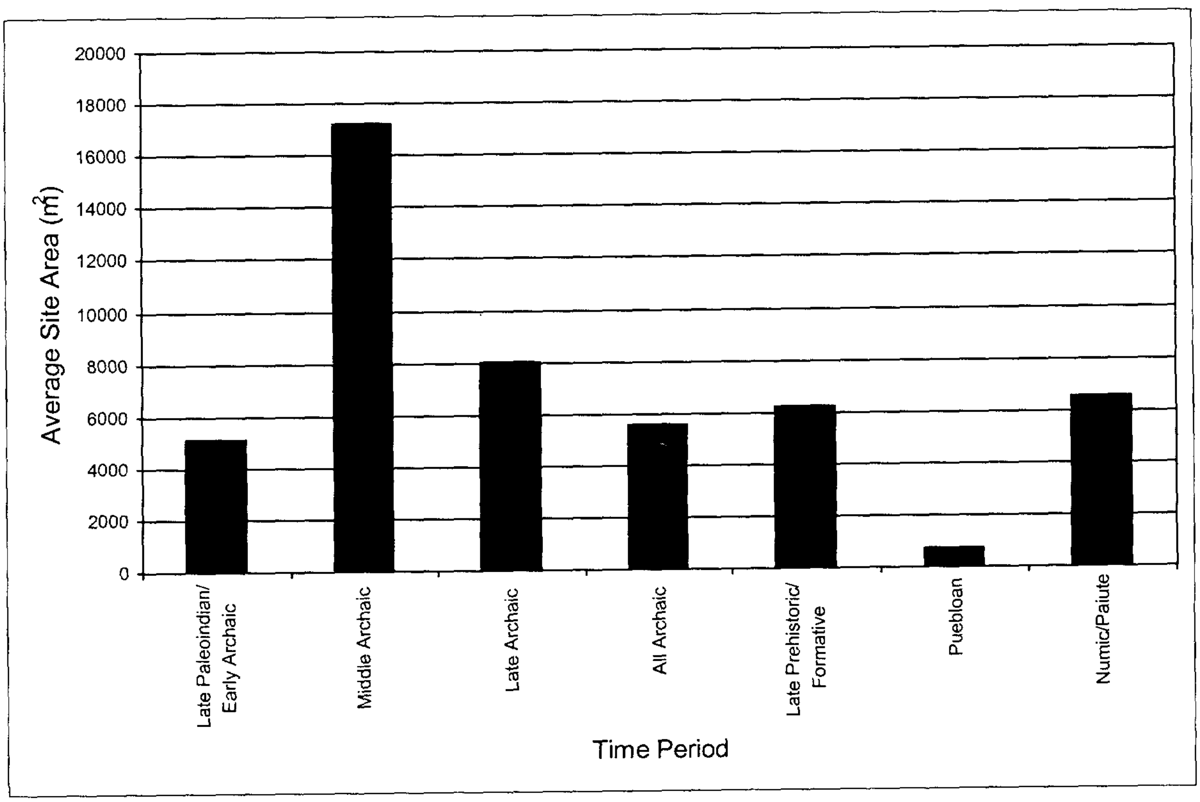


Figure 8.5. Average area covered by sites of known time periods or affiliations.

General Archaic Period Sites

Sites and IOs that can be attributed to the general Archaic period make up the most common datable site class. These sites contain only artifacts such as Elko Series or untyped dart points that minimally indicate an Archaic period age, but the available data do not allow the site occupation to be further segregated into early, middle, or late periods. Twenty-six sites containing 41 artifacts and an additional 27 IOs are attributed to the Archaic period in general. The relative occupational intensity that these points represent is fairly low (Figure 8.2) because the long span of time encompassed by the entire Archaic period balances against the high count of general Archaic period artifacts. Of course, these points do not represent a separate time period, and in all actuality the contributions of these artifacts to the point-deposition rates should be distributed among the early, middle, and late Archaic period calculations in Figure 8.3. Unfortunately the proportions of points that should be attributed to each period cannot be determined. Hence, all early, middle, late, and general Archaic period sites are also combined in Figure 8.3 to allow comparisons with later time periods. Overall Archaic period projectile point deposition rates are lower than, but comparable to, those of later periods.

As Geib et al. (2001:324) note, the apparent increase in late Archaic period occupation on the Kaiparowits Plateau is "doubtless a spurious result because of our current inability to use Elko Series points for assignment to these three general intervals." Geib et al. (2001:324) explain that, regionally, Elko Corner-notched and Side-notched points are common at early Archaic period sites (see also Holmer 1980: Figure 42), so "many early Archaic sites are likely listed as general Archaic. Elko Series points are common during the late Archaic as well, but so too are Gypsum points, so there is less chance for underrepresentation of late Archaic sites."

If the count of general Archaic period projectile points from Bryce Canyon National Park is theoretically redistributed equally to the early, middle, and late phases in Figure 8.3, the early Archaic period would reflect a point loss rate of .019/year, the middle Archaic period would total .008/year, and the late Archaic period would exceed all other periods prior or hence with a rate of .020/year. Similarly, in Figure 8.4, the generalized Archaic period sites contribute roughly 57 percent (105,000 m^2) of the total site area occupied by all Archaic period sites. If this proportion of the overall site area is equally reapportioned to the early, middle, and late Archaic period totals, the contribution of roughly 35,000 m^2 to each phase produces occupation intensity levels equal to or higher than later periods. Regardless, these data-manipulation exercises can only hint at the true Archaic period occupation density. The inability to use Elko Series projectile points as chronological markers truly inhibits an accurate appraisal of early, middle, and late Archaic period occupational intensity with the present survey data.

Late Prehistoric/Formative Period Occupation

Sites containing material that postdates the Archaic period but that cannot be attributed to a more specific affiliation are conservatively categorized as generalized late Prehistoric period sites. Sites in this broad category could derive from Fremont, Puebloan, Numic, Paiute, or any other regional post-Archaic groups. Sites classified to the Formative period contain material definitely attributable to Puebloan occupations (no Fremont material is currently known in Bryce Canyon National Park). In cases when all sites of these periods are discussed, a late Prehistoric/Formative assignation is used. Numic and Paiute sites are discussed separately in a later section.

Late Prehistoric Sites

Fourteen sites in the project area contain generalized late Prehistoric artifactual material

(Table 8.1; Figure 8.6). Eleven sites contain 15 arrow points; five of these sites contain a total of six arrow points in the Rose Springs, Parowan, or Bull Creek series, suggesting that these sites probably relate to Formative period occupations (as opposed to Numic or Paiute occupations). Three of these five sites also contain a total of three other untyped arrow points. The remaining six sites only contain single untyped arrow points, suggesting that they may have been occupied at any point in the post-Archaic era.

Radiocarbon samples from three additional sites returned dates that also place them in the general late Prehistoric period. None of these sites contain temporally diagnostic artifacts, so their placement in this period relies on the assumption that the dated natural charcoal was related to the period of site occupation (Dominguez and Danielson 2000).

Isolated occurrences in the project area include 2 Rosegate Stemmed, 1 Parowan Basal-notched, and 10 untyped arrow points, totaling 28 projectile points attributed to the late Prehistoric period. Despite the relatively low count of points, the occupational intensity represented by these items is exceptionally high (Figure 8.2) due to the significantly shorter spans of time covered by these point types. For example, the lumped assemblage of untyped arrow points returns one of the highest overall deposition rates, despite their assignment to the entire post-Archaic time span. All points from late Prehistoric and Formative period sites are combined in Figure 8.3, producing the highest rate of point deposition witnessed in the project area. Conversely, the total area covered by late Prehistoric and Formative period sites (Figure 8.4), calculated either separately or together, falls far short of that represented by Archaic period sites. Figure 8.5 illustrates that, on average, Archaic period sites cover a roughly equivalent site area, but these sites still contain proportionally fewer projectile points than late Prehistoric and Formative period sites. As will be seen, this relationship holds for the post-Formative Numic and Paiute sites as well. Vagaries of site preservation (e.g., erosion, site scavenging) may account for some of these disparities, but cultural factors such as different site functions or occupational durations may also have produced this pattern. Geib et al. (2001:443) note significant differences between the assemblages of Archaic period and post-Formative period hunter-gatherers on the Kaiparowits Plateau, indicating different settlement and subsistence strategies. Succeeding sections of this chapter will explore the Bryce Canyon National Park data to determine if similar patterns are evident.

Formative Period Sites

Three sites in the project area contain Virgin Anasazi ceramics, providing the only certain evidence of a Formative period cultural affiliation in the park. No Fremont material is known from the park, although several Fremont ceramic-and-lithic scatters lie along the East Fork of the Sevier River just outside the park (one of which may contain pit houses; Marion Jacklin, Dixie National Forest, personal communication 2000). The sites in Bryce Canyon National Park represent some of the highest-elevation Puebloan sites known in the Grand Staircase (e.g., McFadden 1996).

One of the sites with Puebloan ceramics is a multioccupation site that also contains fairly abundant general Archaic material in the form of Elko Corner-notched and Elko Eared points. This site also contains a single untyped arrow point, which is attributed to the Formative period occupation. The other two sites are single-component artifact scatters with no diagnostic materials other than ceramics. Because few points were found at these sites, the occupational intensity measure presented in Figure 8.3 lumps the Formative period sites with the late Prehistoric period sites. The total and average site area (Figures 8.4 and 8.5) covered by the Puebloan sites is the lowest of all time periods. Although the size calculations may be skewed by small sample sizes, the consistently small size of the Puebloan sites and the trend toward single-

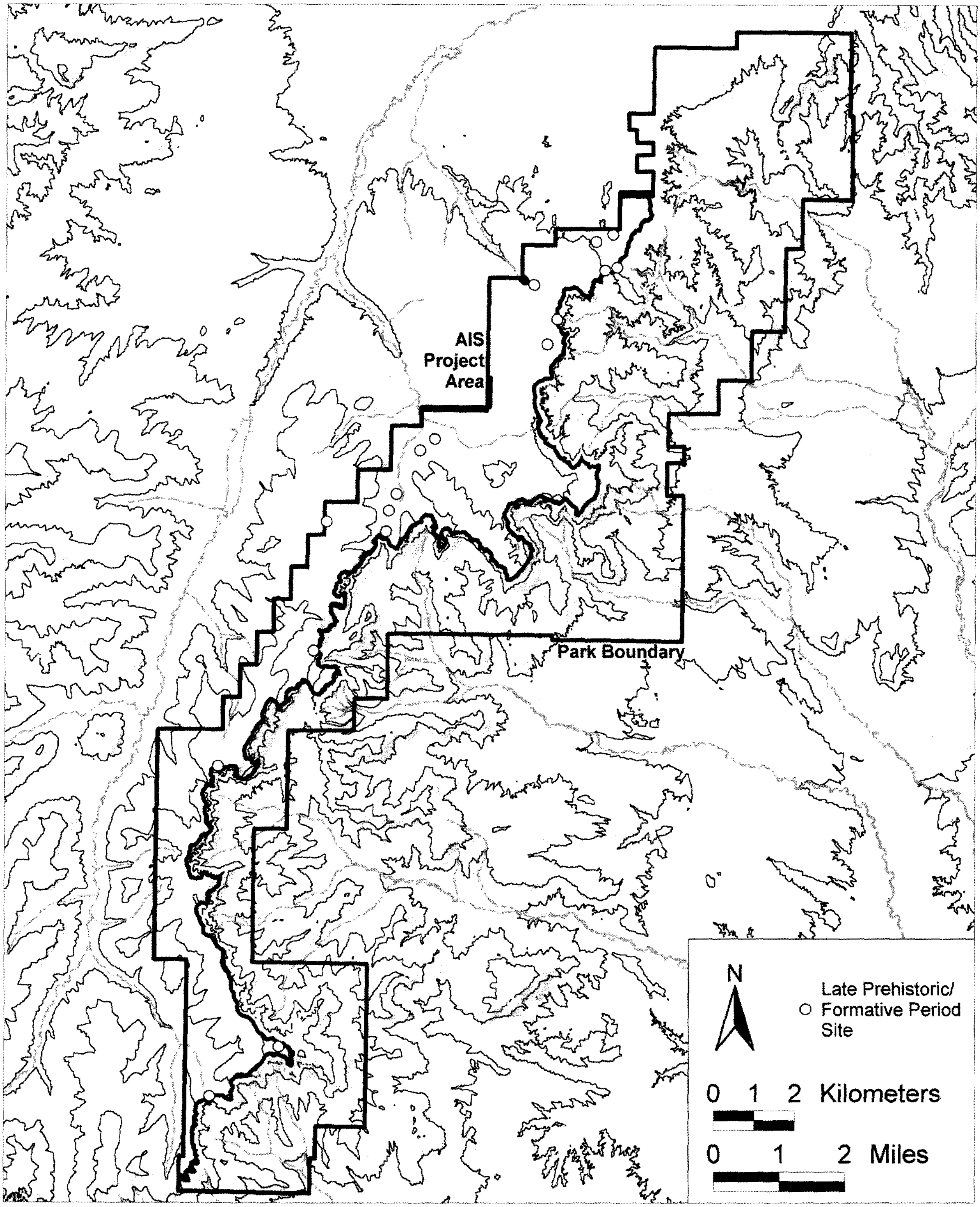


Figure 8.6. Locations of all sites containing late Prehistoric/Formative period material recorded in the project area.

component occupations argue that cultural factors such as site function and land-use strategies rather than sample sizes are responsible for the low level of occupational intensity. These topics are explored later in this chapter.

Numic and Paiute Occupation

Following Reed (1994) and Geib et al. (2001:392), all sites in the project area containing post-Formative artifact or feature types such as Desert Side-notched points, brown ware ceramics, or bark-stripped trees are assigned general Numic/Paiute affiliations, because Bryce Canyon National Park lies squarely in the historic range of Southern Paiute bands (Kelly 1964) and this attribution seems safely warranted. Eleven sites recorded during the inventory contain Numic or Paiute material (Table 8.1; Figure 8.7). Four sites were identified by the presence of bark-stripped ponderosa pine trees. The steel axe marks on these trees indicate a protohistoric or historic age for these features, and these sites are attributed to the Southern Paiute, who are historically documented to have occupied the plateau (Kelly 1964). One of these sites also contains a Desert Side-notched projectile point. Two of these bark-stripped tree sites also contain Archaic period lithic scatters.

The remaining seven Numic sites are identified by the presence of Desert Side-notched projectile points or Southern Paiute Brown Ware ceramics. Because these sites cannot be confidently ascribed to either the prehistoric, protohistoric, or historic periods, they are categorized as general Numic sites (hence the "Numic/Paiute" ascription for the class as a whole). Three of these sites contain brown ware sherds, two contain Desert Side-notched points, one contains both brown ware ceramics and a Desert Side-notched point, and one contains a Desert Side-notched point and also returned three radiocarbon dates that indicate a sixteenth to eighteenth century period of use (Dominguez and Danielson 2000:110). An additional six Desert Side-notched points are recorded as IOs in the project area.

The occupational intensity represented by the Desert Side-notched projectile points alone supercedes all other point types (Figure 8.2). When all late Prehistoric and Formative period types are lumped (Figure 8.3), that period's occupational intensity exceeds that of the Numic/Paiute period, but only by a slight margin. Geib et al. (2001:442) observe a similar phenomenon on the Kaiparowits Plateau. There, although Archaic period sites were the most numerous, "the sites of Post-Formative foragers actually have a greater density per unit of time. There are 0.05 Archaic sites per year, whereas there are 0.1 Post-Formative sites per year." On the Paunsaugunt Plateau, the project area contains .004 Archaic period sites per year and .016 Numic/Paiute sites per year. This 1:4 ratio represents an even higher proportion of Numic/Paiute sites than reported by Geib et al. (2001).

Site-size assessments (Figures 8.4 and 8.5) reveal that Numic/Paiute sites are generally larger than all size categories except the late Archaic period. This observation is not in line with sites on the Kaiparowits Plateau, where Geib et al. (2001:397, 443) characterize the post-Formative sites as being much smaller than Archaic period sites. This discrepancy may be due to the different types and functions of sites present in Bryce Canyon National Park, which include sites with either bark-stripped trees or Southern Paiute Brown Ware ceramics, neither of which are present in the Kaiparowits Plateau survey area. When the four sites with bark-stripped trees are excluded, the average Numic/Paiute site size drops to 1,439 m^2, indicating that the artifact scatters at these sites are actually quite small, as Geib et al. (2001) also point out. Paiute site types and functions are further discussed in a following section.

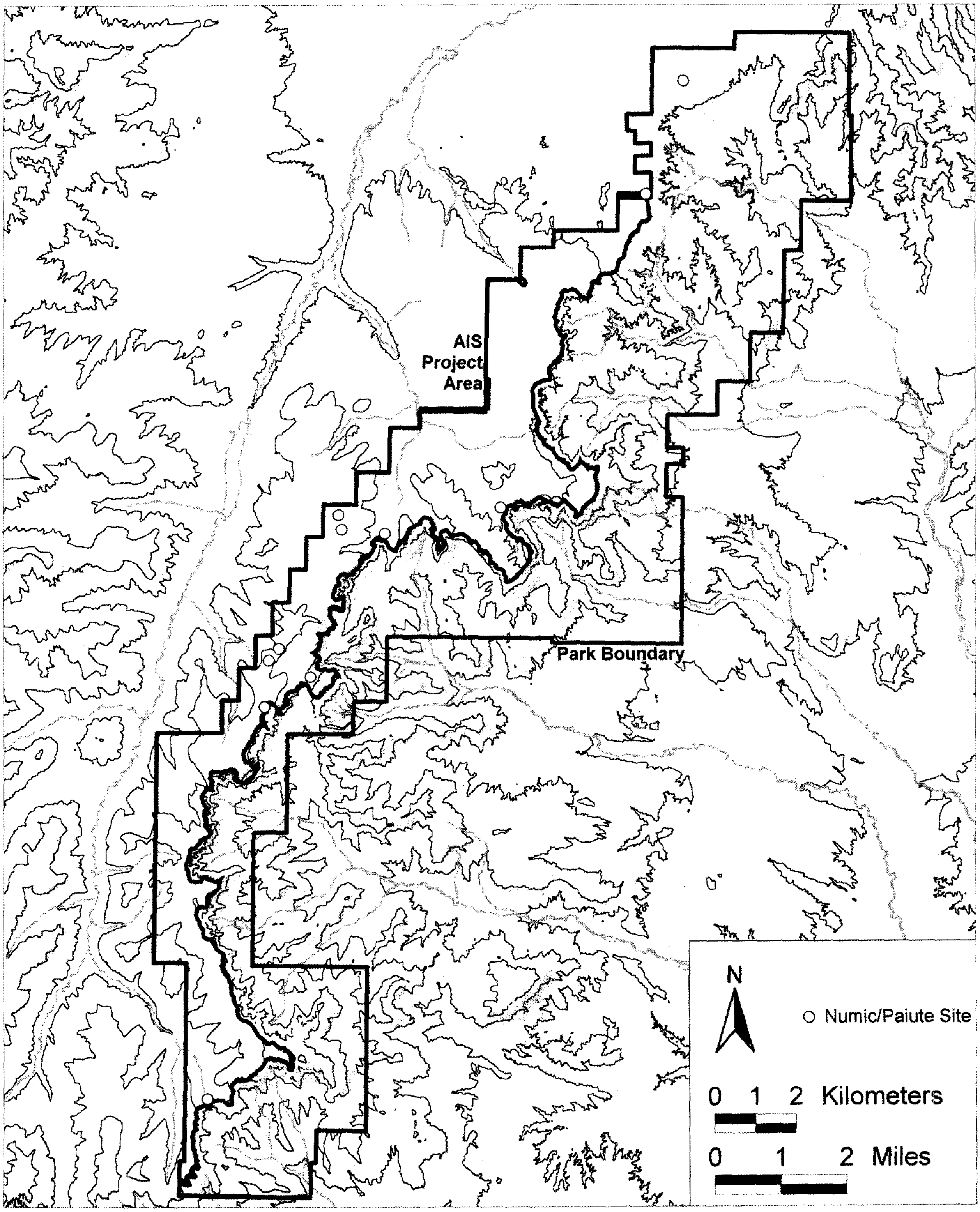


Figure 8.7. ***Locations of all sites containing Numic/Paiute period material recorded in the project area.***

Native American Technology and Cultural Material

Aspects of Native American technology can be inferred from the ceramics, stone tools, and flaked stone manufacturing debris found at project sites. Although the durable artifacts that are found in the archeological record represent a substantially depleted sample of the items that were actually used at these sites, important information about raw material procurement and use, tool production and use, and curation can be discerned. Once these assemblage characteristics are sketched out, some aspects of site function may be inferred. Finally, temporal changes linked to land-use strategies may become apparent. These latter topics are discussed in following sections.

Sources of Flaked and Ground Stone Materials

The types of stone tools employed by the past Native American residents of Bryce Canyon National Park required raw materials with specific characteristics (such as tractability, durability, etc.). These materials may be naturally distributed across the landscape in either discrete or dispersed source areas. The natural distribution of stone types affects the processes through which those materials were obtained. An understanding of procurement strategies can provide another line of evidence through which to discern past land-use patterns.

Brian Head Chert and Other Siliceous Material

As noted by Irwin (Chapter 7), Brian Head chert is the most common stone type used to make dart and arrow points in the park assemblage. Brian Head chert is a shorthand term describing a range of highly siliceous, altered crystal vitric tuffs and porcelanites that occur in the highly variegated, volcanic Brian Head formation. This formation has widespread distribution in south-central Utah, although it does not occur within Bryce Canyon National Park (Bowers 1991; Doelling 1975). Stone types included in the Brian Head chert category encompass a wide range of macroscopic characteristics. This multicolored chert is often mottled, and samples may range from transparent to opaque, from vuggy to homogenous, and from lustrous and cryptocrystalline to matte and microcrystalline (see Bakewell 2001). Although Brian Head chert is not naturally available within the park, a probable source is reported from Flake Mountain, roughly 10 km (6 mi) to the north (Dominguez and Danielson 2000:41; Dykmann 1976). Other sources of this material are suspected from the gravels of Casto Canyon and the terraces of the Sevier River, both approximately 24 km (15 mi) north and west of the park. The best-known Brian Head chert outcrops are found 48–64 km (30–40 mi) to the west at Panguitch Lake (Marion Jacklin, personal communication 2000) and around Cedar Breaks National Monument and Brian Head Peak on the Markagunt Plateau (Canaday 2001). All of these source areas except Flake Mountain were visited by the author during the survey. In Chapter 7, Irwin distinguishes Brian Head chert and chalcedony, but this chapter treats all Brian Head material as a single category.

Artifacts made of Brian Head chert constitute fully 86 percent of the analyzed sample. Eighty-nine percent (n=1,502) of the 1,687 analyzed flakes were made of varieties of Brian Head chert (Table 8.2). The strong reliance on this material type emphasizes its popularity to the region's prehistoric inhabitants, even though this stone is not immediately available in the park. Chert procurement sites at the primary source area on the Markagunt Plateau cover hundreds of hectares and represent over 8,000 years of use (Canaday 2001).

Items in the untyped chert category represent varieties of siliceous material that exhibit visual attributes outside the range of Brian Head chert. These stone types are generally brown, tan, or gray, and they often trend toward opacity. One subvariety of the untyped chert is a translucent

Table 8.2. ***Stone material types of flaked and ground stone tools and debris at all analyzed project sites.****

	Stone material type											
Technological Type	Misc. Igneous	Basalt	Obsidian	Local Quartzite	Exogenous Quartzite	Brian Head Chert	Untyped Chert	Untyped Jasper	Untyped Petrified Wood	Siltstone	Sandstone	Total
Flaking debris												
Angular debris	–	–	4	6	–	172	10	1	1	–	–	194
Biface thinning	–	–	11	–	–	113	4	1	–	–	–	129
Biface reduction	–	–	14	–	–	32	5	–	–	–	–	51
Hard hammer	1	–	38	38	–	1,104	26	5	7	–	–	1,219
Pressure	–	–	8	–	–	75	4	–	–	–	–	87
Notching	–	–	–	–	–	2	–	–	–	–	–	2
Bipolar	–	–	–	1	–	–	–	–	–	–	–	1
Potlid	–	–	–	–	–	4	–	–	–	–	–	4
Cores	–	–	–	14	–	5	2	–	1	–	–	22
Pressure-flaked bifaces	–	1	7	–	–	85	6	2	1	–	–	102
Projectile points	–	–	8	–	1	57	4	–	1	1	–	72
Used flakes	–	1	3	5	–	24	–	1	3	–	–	37
Tested cobbles	–	–	–	–	–	2	–	–	–	–	–	2
Percussion bifaces	1	–	–	–	1	36	4	–	1	–	–	43
Drills	–	–	1	–	–	–	–	–	–	–	–	1
Scrapers	–	–	–	–	–	5	–	–	–	–	–	5
Hammerstones	–	–	–	2	–	–	–	–	–	–	–	2
Ground stone, unid.	–	–	–	–	–	–	–	–	–	–	5	5
Manuports	–	–	–	1	–	–	–	–	–	–	16	17
Manos	1	–	–	1	–	–	–	–	–	–	–	2
Metates/grinding slabs	–	–	–	–	–	–	–	–	–	–	7	7
Total	3	2	94	68	2	1,716	65	10	15	1	28	2,004

* Does not include IOs.

blue siliceous material that resembles chalcedony. These stone types probably represent source areas other than the Brian Head formation, but the area of procurement is unknown. Some material may derive from sparse lag gravel deposits on the plateau top (see the discussion of quartzite, below). Other possible local sources for chert (including Kaibab chert) may exist in conglomerate beds below the Pink Cliffs (Gayle Pollock, Bryce Canyon Natural History Association, personal communication 2001). Although Bryce Canyon AIS staff discovered several small chert veins outcropping from the Claron Formation in the eastern tributary canyons of Podunk Creek, none of these outcrops showed any signs of cultural exploitation. Christensen et al. (1983:13) report that abundant chert, chalcedony, and quartzite cobbles are found in the Alton area, immediately south of the park.

Flaking debris and tools of jasper and petrified wood are present in low quantities (Table 8.2). The sources for these materials are unknown, although several regional sources are available. Geib et al. (2001:185–186) describe Boulder jasper, an opaque reddish brown or brown material that outcrops in the Escalante River drainage to the east. Another variety, Zion jasper, is an opaque and semitranslucent red, yellow, black, gray, and white banded chert that derives from areas south of Zion National Park (Matt Betenson, Zion National Park, personal communication 2002). Based on these descriptions, most of the jasper in Bryce Canyon National Park may be from the Boulder source.

The examples of petrified wood at the project sites are generally dark brown to tan in color. This material is typically microcrystalline and quite opaque. None of the items resembled the brightly colored Morrison Formation agatized wood known from the Escalante area, and it is more probable that the artifacts are made of Chinle Formation petrified wood, which is available from the Vermilion Cliffs southeast of the park (Geib et al. 2001:184).

Obsidian

Obsidian represents the next most common material type (Table 8.2). X-ray fluorescence analysis of 15 projectile points collected during the inventory indicates a heavy reliance on stone deriving from the Wild Horse Canyon source area in Utah's Mineral Mountains (approximately 112 km [70 mi] to the northwest). A single point was assigned to the Panaca Summit/Modena source (roughly 192 km [119 mi] to the west along the Nevada/Utah state line) and one was unsourced (Appendix 7.3). No flaking debris from the project sites was submitted for source analysis. Dominguez and Danielson (2000) previously analyzed eight obsidian artifacts including flakes, cores, and a single projectile point from three sites in the project area. The analyzed items indicated a variety of source areas including Wild Horse Canyon (n=3), Panaca Summit/Modena (n=2), and Pumice Hole (n=1) in Utah as well as Brown's Bench (n=1) in Nevada, plus one unsourced specimen (Hughes 2000). The results from Bryce Canyon National Park mirror the analysis results from Cedar Breaks National Monument to the west (Canaday 2001), where 53 of 68 specimens derived from the Wild Horse Canyon source and 11 were from the Panaca Summit/Modena area, while 3 were from Nevada and 1 came from Black Mountain in Utah (Hughes 2001).

Conversely, the preponderance of obsidian artifacts in a sample from Zion National Park, somewhat farther to the west, match the Panaca Summit/Modena source more frequently (14 of 21); only six were from Wild Horse Canyon and one was from Black Mountain (Hughes 2001). To the east of Bryce Canyon National Park, surveyors on the Kaiparowits Plateau found relatively little obsidian. Geib et al. (2001:186) visually identified most of the obsidian as Modena or Mineral Mountains material, but no X-ray fluorescence analysis was conducted so no quantifiable frequency data are available.

Quartzite

Flakes made of local quartzite constitute the third most common general material class (Table 8.2). Pebbles and cobbles of coarse quartzite are naturally present throughout the park as sparse lag deposits. These pebbles and cobbles probably derive from the unnamed sandstone conglomerate that unconformably overlies Bryce Point (Chapter 2). This sandstone contains abundant quartzite, chert, and limestone gravels and pebbles (Bowers 1991) that could provide a source of coarse, low-quality toolstone. Quartzite cobbles are unevenly distributed across the plateau top; areas of relatively dense deposition include the hills northwest of Fairyland Canyon, the rim of the Pink Cliffs north of Bryce Point, the broad upland ridge extending west from Bryce Point, and some of the eastern tributary canyons of Podunk Creek. As will be seen in the following technological discussion, no formal flaked stone tools are made of this material, probably due to its low tractability, but several used flakes and ground stone items were observed in addition to the flaking debris.

Exogenous quartzite was identified based on its fine-grained texture and different coloration. One of the projectile points is made of this material and may derive from a source near Kanab, Utah, south of the park (Marion Jacklin, personal communication 2000).

Miscellaneous Stone Types

Igneous material other than obsidian is uncommon at project-area sites. One flake and one mano fragment were made of an unidentified igneous stone, and one percussion-flaked biface was made of a stone that appeared to be welded tuff. These stone types are probably present locally, possibly as lag gravels in the park. Two tools (a pressure-flaked biface and a used flake) were made of fine-grained basalt. This material is also probably locally available; a quarry is known on the Sevier Plateau to the north (Marion Jacklin, personal communication 2000).

Items of sandstone are relatively common, but most appeared as small slabs or spalls with no identifiable use wear. Few metates or grinding slabs were confidently identified, and all were fragmentary. Unidentified worked fragments also probably represent nether stone fragments. The unworked manuports, which are objects that were evidently brought to the sites by past occupants, also probably represent fragments of badly degraded grinding implements (e.g., Geib et al. 2001:Figure 7.8). All of the sandstone fragments at project-area sites are made of relatively soft, friable stone types, but the geological strata from which they derive is unknown.

Finally, a single projectile point of gray, fined-grained siltstone was recorded. Geib et al. (2001:183) report that a variety of gray silicified siltstone outcrops around Smoky Mountain on the Kaiparowits Plateau, which could represent the source area for this artifact.

The preceding discussion highlights the strong tendency for past Native American occupants of the Paunsaugunt Plateau to use lithic materials deriving from areas north and west of the plateau. Stone types such as Brian Head chert are available from locations within relatively short distances, but all obsidian artifacts in the park are made of stone from far-distant Great Basin sources. The procurement of obsidian would have required either lengthy journeys to the source areas or access through exchange partners. Minute proportions of stone types that may derive from the east or south suggest use of the plateau by people living in the Grand Staircase, but the overall pattern of lithic material types suggests a Great Basin focus.

Lithic Material Use Through Time

Changes in frequencies of stone materials through time may be indicative of a variety of circumstances including changes in the method of procurement, changes in affiliations of regional cultural interaction, or changes in technological approaches to land use. The lithic assemblages from the Paunsaugunt Plateau provide an excellent opportunity to study changes in toolstone preference over time because the study area itself contains virtually no high-quality natural toolstone. Nearly all flaked and ground stone artifacts had to be carried onto the plateau, obviating the possible obfuscatory influences that might otherwise have been introduced by locally available lithic sources. The following section explores the prevalence of stone types at sites of known or estimated age to determine if trackable changes are evident. Later sections will explore the technological characteristics of these assemblages for concurrent changes, which may or may not be dependent on the stone types being used.

Two categories of data collected by the project analysts can be used to explore temporal changes. First, the overall lithic assemblages at single-component sites of known or estimated age can be used to gain broad views of all debris and tool materials. Table 8.3 presents the number of sites and artifacts included in the assessment of each time period. Second, the park-wide assemblage of temporally diagnostic projectile points (including IOs and points collected from multioccupation sites) can be compared to the single-component site-assemblage data.

Tabulation of the site-wide assemblages shows that four main lithic material classes persist through most time periods. The proportions of these material classes (obsidian, local quartzite, Brian Head chert, and untyped chert) are depicted in Figures 8.8 and 8.9. Figure 8.8 depicts only Archaic period sites and Figure 8.9 compares Archaic and post-Archaic period assemblages (which also include sandstone). The middle Archaic period lithic sample (Figure 8.8) is based on only 35 items from one site, so the disproportionate frequency of non-Brian Head chert at this site may result from a sampling deficiency.

Table 8.3. Single-component sites used for temporal analysis of lithic assemblages.

		Grouped Assemblage Size		
Period	Site	Count of Sampled Flaking Debris	Count of All Tools	Total Analyzed Assemblage
Early Archaic	42GA5177, 42GA5182, 42GA5190, 42GA5218, 42GA5237	132	22	154
Middle Archaic	42KA5798	21	14	35
Late Archaic	42GA1902, 42GA3388, 42GA5210, 42GA5213	50	20	70
All Archaic*	42GA1896, 42GA1902, 42GA3388, 42GA3558, 42GA5177, 42GA5182, 42GA5190, 42GA5200, 42GA5209, 42GA5210, 42GA5213, 42GA5218, 42GA5223, 42GA5235, 42GA5237, 42GA5284, 42KA3284, 42KA5773, 42KA5798, 42KA5813	328	89	417
Late Prehistoric/ Formative	32GA3560, 42GA5193, 42GA5202, 42GA5203, 42GA5205, 42GA5244, 42GA5278, 42KA5756	147	14	161
Numic/Paiute	42GA2634, 42GA3387, 42GA3488, 42GA5192, 42GA5245, 42GA5262	143	35	178

* Includes all early, middle, and late Archaic period sites as well as generalized Archaic period sites.

When lithic material proportions of tools and flaking debris in each time period are compared separately, no meaningful differences from the overall site assemblages are apparent. In no time periods do the raw materials of any specific tool types or debris categories contribute disproportionately to the lithic material composition of overall site assemblages. A close correlation between the lithic material types of high-maintenance tool classes such as projectile points and the material types of flaking debris (particularly, pressure flakes) should be expected in a zone such as the Paunsaugunt Plateau which lacks natural lithic sources. All items brought on to the plateau had to be maintained or newly manufactured on site with imported toolstone instead of local material. The local production or resharpening of imported tools or tool blanks should produce similar frequencies of raw-material types for both discarded tools and debris, and that expectation is borne out at plateau-top sites.

No dramatically obvious changes in preferential raw material use are apparent through time, but the incidence of sandstone rises during later periods. This observation may be related to the deterioration of poorly cemented sandstone artifacts at early sites, however. Obsidian appears to decrease consistently from the early Archaic period (where it constitutes 26.6 percent of the overall site assemblages) to the Numic/Paiute occupation (the sites of which contain 0.6 percent obsidian). Although the Desert Side-notched points collected during the project are made of either obsidian or Brian Head chert, another previously collected Desert Side-notched point

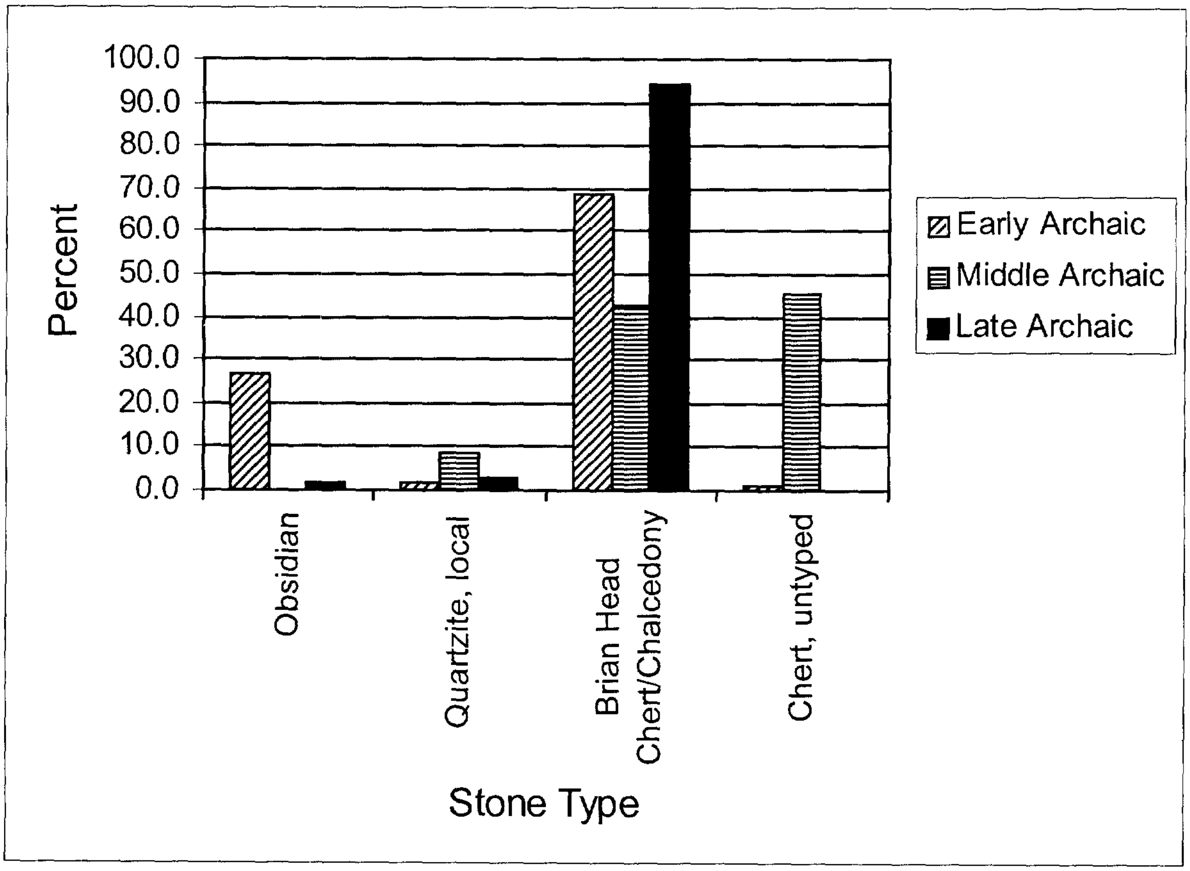


Figure 8.8. ***Proportions of stone material types in single-component early, middle, and late Archaic period sitewide assemblages.***

(Hartley 1980a:48) curated at the park is made of petrified wood or other chert. Despite the common use of Brian Head chert for projectile points, Numic/Paiute lithic assemblages contain the lowest overall proportion of Brian Head chert and the highest proportion of other chert (although Brian Head chert still dominates; Figure 8.9). This correlation may indicate that Paiute groups who used the Paunsaugunt Plateau had stronger connections with areas outside the Brian Head chert source area (which lies to the west) than did groups of the preceding periods. The presence of recycled Anasazi ceramics at Paiute sites (see below) further implies an eastern or southern focus toward the Grand Staircase, rather than to the west.

An assessment of the raw materials of temporally diagnostic projectile points from the survey collection provides little additional insight (Appendix 7.2). Brian Head chert forms the most commonly used material in all time periods, and other chert and obsidian make up the bulk of the remaining points. No trends divergent from the site-assemblage data are apparent in the projectile point assemblage. Among obsidian artifacts, no temporal changes in source-area preference are apparent, which may be due to the small number of items that have been analyzed and the overwhelming reliance on the Mineral Mountains source.

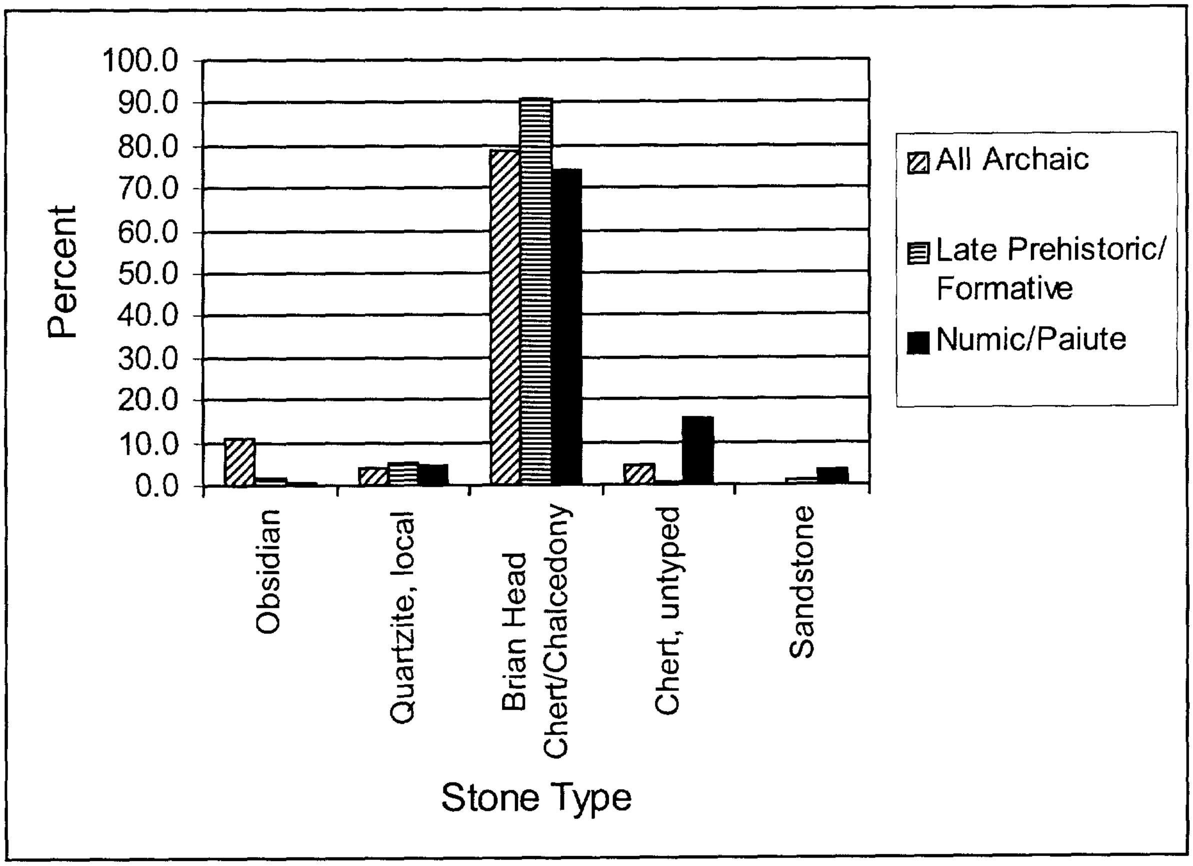


Figure 8.9. ***Proportions of stone material types in single-component Archaic, late Prehistoric/Formative, and Numic/Paiute sitewide assemblages.***

Technological and Functional Aspects of Flaked Stone Tools and Debris

All but two of the 98 Native American sites contain flaked stone artifacts. Four of the previously test-excavated sites had been extensively surface-collected, and insufficient artifact counts at these sites precluded any in-field analysis during the inventory. The project analyzed 1,971 flaked stone artifacts at the 92 remaining sites.

Flaking debris was sampled from each site to obtain representative data, as described in Chapter 5. Seventy-five of the analyzed sites contain flaked stone tools in addition to flaking debris. All tools, including cores and used flakes, were analyzed. Data from IOs supports the site data, but the IO information is not part of the analysis database and is not systematically used here.

Flaked Stone Tool Technology and Function

All flaked stone artifact classes other than flaking debris are categorized as tools. The following sections describe individual artifact categories as grouped tool classes, combining all analyzed tools from all sites of all time periods (excluding projectile points, which are discussed by Irwin in Chapter 7). Later sections will explore any temporal changes in tool prevalence, technology, or function.

Pressure-Flaked Bifaces

Small pressure-flaked bifaces are the most common tool type at project-area sites (n=102 at 50 sites; Table 8.2; Figure 8.10). By definition, these tools were manufactured from thin flakes by pressure flaking the margins to create formally shaped tools with bifacially sharpened edges. All are fragmentary, but many display parallel cutting edges that taper to a pointed distal end. Most of these probably represent nondiagnostic portions of projectile points, but at least one shows macroscopic edge-rounding wear suggesting its use as an unhafted knife.

Metric data from 101 pressure-flaked bifaces and 123 projectile points (Irwin, Chapter 7) indicate that length-to-width proportions are generally consistent (Figure 8.11), even when all fragmentary specimens are included. The tendency for pressure-flaked bifaces to possess smaller dimensions probably derives from their comminuted condition, which precluded their identification as projectile points during analysis. The general correspondence in length-to-width proportions indicates that most items in these two tool classes probably shared similar functions as either projectile points, small hafted knives, or multi-purpose cutting/projectile tips.

The range of stone materials used to make pressure-flaked bifaces is also similar to that of projectile points. Over 83 percent of the pressure flaked bifaces are made of Brian Head chert. Obsidian (7 percent) and other chert (6 percent) constitute the next most common materials. Basalt, jasper, and petrified wood are also present in low frequencies.

Percussion-Flaked Bifaces

Large bifaces and biface fragments that show evidence of reduction and shaping by percussive means are also a common tool class in the project area (n=43; Table 8.2; Figure 8.10). Percussion-flaked bifaces are present at 21 sites. All but two are fragmentary. Brian Head chert is the most common material type, and untyped chert is the only other stone type represented by more than one biface.

During analysis, the morphology of these tools' flake scars, edge sinuosity, cortex cover, and width/thickness ratios were examined to assess their relative stage of reduction. Bifaces were assigned to Stages 2 through 5, following Callahan's (1979) biface-reduction trajectory. Stage 2 bifaces are early-stage tools that are thick relative to their width, with highly sinuous edges formed by the bifacial removal of edging flakes that fail to cross onto the tool's face. A hard hammerstone is often used in this step, the goal of which is to create a bifacial edge around the tool's margin. These early-stage bifaces retain much of the original cortex or the unworked

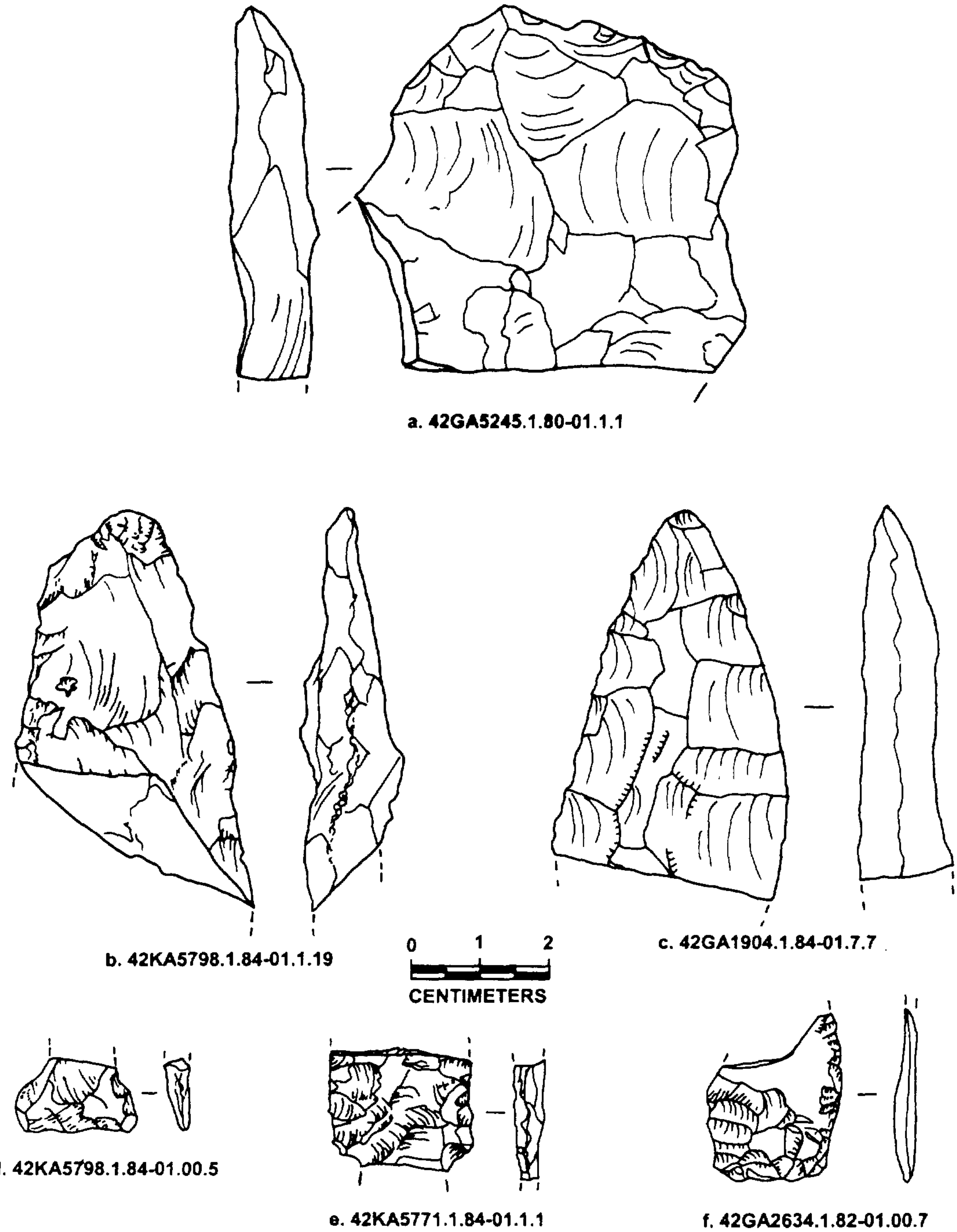


Figure 8.10. ***Bifaces from project sites:*** (a-c) ***percussion-flaked bifaces and*** (d-f) ***pressure-flaked bifaces.***

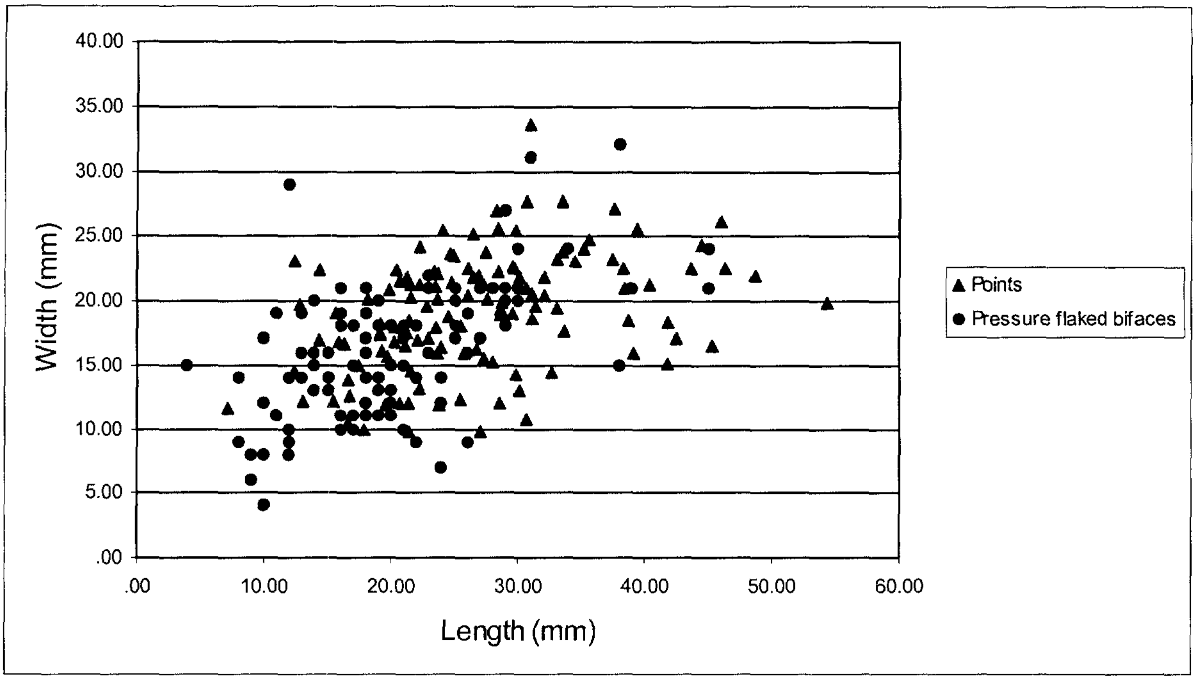


Figure 8.11. ***Scatterplot comparing lengths and widths of pressure-flaked bifaces and projectile points at all project sites.***

surface of the original tool blank. Stage 3 in the trajectory represents a transition from marginal edging to bifacial thinning. Flakes are removed that extend onto the tool's face, removing facial bulk from the tool without excessively reducing its width. Edge sinuosity is reduced and cortex is removed, and thinning is often achieved by using a soft hammerstone or antler percussor. Stage 4 bifaces represent well-thinned items with little cortex and highly regularized edges. Stage 5 bifaces are purposefully shaped into formal, usable tools. Pressure-flaking techniques occasionally supplement this final shaping stage.

Sites with bifaces most commonly contain Stage 4 bifaces (Figure 8.12), tools that have been extensively thinned but not fully shaped. Stage 3 bifaces, which are partially thinned, are also relatively common. Few early or late-stage bifaces are present. As observed in other tool classes, items made of Brian Head chert are the most common. The functions of these tools cannot be directly determined with the present analysis data (the use-wear analysis was conducted under less than 10-power magnification). Only two Stage 3 and two Stage 4 bifaces show signs of pressure-flaked retouch scars, but these pressure flakes may have been removed as part of the manufacturing process rather than during resharpening activities. Three other Stage 4 bifaces show microflaking scars along their edges, but this wear pattern cannot be confidently ascribed to either purposeful use wear or to postdepositional damage.

Twenty biface fragments yielded complete width and thickness measurements, allowing the width/thickness ratio of a subset of the assemblage to be calculated (Figure 8.13). Over three-quarters of the measurable bifaces show a width/thickness ratio greater than 3:1. Callahan (1979:18) indicates that this ratio is characteristic of bifaces in reduction Stage 3 or later, indicating preliminary or advanced thinning

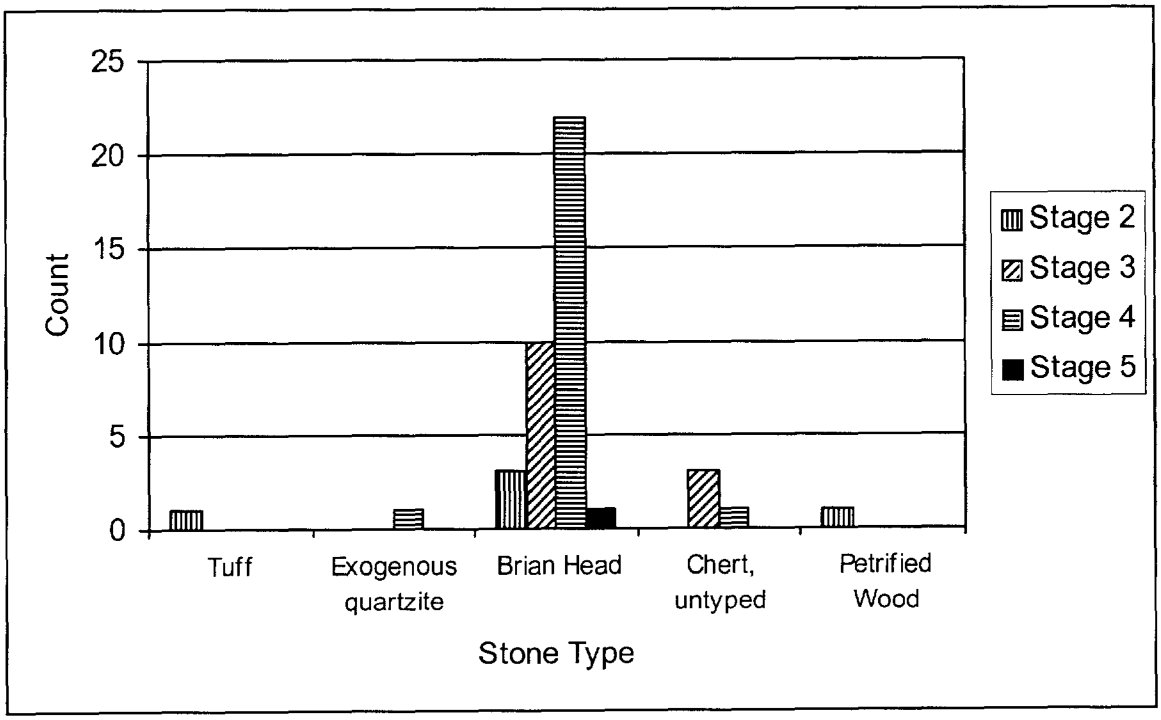


Figure 8.12. ***Count of percussion-flaked bifaces by stone material type at all project sites.***

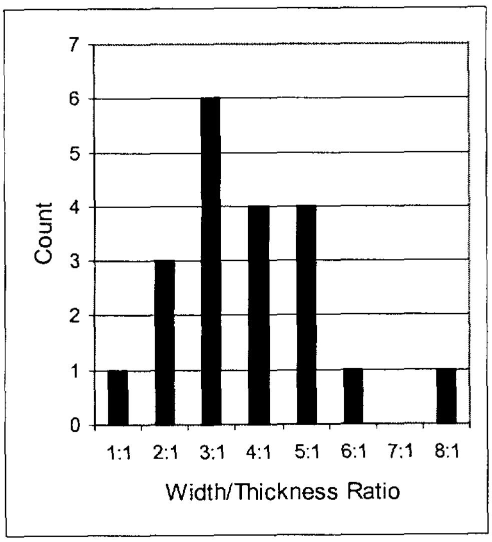


Figure 8.13. ***Frequencies of percussion-flaked bifaces in rounded width-to-thickness ratio groups at all project sites.***

and edge regularization. The prevalence of bifaces in the middle stages of thinning and the paucity of early-stage bifaces indicates that these tools were brought on to the Paunsaugunt Plateau in a partially reduced state. The near absence of shaped, late-stage bifacial tools supports the inference that the goal of biface reduction on the plateau was not the creation of finished tools but was instead the maintenance of a portable tool kit (Bleed 1986). These large mid-stage bifaces may have served as multipurpose tools that provided not only coarse cutting edges but also served as lightweight cores that could be reduced through bifacial thinning to produce usable flake blanks (Kelly 1988).

Cores/Tested Cobbles

The primary function of flaked stone *cores* is to simply serve as a nucleus of raw material from which flakes are removed for subsequent use. While cores themselves can be used for other tasks, that use is considered secondary to their function as a raw material source. *Tested cobbles* are nodules showing only one or two flake scars. Given the number of flaked lithic artifact scatters in the project area, cores and tested cobbles are remarkably infrequent in the assemblages (n=24 at 14 sites).

Only four stone types are present in the core assemblage: local quartzite (n=14), Brian Head chert (n=5), untyped chert (n=2), and petrified wood (n=1). The prevalence of cores made of quartzite pebbles or cobbles reflects the local availability of this stone type. Three morphological types of cores are identified: *amorphous* (unpatterned flaking using multiple core faces as platforms, n=13), *unidirectional* (flakes removed from a single platform face, n=3), and *bidirectional* (flakes removed from dual, opposing platform faces, n=6).

Most quartzite cores are amorphous (n=9); three are unidirectional and only two show bidirectional reduction. In contrast, nearly all of the Brian Head chert cores are bidirectional (n=4) and only one is amorphous. Two amorphous tested cobbles of Brian Head chert are also recorded. The bidirectional chert cores are all small (less than 7 cm in maximum length and less than 2.5 cm in thickness), and only one retained any cortical surface. The intensive, possibly patterned reduction of chert cores may represent the purposeful conservation of this imported, high-quality material. Conversely, the two tested Brian Head chert nodules, both found at the same site, are between 6 to 8 cm in length and 3 to 4 cm in thickness and are nearly completely cortical. The presence of such pebbles is unique to this site, and their origin and function is not understood, but they may represent early-stage cores.

Five of the quartzite cores were recorded at a single-component Numic/Paiute site (42GA5192). One of these cores had been reused as a hammerstone. This site also contained a second unflaked quartzite hammerstone, a quartzite hard-hammer flake, and a quartzite used flake. This site's prevalence of quartzite cores is not unique in the project area, however. At the only other two sites that contain multiple cores (one a multioccupation site [42GA5240] and one a single-component middle Archaic site [42KA5798]), all of the cores are quartzite.

Scrapers and Drills

One drill and five end scrapers are present at the project sites. Irwin (Chapter 7) notes that a second drill (originally thought to be a side-notched arrow point [FS 78]) was collected from Site 42GA5240. Drills are small pressure-flaked tools characterized by a long narrow projection used for drilling or perforating. End scrapers are typically flat, lozenge-shaped tools that often expand toward the distal, functional end, which is marked by a retouched face that forms an acute or right-angled scraping edge. All of the scrapers are made of Brian Head chert. The nondescript drill discussed here is made of obsidian; the side-notched point/drill described in Chapter 7 is made of Brian Head chert.

Two of the end scrapers are fragmentary and unmeasurable. One complete specimen measures 36 mm in length and resembles the type of small end scrapers that are informally called "thumb scrapers." Two other broken specimens are much larger (46 to 76 mm in incomplete length) and appear to have shallow lateral notches for hafting. A nearly complete specimen (Figure 8.14a) was found at Site 42GA5218, a possible late Paleoindian/early Archaic site. No denticulate end scrapers with serrated scraping edges, such as reported by Geib et al. (2001:236), are present.

Used Flakes

This tool category includes purposefully shaped or sharpened flakes that do not conform to the formal categories of scraper or biface (Figure 8.14b). This category also includes unshaped flakes that simply show evidence of use wear (Figure 8.14c). These tools are relatively common (n=37 at 31

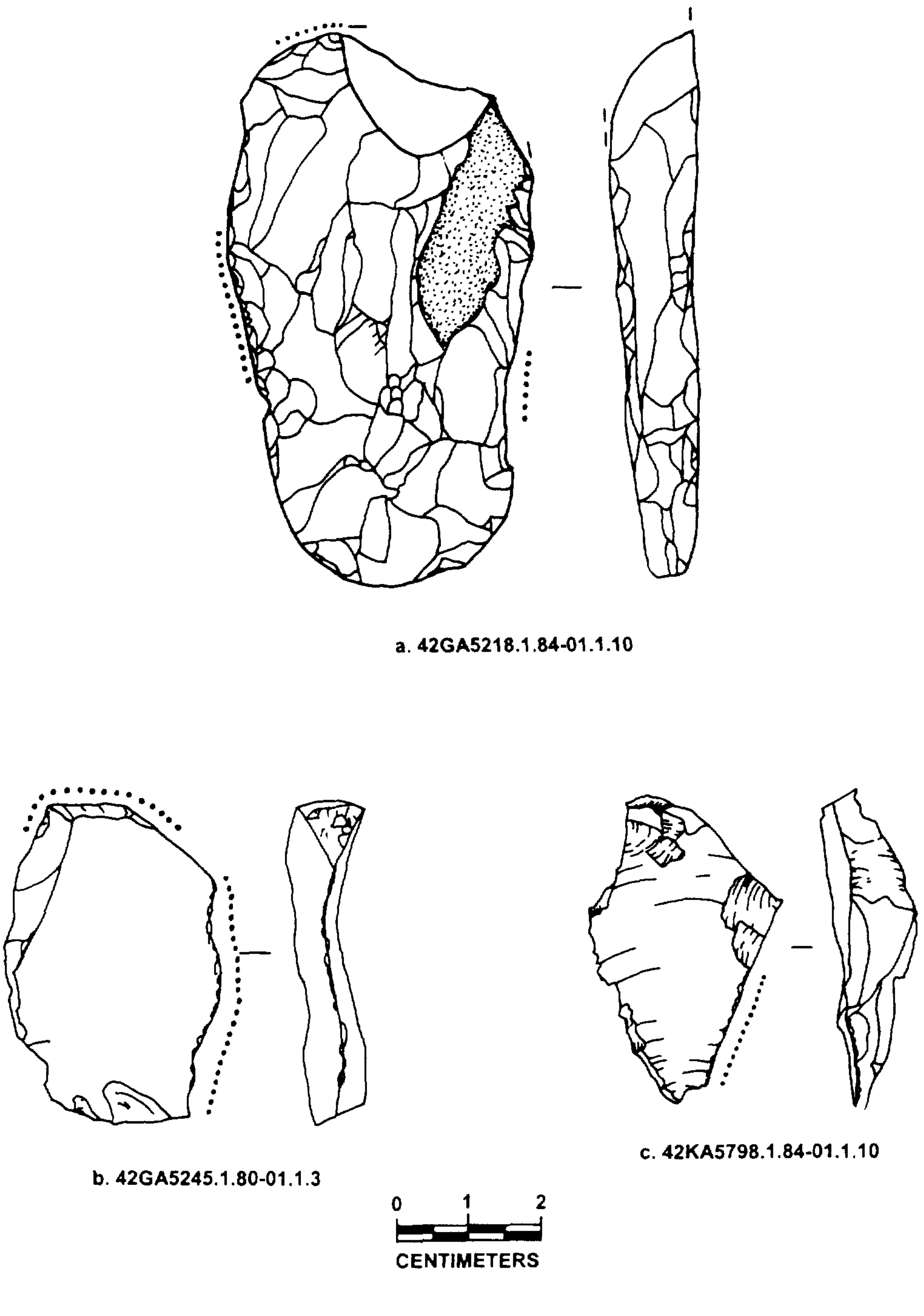


Figure 8.14. A scraper and used flakes from project sites:(a) *scraper and* (b-c) *used flakes. Dotted lines indicate margins with use wear.*

sites). Most used flakes are made of Brian Head chert (n=24), but quartzite forms the next most common used flake material (n=5). Aside from quartzite cores, used flakes represent the only type of tool made from this local but coarse and tough material type.

Twenty-six of the used flakes are noncortical (including 18 of Brian Head chert), indicating that the parent core was substantially reduced when the subject flake was removed. The remaining 11 used flakes are entirely or partially cortical, including all 5 quartzite flakes. The relationship between cortex cover and raw material type further indicates that the Brian Head chert used flakes were generally made from noncortical cores (or bifaces) that were probably in advanced stages of reduction. This characteristic may indicate that the Brian Head chert used flakes were manufactured on the plateau instead of having been manufactured elsewhere and carried in. Local quartzite was used with little removal of cortex, and many quartzite used flakes resemble angular chunks with obtuse or right-angled edges, which still could be used as functional edges (e.g., Crabtree 1977). Conversely, most chert used flakes resemble classic percussion flakes with feathered terminations. Quartzite used flakes are also generally larger (all are 6 to 16 cm across) than used flakes of Brian Head chert (88 percent are between 4 and 8 cm across). These characteristics indicate possible functional differences between used flakes made of the two raw material types.

Fifteen used flakes show signs of purposeful retouch but lack use wear. The 22 items with use wear show varying combinations of retouch, microflake scars, edge rounding, and battering. Flakes made of Brian Head chert dominate all use-wear categories, but no relationship between raw material type and use-wear type is evident.

Technological Aspects of Flaked Stone Debris

Flaking debris is the most common artifact type observed at nearly all project sites. While the term *debris* implies a waste product, some of the flakes probably served as expedient tools during short-term cutting or scraping activities. Because the Bryce Canyon AIS analysis methods did not employ microscopic examination of every flake, probably relatively few of these expedient tools were identified as used flakes.

Still, flakes hold information in their morphology, raw material type, size, and frequency that can be used to infer the technology and techniques that were employed in their creation. Hence, differential patterns of past lithic-reduction behavior, such as core reduction, biface production, or pressure flaking, may be inferred from the flaking debris that was left at these sites, even if the tools have been removed. Data from flaking debris can confirm or expand the information derived from the flaked stone tool analysis. The sum of these analyses may illuminate site functions, and ultimately land-use patterns.

In a preceding section of this chapter, the frequencies of raw material types used for tools were compared to the raw materials found among the flaking debris, and no proportional differences were apparent in the overall site assemblages. This section will return to the issue of lithic material types to evaluate the technological uses to which the various materials were put. Even though similar frequencies of raw material types are present between the tool and flake assemblages, the flaking debris may point out additional activities not indicated by the tools. A primary goal of this study is to determine if the types of flaking debris represent lithic reduction activities that correspond with or contradict the types of tools found at these sites.

Flake Type Frequencies

Field analysts used a polythetic hierarchy of morphological attributes to classify flakes into mutually exclusive flake types. Many archeologists acknowledge that no direct correlation between flake type and reduction technology exists (e.g., Ahler 1989; Sullivan and Rozen 1985), meaning, for example, that biface-thinning activities do not produce exclusively biface-thinning flakes. Still, the proportions of flakes of different types can correlate in a general way to overall reduction strategies, allowing activities such as core reduction to be distinguished from tool sharpening or other activities. The presence of certain flake types, such as pressure, notching, and biface-thinning flakes, even in low frequencies, can also point out with good certainty that specific activities occurred at a site. Flake type definitions mainly follow Ahler (1989), Crabtree (1972), and Newcomer (1971).

Biface-thinning flakes exhibit some combination of several distinctive attributes such as a thin, flat cross section; acute edge angles associated with feathered terminations; multiple dorsal flake scars with little cortex; and a narrow, faceted, prepared, lipped platform with a subdued positive bulb of force. *Biface-reduction flakes* show some attributes of thinning flakes (e.g., dorsal scars, faceted or prepared platforms, etc.) but also show cone-fracture positive bulbs of force or thick cross sections that suggest an origin from other than strictly thinning reduction. These flakes may represent early-stage biface-edging activities, biface-thinning accidents, or biface error-recovery flakes. *Freehand reduction flakes*, produced through direct freehand percussion, display cone or indeterminate platforms. This type generally follows Ahler's (1989:211) definition of hardhammer or other "good" flakes. These flakes possess attributes that allow their orientation to be determined but otherwise lack a technologically diagnostic morphology; they can derive from any reduction technique and are not diagnostic solely of core reduction. *Bipolar flakes*, commonly produced during bipolar core reduction, display sheared, opposed, crushed platforms and accentuated ripple marks.

Pressure flakes, produced with pressure-flaking tools during shaping or sharpening tasks, are often small and show prepared, lipped platforms and parallel dorsal scars. *Notching flakes* are a specialized subset of pressure flakes that show deeply concave dorsal flake scars near the proximal end and a V-shaped platform surface, indicating the flake was removed from the notch of a projectile point. Pieces of *angular debris* are cubical or irregularly shaped chunks that cannot be oriented because they lack any well-defined bulbs of percussion or systematic alignment of cleavage scars. *Potlid flakes* also lack platforms, but they resemble dome-shaped spalls with one flat (often cortical) face; these flakes derive from excessive heating or natural material flaws. Potlid flakes do not provide appreciable behavioral information but can indicate postdepositional fire effects on lithic assemblages.

Table 8.2 summarizes the counts of analyzed flake types at all project sites. Because Brian Head chert is the overwhelmingly dominant raw material (89 percent of the assemblage), flakes of this stone type significantly skew the proportions of overall flake types. Obsidian, local quartzite, and untyped chert constitute the three other most common flake materials. Excluding notching and potlid flakes, the proportions of quartzite flake types do not appear to differ from Brian Head chert, but untyped chert and obsidian appear to have been flaked differently than Brian Head material. Although local quartzite has some empty cell values, a chi-square test of independence indicates flake-type frequencies that are not statistically different from Brian Head chert (χ^2 = 8; df = 4; p = .11). The quartzite assemblage probably appears similar to Brian Head chert due to the predominance of freehand percussion flakes in both assemblages. When the frequencies of obsidian and Brian Head chert flake types are compared, however, significant differences are apparent ($\chi^2 > 37$; df = 4; p < .01). A visual assessment of obsidian flake counts indicates that substantially higher proportions of biface thinning, biface reduction, and pressure flakes are present than among the Brian Head chert assemblage. Similarly, untyped chert also shows significantly different flake type proportions from Brian Head chert ($\chi^2 > 19$; df = 4; p < .01), possibly induced by a lower-than-expected frequency of freehand percussion flakes and a higher-than-expected frequency of biface reduction flakes.

Regardless of raw material type, freehand percussion flakes, especially those of Brian Head chert, predominate. Because these flakes can derive from a variety of reduction techniques including core reduction, biface production, or tool sharpening, the dominance of this flake type cannot be inferred as an indication of a particular reduction strategy. Other more technologically diagnostic flake types such as biface thinning and biface reduction flakes can be taken as fairly certain indicators of percussive biface reduction, however. Pressure flakes represent small tool-production or tool-sharpening activities, and notching flakes specifically indicate projectile point manufacture or maintenance (although this flake type is exceedingly uncommon).

Angular debris, the proportion of which remains fairly constant through time, is composed entirely of chert and quartzite in all time periods. The presence of this flake type, which can be produced during any type of reduction activity, is not technologically diagnostic, but the types of raw materials constituting this flake class further emphasizes the focus on reducing quartzite, Brian Head chert, and other chert at project sites. Other flake types are much less common. One quartzite bipolar flake was identified at an undated lithic scatter site. Four potlid flakes indicate post-depositional fire damage but are not useful for behavioral inferences.

No temporal trends in the relationships between flake size or cortex coverage are evident among different flake types or raw material classes at all sites. Nearly every biface thinning or reduction flake is free of cortex (98 percent), and the majority (92 percent) are relatively small (less than 4 cm in maximum dimensions). Freehand reduction flakes at all sites show a similarly consistent pattern of stable flake size and cortex cover relationships through time, and this pattern does not differ greatly from the biface-production assemblage. Ninety-five percent of freehand reduction flakes are smaller than 4 cm in maximum dimension, and of the remaining large flakes (> 4 cm), many are made of locally available quartzite.

The cortex cover of freehand reduction flakes does differ slightly from biface production flakes, however, in that a fairly substantial proportion of freehand reduction flakes retain some cortical surface. Three percent of the freehand reduction assemblage is entirely cortical, and 90 percent of these cortical flakes are made of Brian Head chert. Eighty percent of these cortical freehand reduction flakes are also smaller than 4 cm across. Thirteen percent of the freehand reduction assemblage shows partial cortex cover, and again, 89 percent of the partially cortical flakes are smaller than 4 cm across. The remaining 84 percent of the freehand reduction assemblage lacks any dorsal cortex and is, again, mainly (96 percent) composed of small flakes. Except for the few exceptionally large, cortical quartzite flakes, the proportions of quartzite flake sizes and cortex cover generally correspond with those of Brian Head chert. These observations suggest that, although minor shifts in raw material preferences may have occurred through time, the residents of the Paunsaugunt Plateau conducted little wasteful lithic reduction. The low incidence of flakes with any amount of cortex indicates that the parent cores or bifaces that were being flaked also retained little or no cortex, meaning that the core pieces were tested and initially prepared elsewhere and brought onto the plateau. The generally small flake sizes also speak to a conservative reduction strategy. Only the largest flakes (including used flakes) are made of local quartzite material, which although fairly abundant, is also relatively intractable. These conservative strategies were apparently in place during the entire tenure of Native American occupation on the plateau (although little can be said about the techniques used specifically by historic-era Paiute groups with the available data).

Overall, the flake assemblages on the plateau generally reflect a high level of chert and obsidian bifacial tool production or maintenance as well as sharpening or fine shaping tasks. The interpretation of these activities from the flaking debris corresponds well with the inferences from tool analysis. The plateau residents, who were without immediate recourse to a source of fine-grained knappable stone, created and maintained flexible, portable, bifacial tool kits made of exogenous materials and supplemented those imported tool kits with simple expedient flake tools made of local, coarse-grained quartzite and occasionally with flake blanks made from imported chert cores or bifaces.

Temporal Changes in Flake Types and Raw Material

Although the flake types indicate that Brian Head and other chert materials were evidently used for manufacturing bifaces, proportionally, obsidian was used much more commonly for this task. Further, nearly all of this obsidian reduction was conducted during the early Archaic period. Obsidian flaking debris is virtually absent from all other single-component sites in the project area (only one obsidian flake was analyzed at a late Prehistoric/Formative period site).

The temporal distribution and types of obsidian tools at the sites do not bear out the flaking debris observations, however. Obsidian tools generally consist of pressure-flaked bifaces or projectile points and are present in low frequencies in nearly all time periods. No large percussion-flaked obsidian biface fragments are present at any dated or undated sites. Still, the flaking debris indicates that these tools were present. Large obsidian bifaces were apparently favored by the plateau's earliest Archaic period residents, who did not shy away from shaping or sharpening these tools or using them to produce usable flake blanks. The bifaces themselves, however, were not left on the sites. Later plateau residents also possessed obsidian artifacts, but little or no maintenance was conducted. This observation may indicate that obsidian procurement was more difficult for later residents, who may have responded with more conservative flaking of their obsidian tools (c.f., Geib et al. 2001:369–370).

Although the overall proportions of biface thinning flakes remain fairly constant through the Archaic, late Prehistoric, and Numic occupations (Figure 8.15), a sharp increase in chert biface reduction flakes at the Numic sites (as opposed to biface thinning flakes) suggests an increase in large biface production in this terminal Native American period. Large Stage 3 and 4 percussion bifaces made of chert become increasingly common at late Prehistoric and Numic sites as well. Despite the prevalence of biface-reduction flakes at Numic sites, a correspondingly high number of early-stage bifaces is not present, however, suggesting that these flakes instead derived from late-stage bifaces.

Conversely, pressure flakes consistently become less common through time. This trend is not reflected in the frequencies of pressure flaked bifaces or projectile points, however, which remain roughly even through time (although the complete absence of pressure flaked bifaces at late Prehistoric/Formative sites is anomalous). The proportion of used flakes showing purposeful retouch also decreases slightly through time, but no causal relationship between counts of retouched used flakes and pressure flakes can be proposed with the available data.

A similarly equivocal trend is apparent among freehand reduction flakes. This flake type constitutes the highest assemblage proportions in all time periods, but these flakes are most common at late Prehistoric/Formative period sites and are somewhat less common at Numic sites. A similar trend among cores is

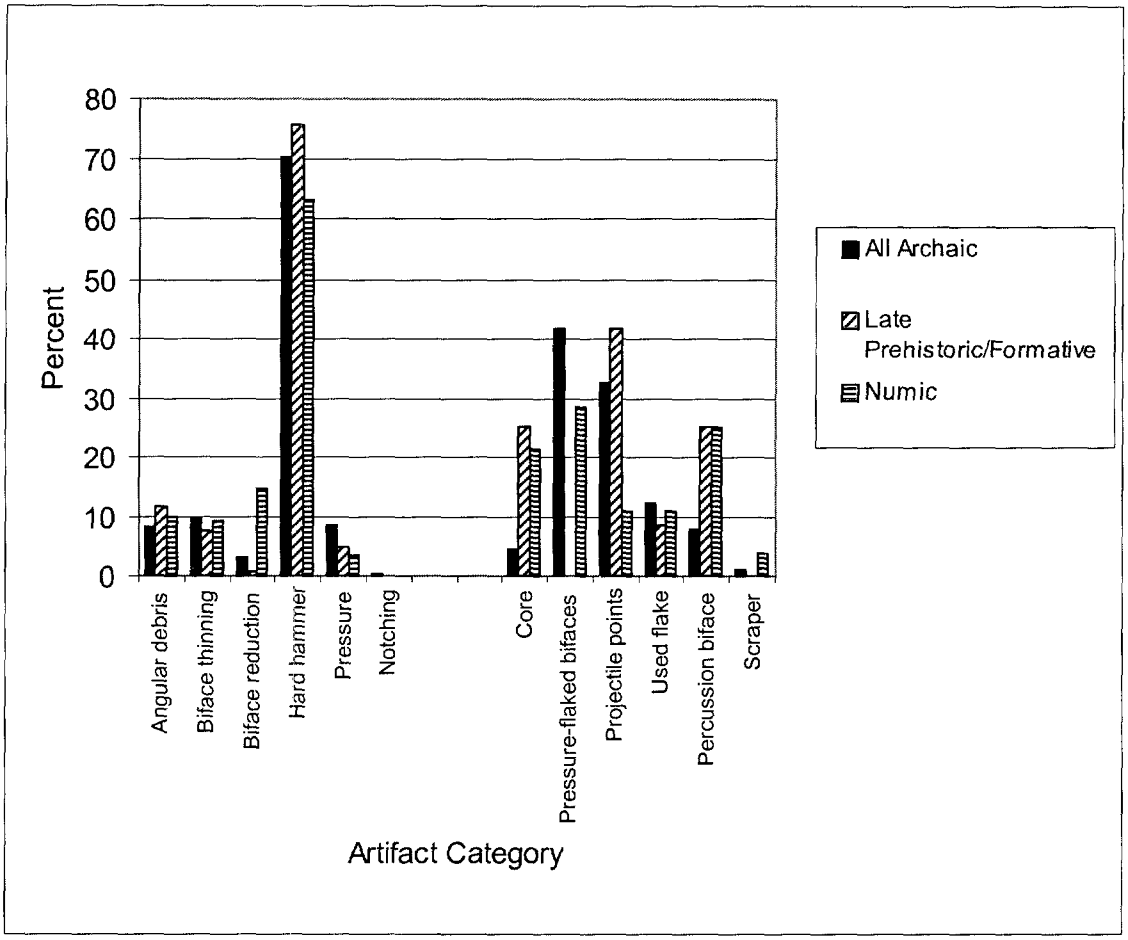


Figure 8.15. ***Frequency of flaking debris types* (left) *and flaked stone tool types* (right) *through time at all single-component project sites. Flake and tool type percentages are calculated separately.***

also observed, wherein cores are most common at late Prehistoric/Formative period sites and decline somewhat in frequency at Numic sites, but again, this relationship cannot be taken as a causal one.

Overall, few obvious temporal trends can be identified in the flaking debris assemblage. Several parallel or inverse temporal relationships are evident among and between certain flake, tool, or raw material types, but few of these relationships are sufficiently strong to allow definitive observations about technological change.

Implications of Flaked Stone Technology

Some inferences about the flaked stone assemblages at the Bryce Canyon National Park sites do not mesh with the interpretations of Geib et al. (2001) at contemporary sites on the Kaiparowits Plateau to the east. These observations indicate that environmental or cultural differences between the two areas may be working in the background. Smaller sample sizes (both in terms of site counts and project-wide artifact counts) may also impinge on the project sites, but some dissimilarities between sites in the two areas are bold and are worth examining.

Archaic and Numic/Paiute Flaked Stone Technology

Geib et al. (2001:369–373) characterize Archaic period sites on the Kaiparowits Plateau as having greater proportions of imported raw material types than post-Formative sites. Obsidian represents the exception to this trend, however, because this material is common at post-Formative sites in the form of used and unused flakes, while few obsidian flakes are present at Archaic sites on the Kaiparowits Plateau. The single-component Archaic and Numic sites on the Paunsaugunt Plateau do not conform to these observations. Instead, obsidian flaking debris is almost entirely restricted to early Archaic period sites, and Numic sites completely lack obsidian debris, although tools and projectile points are present. The obsidian flakes at Archaic period Bryce Canyon National Park sites strongly indicate biface production, which is consistent with Geib et al.'s (2001) general observations about Archaic period lithic technology.

While Archaic period sites on the Paunsaugunt Plateau show a strong overall focus on biface production, expedient tools such as used flakes are also relatively common. After percussion and pressure-flaked bifaces (including projectile points), used flakes are the next most common Archaic period tool type. Further, the proportion of used flakes remains relatively constant from the Archaic period through the late Prehistoric and Numic occupations. This observation stands in contrast with the general technological approach observed at Archaic period Kaiparowits Plateau sites. There, Archaic period sites show two main foci of flaked stone tool use: percussive bifaces and heavy-duty flaked cobble tools. Despite a relative abundance of flaked quartzite cobbles at Paunsaugunt Plateau sites, none were identified as choppers or scraper planes (cf. Geib et al. 2001:370). Used flakes apparently take the place of cobble tools at Paunsaugunt Plateau sites.

The technology of Numic sites on the Paunsaugunt Plateau shows an even greater departure from that of (presumably) contemporary sites on the Kaiparowits Plateau, where Geib et al. (2001:370) characterize the post-Formative strategy as a core-flake technology that included the use of much obsidian. Although the proportion of biface production flakes was not quantified during the Kaiparowits Plateau survey, Geib et al. (2001:370) anticipate "that Post-Formative sites contain far less percussion biface thinning debris than Archaic sites." The incidence of cores at Numic sites on the Paunsaugunt Plateau is in fact higher than at Archaic period sites, but the majority of these cores are made of quartzite and represent particularly expedient items of limited utility, as opposed to the intensive obsidian core reduction seen at the Kaiparowits Plateau sites (Geib et al. 2001:188, 370).

Further, in direct contrast to the Kaiparowits Plateau sites, Numic sites on the Paunsaugunt Plateau show a strong reliance on percussive biface reduction strategies, higher, in fact, than observed at the Archaic period sites. One-half of the single-component Numic sites contain chert bifaces (3 of 6, with one site alone containing five Stage 3 and 4 bifaces), and over 83 percent of sites contain chert flaking debris representing biface production (representing nearly one-quarter of all Numic site flaking debris). Conversely, only 20 percent of single-component Archaic period sites (4 of 20) contain percussive bifaces (one site contains four Stage 2 and 3 bifaces), and 50 percent of sites contain flaking debris from biface production.

The strong evidence of percussive biface use at Numic sites on the Paunsaugunt Plateau supports observations at other regional Numic or Paiute sites, aside from those on the Kaiparowits Plateau. Bifaces are frequently reported by Moffit (1978) and Westfall et al. (1987) at sites with Numic or Paiute components, and Firor (1994) reports that both bifaces and biface-reduction flaking debris is common at two prehistoric Paiute sites near Kanab, Utah. The Kanab sites also contain flake cores, used flakes, and obsidian flaking debris, indicating lithic assemblages of similar diversity as the Bryce Canyon National Park sites.

Late Prehistoric/Formative Period Flaked Stone Technology

Another seeming discrepancy in flaked stone assemblages of the Paunsaugunt Plateau involves the late Prehistoric/Formative period sites. Most of the sites of this age in the park are of unknown affiliation (some may derive from Fremont or Numic occupation), but components of Virgin Anasazi affiliation are known to be present. In the American Southwest, lithic assemblages at Formative period Anasazi sites typically contain low frequencies of formally shaped tools and high proportions of expedient cores, flake tools, and bipolar flakes (Geib et al. 2001:380). Fremont sites often show diverse lithic assemblages that contain finely retouched projectile points, blades, and drills, but these assemblages are mostly composed of utilitarian amorphous choppers, scrapers, cores, and the like (e.g., Adovasio 1970:85; Marwitt 1968; Talbot et al. 1999). The flaked stone assemblages at all of the project's late Prehistoric/Formative sites contain relatively high proportions of biface thinning and pressure flakes as well as projectile points and percussion bifaces (Figure 8.15). Even both of the single-component Puebloan sites contain biface-reduction flaking debris.

The evidence for formal tool use, shaping, or resharpening activities at these sites contradicts common observations of expedient Formative period lithic use (e.g., Nickens and Kvamme 1981; Schwartz et al. 1981). Most interpretations of Formative period assemblages are based on assemblages from permanent habitation sites, however, where sedentism is perceived to drive or allow core-flake technology (Parry and Kelly 1987). On the Paunsaugunt Plateau, differential late Prehistoric/Formative period site functions may be invoked to explain the relatively sophisticated lithic assemblages, where special-use sites required portable, multifunctional tool kits (especially in an area devoid of natural toolstone). Geib et al. (2001) also report extensive percussive biface reduction debris at Anasazi habitation sites on the Kaiparowits Plateau. These observations suggest that some Formative period groups in the western Colorado Plateau regularly used techniques more involved than straightforward core reduction, even at their residential bases. Hence, instances of biface reduction on the Paunsaugunt Plateau generally fall in line with the regional Formative period technology.

Summary of Flaked Stone Technology

The project-wide assemblage contains sufficiently abundant evidence of bifacial tool use and maintenance to suggest that percussion bifaces formed a substantial component of the overall tool kit of the plateau residents. Pressure flaked bifaces, projectile points, and pressure and notching flakes are common, suggesting that the production of these retouched tools occurred on the plateau rather than elsewhere. Cores, by contrast are uncommon, indicating that the flake blanks for retouched tools derived from biface reduction flakes. Few special-function tools are present. Few whole tools are present, indicating conservation of material (or subsequent scavenging, which is also an indication of material conservation). The multifunctionality of the bifaces and the indications of on-site pressure flaking suggest an adaptable tool system. The role that these tool kits play in evaluating site functions is discussed in a following section.

Nonflaked Stone Artifacts

Ground stone and other nonflaked stone artifacts are exceptionally uncommon on the plateau. Overall, only 33 items are inventoried at project sites. Of these, the majority (n=17) are simple manuports such as imported sandstone slabs or quartzite cobbles that show no definite signs of wear or modification. The unworked sandstone fragments probably represent small portions of deteriorated grinding slabs, but tentative functions cannot be proposed for the unworked quartzite cobbles.

Seven other smoothed sandstone slabs are sufficiently intact to identify as grinding slabs. The remainder of the identifiable assemblage contains five small sandstone fragments with smoothing or battering wear, minimally indicating their use as milling implements.

Three of these worked sandstone slab fragments occupy a Paiute site, and probably represent parts of a single milling implement. Two others occupy multioccupation sites of various affiliations. One of the grinding slabs is present at multioccupation site with great time depth, one occupies a late Prehistoric/Formative period site, one is present at an Anasazi site, two occupy Numic/Paiute sites, and two are found at undated scatters.

Two manos are present. One small mano, the only nonflaked item at a complex multioccupation site, is part of an unshaped quartzite pebble. The other, found at an undated site, consists of two fragments of a shaped, two-handed, bifacially faceted, granitic mano. Neither site containing a mano possessed an accompanying nether stone.

Two quartzite hammerstones are also recorded in the project assemblage. One is present at a Numic/Paiute site and one occupies a multioccupation site. Dominguez and Danielson (2000) also report several hammerstones, but given the prevalence of lithic debris on the plateau sites, the general paucity of this tool type suggests either that the knappers used perishable percussive instruments (e.g., antler, wood, etc.) or that percussors were rarely discarded or lost.

As is evident from this summary, late sites, particularly Numic/Paiute sites, are most likely to contain ground stone and other nonflaked stone artifacts. Geib et al. (2001) posit that some of the temporal variation in grinding slab frequency can be attributed to the deterioration of soft sandstone slabs that may have once been present at Archaic period sites, but that proposal cannot be tested with the present data.

Native American Pottery

The Bryce Canyon AIS identified the first Puebloan and Paiute ceramic artifacts in Bryce Canyon National Park. Although pottery-bearing sites are previously reported from the park vicinity (e.g., Dominguez 1989a; O'Connell 1984), such sites are exceptionally uncommon, and the ceramics are often poorly described. For example, O'Connell (1984) actually first reported ceramic artifacts in the park at Site 42GA2634, but he failed to describe or identify the sherds. This site was only positively identified as a Numic/Paiute occupation during a site revisit during the inventory. Similarly, Dominguez (1989a) noted a ceramic and lithic artifact scatter adjacent to park land, but the site is not otherwise described. Elsewhere, Dixie National Forest archeological site files indicate a handful of sites with either Fremont or Paiute ceramics (or both) along the East Fork of the Sevier River west and north of the park (e.g., Gillio 1974; Jacklin 1993a; Snedeker 1982). Kearns (1982:264) also reports a site containing Snake Valley Gray Fremont sherds and a site with Paiute ceramics in Johns Valley northeast of the park.

Scattered sherds or concentrated pot breaks are present at seven project sites. All ceramic samples collected during the inventory were analyzed and assigned type identifications by Doug McFadden, Grand Staircase-Escalante National Monument Archeologist. Four sites contain Southern Paiute Brown Ware sherds. Five sites (including two of the Paiute sites) contain decorated and utilitarian Virgin Anasazi ceramics (Table 8.4; Figure 8.16).

At the three sites representing Puebloan occupations, the preponderance of Shinarump varietals may indicate an affiliation with the Virgin Anasazi groups in the Grand Staircase, because Keller (1987:35–36) and Christensen et al. (1983:45) note relatively abundant similar ceramics in the Alton area, just south of the park. Two of the three Puebloan sites in the

Table 8.4. ***Summary of ceramic artifacts recorded at project sites.***

Site	Site Occupation Period	Type	Form	Count	Comments
42GA2634	Numic/Paiute	Southern Paiute Brown Ware	Jar	14	
42GA2634	Numic/Paiute	Unidentified black-on-gray; Virgin series	Jar	4	Probably a curated item
42GA5192	Numic/Paiute	Southern Paiute Brown Ware	Jar	25	Probable pot break
42GA5244	Virgin Anasazi	Shinarump Corrugated	Jar	2	
42GA5245	Numic/Paiute	Shinarump Red Ware	Jar	1	Tempered with chert-bearing sand; possibly oxidized; probably curated
42GA5245	Numic/Paiute	Southern Paiute Brown Ware	Jar	6	
42GA5262	Numic/Paiute	Southern Paiute Brown Ware	Jar	18	Probable pot break
42GA5278	Virgin Anasazi	Shinarump Gray	Unknown	2	
42GA5278	Virgin Anasazi	Unidentified black-on-gray; probably St. George B/g	Unknown	1	
42KA3288	Archaic/Virgin Anasazi	Shinarump Corrugated	Jar	1	

project area contain solely corrugated sherds, and Keller (1987) attributes such corrugated ceramics to a late Pueblo II period occupation (postdating A.D. 1050), implying that most Puebloan use of the Paunsaugunt Plateau occurred relatively late during their tenure. Keller (1987) also notes a close contemporaneity between the ceramic sites in the Alton area and sites farther south in Johnson Canyon, further indicating a southern origin for the Puebloan groups who used the plateau.

The Virgin Anasazi sherds found at two of the Paiute sites probably represent sherds or vessels that were curated by the Paiute residents (e.g., Fowler and Matley 1979:84–85). The probable southern or eastern provenance of the Anasazi sherds also indicates that some Paiute groups using the Paunsaugunt Plateau originated from or were affiliated in some manner with the Grand Staircase region.

The consistency in vessel form (overwhelmingly jars) at all sites suggests a limited range of storage or cooking functions. Low sherd or vessel counts indicate short-term use of ceramic-bearing site components. Small assemblage sizes and the limited diversity of ceramic types at any single site hinder any further observations.

Native American Feature Types

Two classes of features that can be confidently ascribed to Native American use are present at project sites: thermal features and culturally modified trees. One pictograph panel recorded outside the project boundary strongly resembles a

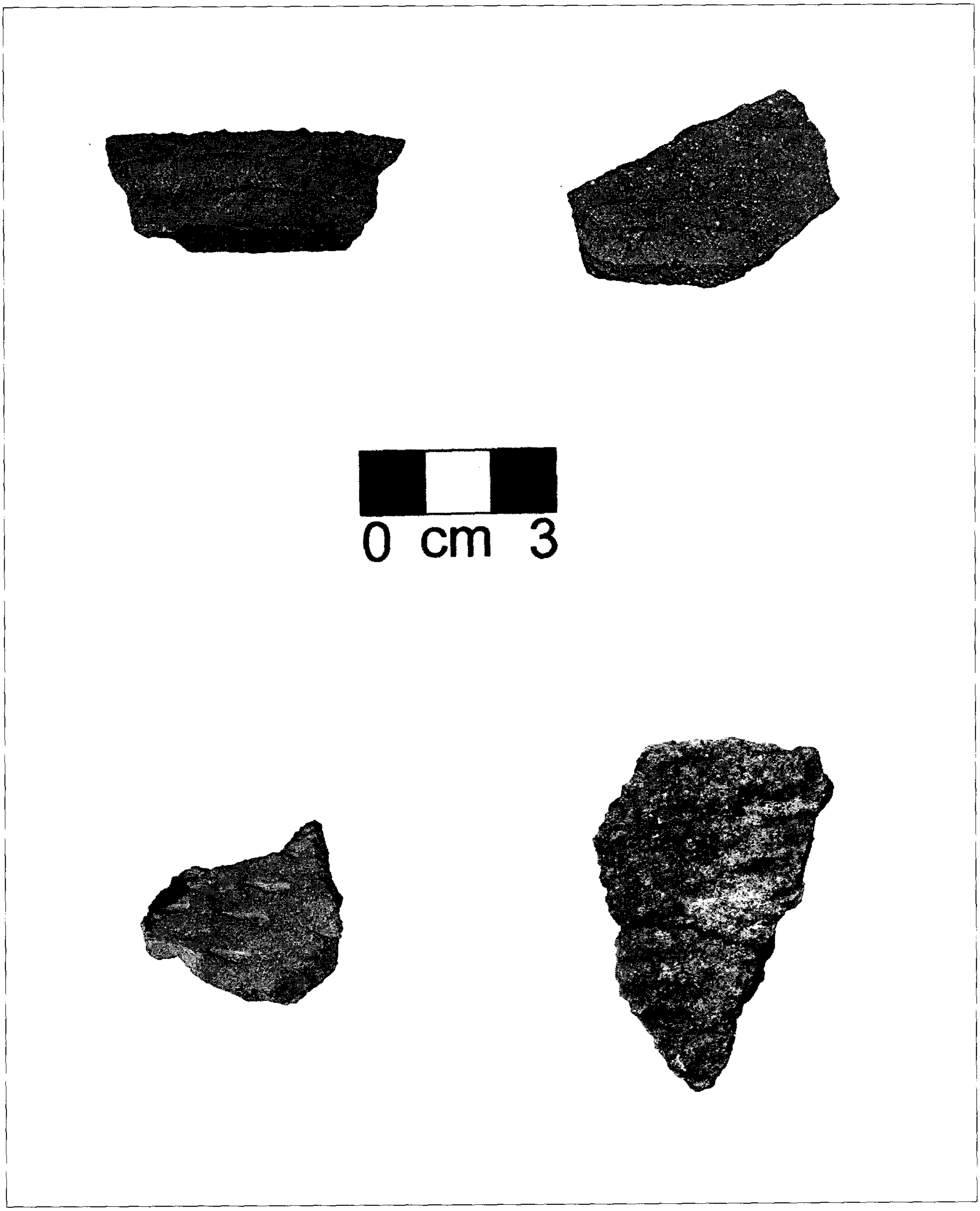


Figure 8.16. ***Sherds collected from project sites: (top) selected Virgin Anasazi Shinarump Corrugated sherds and (bottom) Southern Paiute Brown Ware sherds.***

Native American style, but a Euro-American inscription is also present on the rock face and the panel's actual affiliation remains undetermined. Rock piles or cairns with no signs of thermal use are also present at several Native American sites, but the actual function or affiliation of these features remains unknown. Overall, Native American features of any type are exceedingly uncommon on the plateau, or at least they are rarely visible from the modern surface. No signs of Native American structural or architectural features are known in the park.

Thermal Features

Only two sites recorded during the inventory project contain visible signs of buried thermal features. Dominguez and Danielson (2000) report the excavation of two probable Numic/Paiute thermal features at an additional site (42GA905) north of the project area. These excavated features were visible on the modern surface, and after excavation resembled broad, shallow basins (.8–1 m in diameter and 15–20 cm deep) that contained sparse to abundant charcoal, abundant burned rocks, and few artifacts. Macrobotanical, pollen, and faunal analyses of the feature contents provided equivocal results.

One of the two surface-visible features in the project area is also located at a Numic/Paiute camp, and the second is present at a multi-occupation early Archaic to late Prehistoric/Formative site. Both features are visible as discrete but irregularly shaped clusters of burned rock fragments. The Numic/Paiute feature is relatively large (1-x-3-m across), but the feature at the multioccupation site is roughly the same size as the excavated examples at Site 42GA905. Neither of the features recorded during the inventory were test excavated, and no carbonaceous staining was observed on the modern surface, so their identification as thermal features is tentative. A second scatter of burned rocks also exists at the multioccupation site, but its dispersed nature suggests that it could represent a deflated thermal feature or a midden.

Culturally Modified Trees

No examples of this Native American feature type were previously recorded in Bryce Canyon National Park, but four sites containing a total of 16 trees are now known in the project area. These features are classified as bark-stripped trees (Stryd 1998), from which large rectangular or triangular sections of bark have been removed, exposing the underlying heartwood (Figure 6.6).

Most researchers concur that inner bark was obtained by historic Native American groups for use as food, but the sap or bark may also have provided medicine, mastic, or construction material (Martorano 1981, 1989; Stryd 1998; Swetnam 1984). Bark-stripped trees are widely distributed throughout the American west, especially in the Rocky Mountains, but they are relatively infrequent in the arid southwest or Great Basin regions. DeVed and Loosle (2001) report several clusters of bark-stripped trees in northeastern Utah, and Welsh and Olsen (1969) note a single culturally modified ponderosa pine in Canyonlands National Park. Several additional bark-stripped trees are also known on the Dixie National Forest west of Bryce Canyon National Park, along the East Fork of the Sevier River and farther west near Panguitch Lake. Some of the trees on the Dixie National Forest (called "tanning trees" by a local archeologist) show scar surfaces that are heavily textured with axe marks, suggesting their use as abrading surfaces for hide de-fleshing activities (Marion Jacklin, personal communication 2000; cf. Stryd 1998:47, 65).

The 16 features in Bryce Canyon National Park all appear as rectangular or vertically tapering scar faces on large ponderosa pine trees (1–1.5 m diameter at chest height). Fourteen stripped trees contain single large scar faces and one contains two large scars (typically 50–100 cm wide and 100–175 cm high). One tree exhibits a notably small scar face that measures only 43 cm high by 9 cm across. This feature may represent a tested tree that was abandoned (Swetnam 1984:180–181).

All but one tree in the park exhibit steel axe chopping marks on the scar face. The location and appearance of these axe marks indicate that they are related to the bark-removal process. Many of the axe marks are horizontal and are found at the base of the stripped area, and most axe marks indicate the blows were directed perpendicularly against the trunk. These marks probably represent initial cuts through the outer bark that also penetrated into the heartwood. Shallow, elongated axe marks across the face of some scars indicate that oblique axe blows were occasionally oriented parallel to the wood grain; these marks may have been formed when the bark was stripped from the bole. No trees show the abundant chopping marks found on the "tanning trees" reported from the Dixie National Forest.

The bark-stripped trees in Bryce Canyon National Park most closely resemble the types of culturally modified trees that are typically interpreted as having served as food sources (e.g., Swetnam 1984). The prevalence of steel axe marks strongly indicates that these features date to the protohistoric or historic periods, during which time the region was occupied by Southern Paiute groups. Associated artifacts found at three of the sites lend little support to a Paiute occupation; only one multicomponent site with culturally modified trees contains a Desert-Side notched point (among a variety of Archaic and late Prehistoric period projectile points). Regardless, interpreting these trees as Paiute features is warranted, because, although ponderosa pines may live for 600 years (Martorano 1981:24), steel axe marks indicate a post-Euro-American-contact period of use. Further, the width of the observed axe marks generally indicates they were created with standard single-or double-bit axe or hatchet heads, such as would have been introduced or traded into the area by nineteenth- or twentieth-century settlers. Marks made with earlier Spanish axe heads would have been narrower than those observed at the trees in the park (Charles Haecker, National Park Service, personal communication 2001).

Ethnographic information about Native American practices of stripping bark from trees and processing the products is scarce. Relying heavily on Kutenai ethnographic interviews from Montana reported by White (1954, cited in Swetnam 1984:179–180), Swetnam (1984) infers that much bark peeling was carried out in the spring, because the sap was running in the trees and the bark was easy to peel. Peeling was the task of women, assisted by children. Trees were peeled at locations near camps, and the inner bark was separated from the outer bark at the peeling location because the outer bark was too bulky and heavy to transport. Although special flattened poles and scrapers were used by Kutenai groups to peel the bark from the tree and separate the inner and outer bark (White 1954, cited in Swetnam 1984), the oblique axe marks on the Bryce Canyon National Park bark-stripped trees indicates that axes, rather than special poles, were probably used to strip the bark from the bole. This expedient use of an axe as a bark-stripping tool may imply that these trees were opportunistically peeled.

This observation may indicate that the Paiute peeled these trees during a time of subsistence stress, when the immediate need for food may have outweighed the need to manufacture a specialized tool. Although many native groups in the northern Rocky Mountains and Pacific coast regularly made use of bark foodstuffs (Stryd 1998), many native groups in the American Southwest are believed to have relied on bark mainly during periods of food shortage (Martorano 1981, 1989; Swetnam 1984; cf. DeVed and Loosle 2001). Dendrochronological analysis of these features could reveal the synchroneity (or lack thereof) of these features' peeling episodes, which could further reveal if their use was casual or intensive.

Rock Piles and Cairns

Many rock piles and cairns are present in the project area, and most can be attributed to Euro-American origins; these serve mainly as boundary markers or are waste piles of construction rock. Some of the remaining rock features are located on Native American sites or are found in obscure, isolated locations and appear to bear some antiquity based on their collapsed condition and partial burial under duff and sediment. The few features matching this description may represent Native American constructions, but their affiliation must presently remain undetermined. Two Native American camps near springs (one middle Archaic, the other multioccupational) contain collapsed rock cairns of unknown affiliation that may be related to the Native American occupation. An additional five isolated rock cairns or piles of undetermined affiliation are also present in the project area. Most contain between 4 and 17 rocks and measure less than 1 m in diameter. Some are found on high prominences along the Pink Cliffs rim, while others are buried deep in the forest. Few useful interpretations of these features can be proffered, except to note their possible functions as trail markers, shrines, burial markers, boundary markers, possible thermal features, or other unknown features.

Rock Paintings

The first possible Native American rock painting site recorded in Bryce Canyon National Park lies outside the project area boundary, but it was visited during the closing days of the project. This single pictograph panel (Figure 6.7) occupies a south-facing slickenside rock face in a slightly overhung shelter at the foot of a Claron limestone outcrop at the base of the Pink Cliffs. The panel consists solely of an array of black and red painted vertical lines. Three sets and one isolated line are painted in red; four sets are in black. There are also some irregular lines in black and a few amorphous, poorly preserved areas of red paint. An adjacent Euro-American inscription reads "Joseph W. Thompson / June 23 1891 / July 4." The painted marks may be Euro-American in origin, but they seem to be more stylistically related to regional Native American rock paintings.

Native American Site Types and Functions

Any functional evaluation of past human behavior that collectively addresses archeological material at the component, site, or regional level requires that each component or site first be categorized. Ideally, the categorization process incorporates analytical and descriptive data from artifacts, features, and site attributes to arrive at a site type that accurately characterizes the activities performed by the original site residents. Vagaries of site formation and preservation processes, archeological sampling, and even typology criteria selection often intercede, however, and archeologists must acknowledge that site types cannot fully capture or accurately represent historical realities. These archeological categories in fact impose an artificial order on any emic classifications that the original inhabitants may have used.

Framework of Site Types

Geib and Bremer (1996) used a matrix of coefficients to statistically explore associations among a sample of sites in Glen Canyon National Recreation Area, along the Colorado River east of the park. Although no patterning was presupposed, the sites fell into two first-order clusters: large sites that contained high artifact counts, including tools, and small sites with few artifacts and few tools. The large-site cluster contained no second-order clusters with sufficiently distinctive assemblages to allow further partitioning, however. Despite the initial impression that the cluster containing large, artifact-rich sites could represent camps, Geib and Bremer (1996:144–145, 154) concluded that these sites were actually the products of complex histories of multiple reuses. Conversely the cluster containing small, artifact-poor sites represented a group of specific limited-activity loci for which individual functions could be inferred. Overall, Geib and Bremer (1996:154) found that such a matrix-based analysis is able to differentiate sites that have potentially simple and potentially complex use histories better than it can differentiate functional site types.

Accordingly, when Geib et al. (2001) later surveyed on the Kaiparowits Plateau, sites were categorized intuitively rather than statistically. By modifying a pre-existing typology used by Kearns (1982), Geib et al. (2001:325) identify semipermanent residences, temporary residential camps, processing camps, hunting camps, reduction loci, storage or cache loci, and quarries, as well as indeterminate and unknown/other site types, on the Kaiparowits Plateau. To allow the Bryce Canyon AIS results to be comparable with regional work, this typology is also adopted in the following discussion. Geib et al. (2001:325–341) do not explicate criteria for each site type, but the following attributes are apparent. *Semipermanent residences* evince extended occupancy, perhaps of a full year's cycle, and contain architectural remains, middens, or both. At *temporary residential camps* the important attributes include an abundant and diverse set of stone artifacts, including grinding tools, often co-occurring with hearths and, occasionally, middens. *Processing camps* are temporary resting places and staging points for special-purpose task groups who are believed to have emphasized plant gathering tasks (but not to the exclusion of faunal resources). Artifact diversity is more limited than at residential camps, and certain tool types are dominant, depending on the resource being collected. Hearths may be present but other facilities are lacking. *Hunting camps* are identified principally by the presence of debris from late-stage biface reduction and projectile point bases and other fragments. These sites lack heavy cobble choppers, pounders, or grinding tools. Hearths and burned bone may be present. *Reduction loci* contain debris from nodules or from tool fabrication or production, resharpening, or modification. In cases where the debris derives from tool resharpening, a hunting camp function may be alternately inferred. *Storage or cache loci* may consist of discrete artifact clusters that may be hidden, implying storage, or structural features such as cists. *Quarries* are places where raw materials for stone tool production were procured and initially reduced. *Indeterminate* or *unknown* site types can include rock art sites or small artifact scatters of no apparent unifying theme (Geib et al.'s [2001:341] "tool-kit-guy" sites).

To this list of site types are added two categories that are more descriptive than functionally diagnostic: *complex multioccupation* and *simple multioccupation* sites. Complex multioccupation sites are large sites that show evidence of use during two or more time periods and that contain diverse assemblages. Simple multioccupation sites are smaller and contain less diverse material from only two different occupations. These classes are necessary because it was generally not possible to distinguish and date discrete component areas at the Bryce Canyon National Park multioccupation sites (cf. Geib et al. 2001:348–353).

The multioccupation sites in the project area probably represent palimpsests of multiple temporary residential camps, processing camps, hunting camps, or reduction loci, but the functional history of these sites cannot presently be determined with survey data. The complex sites probably represent favored locales, and as such they probably served domiciliary functions (and hence may be provisionally viewed as temporary residential camps), while the simple sites may represent serendipitous or purposeful reoccupations that could have served any range of functions. The addition of these two site types acknowledges multiple occupations while excluding these presently uninterpretable sites from the following functional typology calculations.

The Functional Role of Flaked Stone Assemblages

Due to an absence of local toolstone sources, the Paunsaugunt Plateau provides an interesting backdrop on which to evaluate some aspects of the flaked stone technological organization of past Native American residents. Raw material availability can significantly affect aspects of stone tool design, use, maintenance, and curation. Andrefsky (1994) proposes that raw material availability is a primary determinant of technological organization, overriding other factors such as mobility or sedentism (cf. Parry and Kelly 1988). Bamforth (1986) and Kelly (1988) recognize the influence of raw material availability on stone tool technology but point out that the degree of logistical or residential mobility (Binford 1980) can also dictate technological organization.

Bleed (1986) notes that the availability of a tool is crucial to conducting an activity and that tools can be designed to be either reliable or maintainable to ensure their availability. Reliable systems can be depended upon to operate in specific tasks when they are needed, while maintainable systems can be easily fixed if broken or altered to function in unanticipated contexts. Each approach has different costs and benefits, and all technologies incorporate some aspects of each system, but one of Bleed's (1986) main points is that all tool kit design and manufacturing activities must anticipate the types of uses to which a tool kit will be put and incorporate the best methods for ensuring the tools' availability. This observation carries powerful interpretive utility for sites on the Paunsaugunt Plateau, because residents of all three time periods (Archaic, late Prehistoric/Formative, Numic) were obligated to carry virtually all their stone tools on to the plateau from elsewhere. The types of tools that were imported can inform about the preparatory activities the residents conducted prior to venturing on to the plateau. Further, the imported tool types, as well as the uses to which these tools were put, can also shed light on the types of activities that the site residents expected to conduct or the residential patterns that they anticipated once on the plateau.

Site Types

In the following section the inventoried sites, which were categorized in the field with strictly descriptive terms, are individually assigned to the functional categories outlined above by intuitively evaluating their contents, condition, size, and other characteristics (e.g., Geib and Bremer 1996:153). Table 8.5 summarizes the postfield assessment results. Hunting camps commonly contain small proportions of pressure flaking and biface production debris as well as either whole or broken projectile points, percussion or pressure-flaked biface fragments, or both. Processing camps contain ground stone artifacts associated with a relatively small flaked stone assemblage of limited diversity. The contents of other site types generally conform to those presented above. No temporary residential camps are identified because no single-component sites with ground stone artifacts and large and diverse flaked stone assemblages are present. Hearths, which are rarely present on the Paunsaugunt Plateau, play little role in the functional assignments. The only sites that may represent residential camp sites are the five complex multioccupation sites, all of which apparently represent lengthy and complicated occupational histories.

Archaic Period Site Types

All single-component Archaic period sites contain either projectile points or pressure-flaked bifaces. Sixty-five percent also contain percussion bifaces, debris from biface reduction and pressure flaking, or both (Table 8.6). The focus on projectiles and cutting tools implicates these sites as hunting loci ("camps" in the typology), although none contain hearths and the actual duration of occupation cannot be evaluated. These sites generally lack bulky cores, ground stone tools, and the like, although several sites contain cores and flakes of local quartzite, which could have been expediently procured and used as needed. No other time period witnessed a similarly one-sided focus on hunting camps; only one other dated single-component hunting camp is present in the project area, although there are several undated hunting camps (Table 8.5).

Table 8.5. Site types in the project area.

	Site Type						
Temporal Affiliation	Hunting Camp	Processing Camp	Reduction Locus	Indeterminate	Unknown	Complex Multioccupation	Simple Multioccupation
Single-Component Sites							
Early Archaic	5	–	–	–	–	–	–
Middle Archaic	1	–	–	–	–	–	–
Late Archaic	3	1	–	–	–	–	–
General Archaic	7	–	–	3	–	–	–
All Archaic Subtotal	16	1	–	3	–	–	–
Late Prehistoric/Formative	1	2	–	5	–	–	–
Numic/Paiute	–	7	–	–	–	–	–
Dated Sites Subtotal	17	10	–	8	–	–	–
Undated Sites	12	4	9	25	1	–	–
Single-Component Site Subtotal	29	14	9	33	1	–	–
Multioccupation Sites							
Late Paleoindian/Early Archaic to Late Prehistoric/Formative	–	–	–	–	–	1	–
Early to Late Archaic	–	–	–	–	–	–	1
Early Archaic to Late Prehistoric/Formative	–	–	–	–	–	1	–
Late Archaic to Late Prehistoric/Formative	–	–	–	–	–	–	1
Late Archaic to Numic/Paiute	–	–	–	–	–	1	–
Archaic to Late Prehistoric/Formative	–	–	–	–	–	1	3
Archaic to Numic/Paiute	–	–	–	–	–	1	2
Multioccupation Site Subtotal	–	–	–	–	–	5	7
Total	29	14	9	33	1	5	7

Table 8.6. ***Characteristics of single-component Archaic period site types.***

	Site																			
	42GA5177	42GA5182	42GA5190	42GA5218	42GA5237	42KA5798	42GA1902‡	42GA3388	42GA5210	42GA5213	42GA1896	42GA3558	42GA3559‡	42GA5200	42GA5209	42GA5223	42GA5235	42GA5284	42KA5773	42KA5813
Period*	EA	EA	EA	EA	EA	MA	LA	LA	LA	LA	GA	GA	GA	GA	GA	GA	GA	GA	GA	GA
Site Type†	HC	HC	HC	HC	HC	HC	PC	HC	HC	HC	HC	Ind.	Ind.	HC	Ind.	HC	HC	HC	HC	HC
Size (m^2)	367	1,323	3,444	1,699	2,128	4,050	1,769	4,199	758	1,543	4,759	420	250	1,348	373	5	554	120	294	392
Total Tool Count	3	3	3	4	9	14	18	4	6	7	5	2	2	3	2	4	3	4	4	2
% Proj. Points/ Pressure Flaked Bifaces	33	67	67	75	89	43	22	75	83	72	80	100	50	100	100	75	100	75	100	50
% Percussion Bifaces	–	–	–	–	–	29	33	–	–	14	–	–	50	–	–	25	–	–	–	–
% Used Flakes	67	33	33	–	11	7	–	25	–	14	20	–	–	–	–	–	–	25	–	50
% Other Tools	–	–	–	25	–	21	39	–	17	–	–	–	–	–	–	–	–	–	–	–
% Ground Stone	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	–
Analyzed Flake Count	7	19	28	70	8	21	29	16	1	4	29	8	1	29	2	–	3	–	–	28
% Biface Production Debris	–	5	14	19	13	29	17	6	–	–	10	–	–	7	–	–	–	–	–	14
% Pressure/ Notching Debris	–	15	7	20	13	5	3	–	–	–	–	–	–	3	–	–	–	–	–	7
% Other Debris	100		79	61	74	66	80	94	100	100	90	100	100	90	100	–	100	–	–	79

* EA=early Archaic, MA=middle Archaic, LA=late Archaic, GA=general Archaic.
† HC=Hunting camp, PC=Processing Camp, Ind.=Indeterminate.
‡ Includes data from Dominguez and Danielson (2000).

A single late Archaic period processing camp is also identified. This site contains a single sandstone mano fragment (Dominguez and Danielson 2000:85) and is positioned adjacent to a spring that was probably a reliable water source. The remaining three Archaic period sites of indeterminate function contain small assemblages that each include two projectile points or bifaces, but they lack tool diversity or lack the appropriate types of flaking debris to qualify as hunting camps under the typology criteria. These sites could also easily be considered hunting locales where no biface reduction took place.

Late Prehistoric/Formative Period Site Types

Single-component sites of this temporal affiliation show a similarly strong pattern toward a dominant site type, but in this case the functional type is the "indeterminate" class (Tables 8.5 and 8.7). These indeterminate sites share a few common themes: all are small, and most contain a projectile point (although one contains a few Virgin Anasazi sherds instead) but lack other tools. All contain a small assemblage of freehand percussion (and some biface production) flakes of various material types, which may or may not be of the same stone material as the projectile points.

In the composition of their flaked stone assemblage, these indeterminate sites are fairly dissimilar from the contemporary processing camp assemblages. One of the processing camps lacks any formal flaked stone tools but contains ground stone. The second processing camp contains a diverse assemblage including two Brian Head chert biface production flakes; a quartzite percussion flake; a core made of a stream-tumbled, untyped chert pebble; a large obsidian retouched used flake; and a sandstone grinding slab fragment; as well as two Virgin Anasazi corrugated pot sherds.

The single late Prehistoric/Formative hunting camp closely resembles those of the Archaic period in that it contains a projectile point as well as biface thinning debris. In sum, the indeterminate sites of this time period do not resemble either processing or hunting camps. While they appear to represent locations where flexible, diversified tool kits were used, the activities that were conducted at these indeterminate sites cannot be determined using the current data and site typology.

Numic/Paiute Site Types

All seven single-component Numic/Paiute sites are classified as processing camps (Tables 8.5 and 8.8). These camps are marked by a constellation of attributes that distinguish them from earlier sites. Three contain ground stone fragments as well as brown ware pottery. Another contains abundant flaked stone tools, a brown ware pot break, and a thermal feature. One contains mostly flaking debris with few tools (but including a diagnostic point), although ground stone items are present among the scanty assemblage. One contains bark-stripped trees and a small flake scatter but lacks any tools, and another consists of only a bark-stripped tree.

Although ground stone artifacts are a common indicator of Numic/Paiute processing camps, only about one-half of such sites contain this artifact class. At the remaining sites, the presence of features or pottery constitutes the diagnostic characteristic. The observation that single-component Numic/Paiute site types diverge so dramatically from those of the Archaic period supports the proposal by Geib et al. (2001:369–373) that ethnographic examples of Numic lifeways may not provide a valid model against which to evaluate archeological sites of Archaic period hunter-gatherers. This topic is further discussed in a later section.

Table 8.7. ***Characteristics of single-component late Prehistoric/Formative period site types.***

	Site							
	42GA3560‡	42GA5193	42GA5202	42GA5203	42GA5205	42GA5244	42GA5278	42KA5756
Period*	LP/F	LP/F	LP/F	LP/F	LP/F	Puebloan	Puebloan	LP/F
Site Type†	PC	Ind.	HC	Ind.	Ind.	PC	Ind.	Ind.
Size (m^2)	14,746	547	1,011	786	3,434	1,180	80	9
Total Tool Count	6	1	1	1	3	3	–	4
% Proj. Points/ Pressure Flaked Bifaces	–	100	100	100	33	–	–	25
% Percussion Bifaces	33	–	–	–	33	–	–	50
% Used Flakes	33	–	–	–	–	33	–	–
% Other Tools	17	–	–	–	34	33	–	25
% Ground Stone	17	–	–	–	–	34	–	–
Analyzed Flake Count	71	8	19	7	13	3	9	17
% Biface Production Debris	6	–	16	–	8	67	11	6
% Pressure/ Notching Debris	9	–	–	–	8	–	–	–
% Other Debris	85	100	84	100	84	33	89	94
Total Ceramic Count	–	–	–	–	–	2	3	–

* LP/F=late Prehistoric/Formative.
† HC=Hunting camp, PC=Processing Camp, Ind.=Indeterminate.
‡ Includes data from Dominguez and Danielson (2000).

Table 8.8. Characteristics of single-component Numic/Paiute period site types.

	Site						
	42GA2634	42GA3387	42GA3488‡	42GA5192	42GA5245	42GA5262	42GA5281
Period*	Numic/ Paiute	PH or H Numic/ Paiute	Numic/ Paiute	Numic/ Paiute	Numic/ Paiute	Numic/ Paiute	PH or H Numic/ Paiute
Site Type†	PC	PC	PC	PC	PC	PC	PC
Size (m^2)	1,306	861	308	623	1,227	858	2
Total Tool Count	10	–	4	15	4	2	–
% Proj. Points/ Pressure Flaked Bifaces	60	–	25	7	25	50	–
% Percussion Bifaces	10	–	–	33	25	–	–
% Used Flakes	–	–	–	20	25	–	–
% Other Tools	20	–	–	33	–	–	–
% Ground Stone	10	–	75	7	25	50	–
Analyzed Flake Count	36	13	33	29	2	30	–
% Biface Production Debris	19	8	33	10	–	40	–
% Pressure/ Notching Debris	6	–	3	3	–	3	–
% Other Debris	75	92	64	87	100	57	–
Total Ceramic Count	18	–	–	25	7	18	–
Culturally Modified Trees	–	2	–	–	–	–	1
Thermal Features	–	–	–	1	–	–	–

* PH or H=Protohistoric or Historic period (based on bark-stripped trees).
† PC=Processing Camp.
‡ Includes data from Dominguez and Danielson (2000).

Multioccupation Sites

The multioccupation sites show roughly similar counts of sites with either "simple" or "complex" assemblages. The size and relative diversity of the assemblages are inferred to represent the intensity of the sites' use histories. Splitting the sites into simple and complex categories provides a simple binary measure of occupational intensity. Simple sites may represent locales that were occupied only twice during separate time periods, and each component is inferred to represent a relatively low-intensity occupation (such as a processing or hunting camp). Complex multioccupation sites probably represent two or more periods of use or residency. One or more of the components at the complex sites are inferred to represent a relatively intensive occupation, such as a temporary residential camp. Conversely, these sites could represent multiple, repeated uses as low-intensity processing or hunting camps. No discrete artifact scatters can be attributed to specific time periods at these sites (cf. Geib et al. 2001). The resulting overlap of occupational residue from multiple use periods renders the site functions uninterpretable with the current survey-based data. No strong patterns emerge in the temporal periods of site reoccupation (Tables 8.5 and 8.9), but many late Prehistoric/Formative and Numic/Paiute sites overlie Archaic period sites. For the purposes of the following discussion, the multioccupation sites are provisionally considered as generalized residential/processing/hunting camps, but because their function during a particular time period is unknown, their interpretive utility is limited.

Discussion of Site Types

Despite low frequencies in some site categories, some temporal patterns emerge, as described above. The relationships between site types, artifact assemblages, and spatial distributions are explored further in this section.

Artifact Assemblages and Site Types

Although ground stone artifacts are not a unique indicator of processing camps, the correlation between Numic/Paiute diagnostic material and ground stone is strong. If all the multi-occupation sites with ground stone are considered (n=6) along with the dated single-component sites with ground stone (n=6), a total of seven sites with ground stone also contain Numic/Paiute components. The remaining five dated sites with ground stone contain late Prehistoric/Formative components (three of which also contain Archaic components). At only one ground stone-bearing site are both late Prehistoric/Formative and Numic/Paiute components found together. Four undated processing camps and one undated indeterminate site in the project area also contain ground stone. The relationship between late sites and ground stone may represent a shift in resource-processing patterns, but as Geib et al. (2001) point out, ground stone artifacts made of the Grand Staircase's friable sandstone are prone to rapid disintegration. Hence, some ground stone artifacts may be absent from early (i.e., Archaic period) sites, a factor that could significantly affect the site type determinations. Similarly, the thermal features and bark-stripped trees at the late-period processing camps are also fragile, perishable archeological remains that might not be preserved at early sites (e.g., Geib et al. 2001). The varying arrays of tools and flaking debris found at project sites speak to the validity of the assigned site types, however. Archaic period sites, which are overwhelmingly identified as hunting camps, contain flaked stone assemblage profiles that dramatically diverge from later sites (Tables 8.6 to 8.8). Even if ground stone implements were added to the Archaic period assemblages, their profile would not match well with that of the Numic/Paiute sites, both in terms of raw material use (see above) and tool and flaking debris proportions.

Table 8.9. ***Characteristics of simple and complex multioccupation site types.***

	Site											
	42GA1899	42GA1901‡	42GA1903‡	42GA1904‡	42GA3383	42GA5201	42GA5215	42GA5240	42GA5242	42KA3284	42KA3288	42KA3289
Period	Archaic to late Prehistoric/Formative	Archaic to late Prehistoric/Formative	Late Paleoindian/early Archaic to late Prehistoric/Formative	Late Archaic to Paiute	Late Archaic to late Prehistoric/Formative	Archaic to Numic/Paiute	Archaic to late Prehistoric/Formative	Early Archaic to late Prehistoric/Formative	Archaic to Numic/Paiute	Early to late Archaic	Archaic to late Prehistoric/Formative	Archaic to Numic/Paiute
Site Type†	CM	SM	CM	CM	SM	SM	SM	CM	CM	SM	SM	SM
Size (m^2)	5,640	1,600	30,402	21,704	3,645	5,432	2,457	1,361	71,581	272	936	320
Total Tool Count	8	2	102	55	2	7	4	12	11	4	10	5
% Proj. Points/ Pressure Flaked Bifaces	75	50	26	33	50	72	100	67	64	75	80	20
% Percussion Bifaces	–	–	49	25	–	–	–	–	–	25	–	60
% Used Flakes	–	–	9	10	50	14	–	8	–	–	10	20
% Other Tools	–	50	16	11	–	–	–	17	–	–	10	–
% Ground Stone	25	–	2	21	–	14	–	8	36	–	–	–
Analyzed Flake Count	27	26	59	27	28	24	6	24	35	26	28	40
% Biface Production Debris	4	–	–	22	4	13	–	4	6	–	–	8
% Pressure/ Notching Debris	15	–	5	11	–	4	–	–	6	15	11	3
% Other Debris	81	100	95	67	96	83	100	96	88	85	89	89
Total Ceramic Count	–	–	–	–	–	–	–	–	–	–	1	–
Culturally Modified Trees	–	–	–	4	–	–	–	–	9	–	–	–
Thermal Features	–	–	–	–	–	–	–	1	–	–	–	–

† CM=Complex multioccupation, SM=Simple multioccupation.

‡ Includes data from Dominguez and Danielson (2000).

One pattern in tool functions that emerges in the Archaic period site types is the prevalence of used flakes (Table 8.6). Used flakes are present at 62 percent (10 of 16) of Archaic period sites identified as hunting camps. No used flakes are present at Archaic period processing camps or indeterminate sites. Similarly, these artifacts are uncommon at late Prehistoric/Formative and Numic/Paiute sites and do not appear at all at the later hunting camps. Two of the Archaic period used flakes are made of quartzite and are probably local products. The remaining nine used flakes at hunting camps are made of Brian Head chert; all but two are completely noncortical, and all measure between 4 and 8 cm across. Because no Archaic period hunting camps contain flake cores (and cores are rare at Archaic period sites in general), the blanks for the used flakes may have been produced prior to the hunting activities. Conversely, the chert flakes may have been produced on site from bifacial cores, but the polythetic flake types of the used flakes are not recorded, so their probable production technique is unknown. The common occurrence of used flakes at hunting sites indicates the hunters were relying on lightweight, flexible tool kits that included the projectile points as well as either the used flakes themselves, or the cores (presumably bifaces) from which the flakes were made. A maintainable, adaptable system such as this is the type that Bleed (1986:741, 745) posits would be used for "forage hunting" of ubiquitous but irregularly available game.

Neither flaked cobble tools (Geib et al. 2001:237–246) nor Cockscomb denticulate tools (Kearns 1982:179; Keller 1987:53–56) are present in any time period. Geib et al. (2001:245) observe that more than half of all residential sites and processing camps on the Kaiparowits Plateau contain flaked cobble tools, which occur during all time periods. The absence of these bulky tool types further speaks to the generally light weight and portability of the tool kits used on the Paunsaugunt Plateau.

Native American Land Use on the Paunsaugunt Plateau

Several possible associations between landform and site type are apparent among the Bryce Canyon AIS sites. The project encompassed only a small portion of the Paunsaugunt Plateau, so this discussion cannot speak to the past land use of the entire plateau. Greater survey coverage and a larger population of sites would be required to evaluate these observations.

Hunting Locales

The spatial distribution of hunting camps does not belie their functional interpretation. Although absolute counts are low and no strong patterns emerge, several clusters of Archaic period hunting camps are apparent in the project area. Five sites ring the meadow of East Creek, where modern populations of pronghorn antelope and elk are abundant. Seven sites occupy Whiteman Bench, three at the northern end and four at the southern. These sites are in less obvious hunting locations, based on modern observations of wildlife, but elk are certainly present on the bench. Although bighorn sheep no longer live in the park, their past presence may also have influenced early hunting practices on the plateau top. Finally, three sites occupy the Rainbow Point and Podunk Creek area at the southern end of the plateau, also in areas where game is not commonly present today.

The distribution of IOs can also illustrate past hunting practices. For example, one particular landform in the park, East Creek Ridge, contains only one site: a sparse, undated lithic scatter. Nine isolated projectile points were collected from this ridge, however, including two untyped arrow points, a Desert Side-notched point, two Elko points, two untyped dart points, a Gypsum point, and an unknown point. Furthermore, fifteen additional nondiagnostic pressure-flaked biface fragments, which most likely represent broken projectile points, are also present on this landform. No other landforms in the project area contain a similarly high density of points and bifaces (Figure 8.17), suggesting that this landscape feature witnessed particularly intensive hunting use.

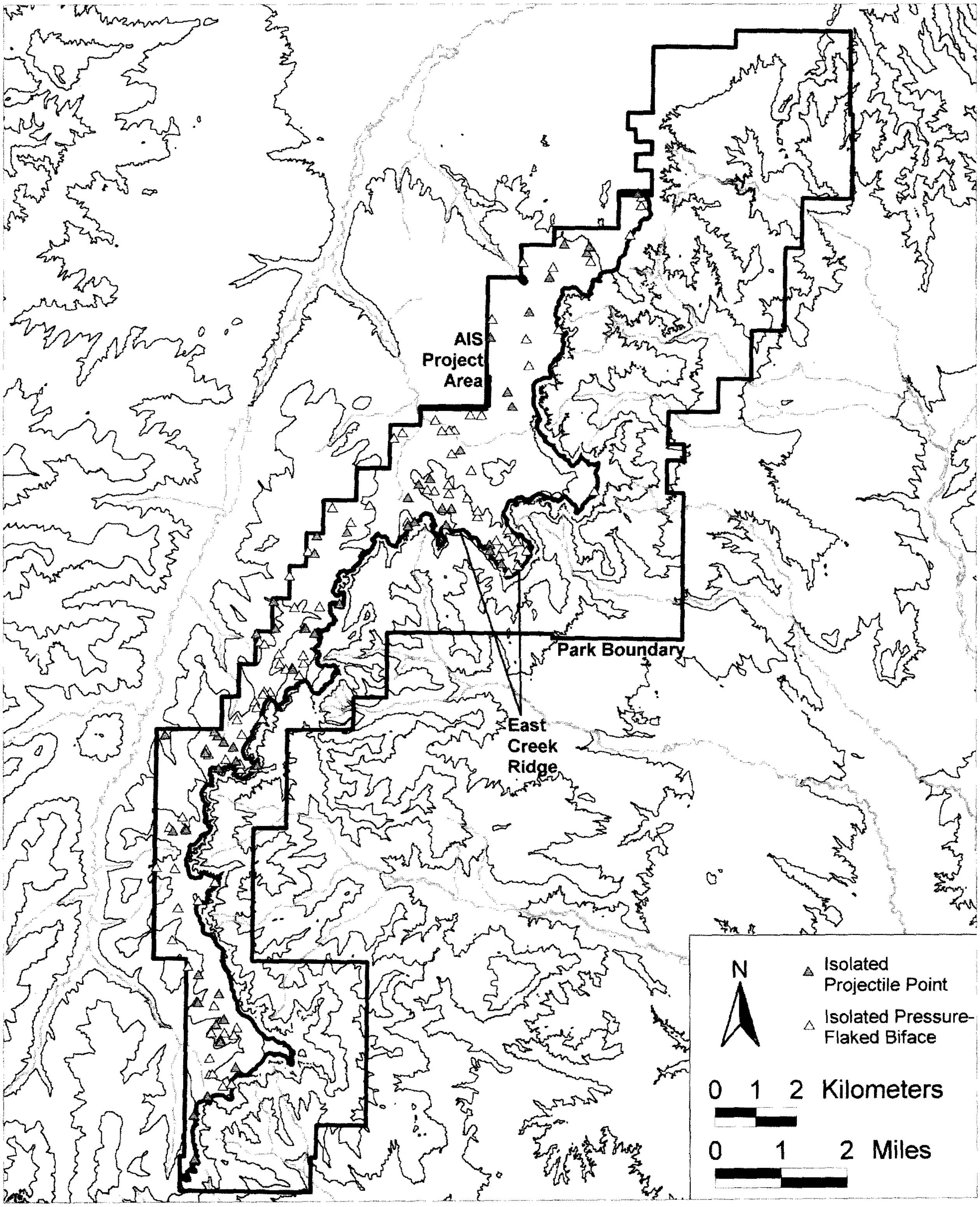


Figure 8.17. Distribution of isolated projectile points and pressure-flaked bifaces in the project area.

The account of Paiute deer hunting related by John H. Davies (Chapter 3) may further suggest that East Creek Ridge was a favored Paiute deer-hunting area. For example, Davies (n.d.:14) mentions a "narrow ridge" "near Sheep Creek" that was "walled in both the eastern and western sides and ending in a perpindicular [sic] cliff at its southern extremity." Davies' characterization matches well with the topography of East Creek Ridge (Figures 1.1 and 8.17). Further, Sheep Creek has its headwaters at the base of the cliffs immediately southwest of East Creek Ridge (Figure 2.2), suggesting that this is indeed the landform in question.

The density of projectile points on this landform (including a Desert Side-notched point) further implies that this ridge is the same as that reported by Davies. At its crest, East Creek Ridge is roughly 800 m (2624 ft) wide. A hunting party with members stationed "along the ridge, about fifty yards [46 m] apart" (Davies n.d.:14) would require about 18 hunters to close off the end of the ridge and another "two or three" to chase the deer back. A similar Paiute approach to cooperative deer hunting is reported by Kelly (1964:48–49), although the size of the hunting party is not noted. During rabbit drives, however, Kelly (1964:50) notes that "10 to 20" drivers and "3–5" net tenders might be involved, providing a head count that is roughly similar in size to the postulated hunting party on East Creek Ridge. Finally, the time depth indicated by the variety of projectile points on East Creek Ridge suggests that hunting drives have long been conducted on this high landform.

Processing Camps

Somewhat surprisingly, a substantial number of the Archaic period and Numic/Paiute processing camps are also located on the relatively high-elevation Whiteman Bench. All others lie north of the bench in lower-elevation settings (none lie to the south at the highest end of the plateau). If complex multioccupation sites are also considered, the count of multifunctional sites on the bench increases further yet, and additional processing camps and complex multioccupation sites lie adjacent to Whiteman Bench along East Creek Meadow (Figure 8.18). The locations of undated functionally diagnostic sites further supports the general distributional patterns of hunting and processing camp sites (Figure 8.19). Much of Whiteman Bench supports a dense modern stand of spruce and fir that differs significantly from the ponderosa pine forests of the lower-elevation plateau-top areas just to the north (Roberts, Wight, and Hallsten 1992). The bench is also relatively flat and easily accessed and traversed, as opposed to the rugged high ridges to the south that have a similar spruce/fir forest cover. The processing camps on the bench appear to be strategically located on this landform for ease of access and may have been oriented toward the procurement of a specific suite of high-elevation botanical resources.

Native American Land Use in Utah's Grand Staircase/High Plateaus

Ultimately, outlining the distribution of individual sites or artifacts across a landform is less illuminating than a temporal evaluation of land use across a range of possible habitable landscapes. Geib et al. (2001:4) note that a "regional landscape is viewed as a composite of opportunity zones that are thought to have conditioned the general placement of sites in both frequency and type." The relatively small portion of the Paunsaugunt Plateau that was examined during the inventory project does not in itself provide an adequate sample of sufficient scale to conduct a regional comparison, and the environmental variation does not adequately encompass the available resource procurement zones that can be found in the Grand Staircase/High Plateau region. Accordingly, the Bryce Canyon AIS project area must be established as a sample area in a regional context.

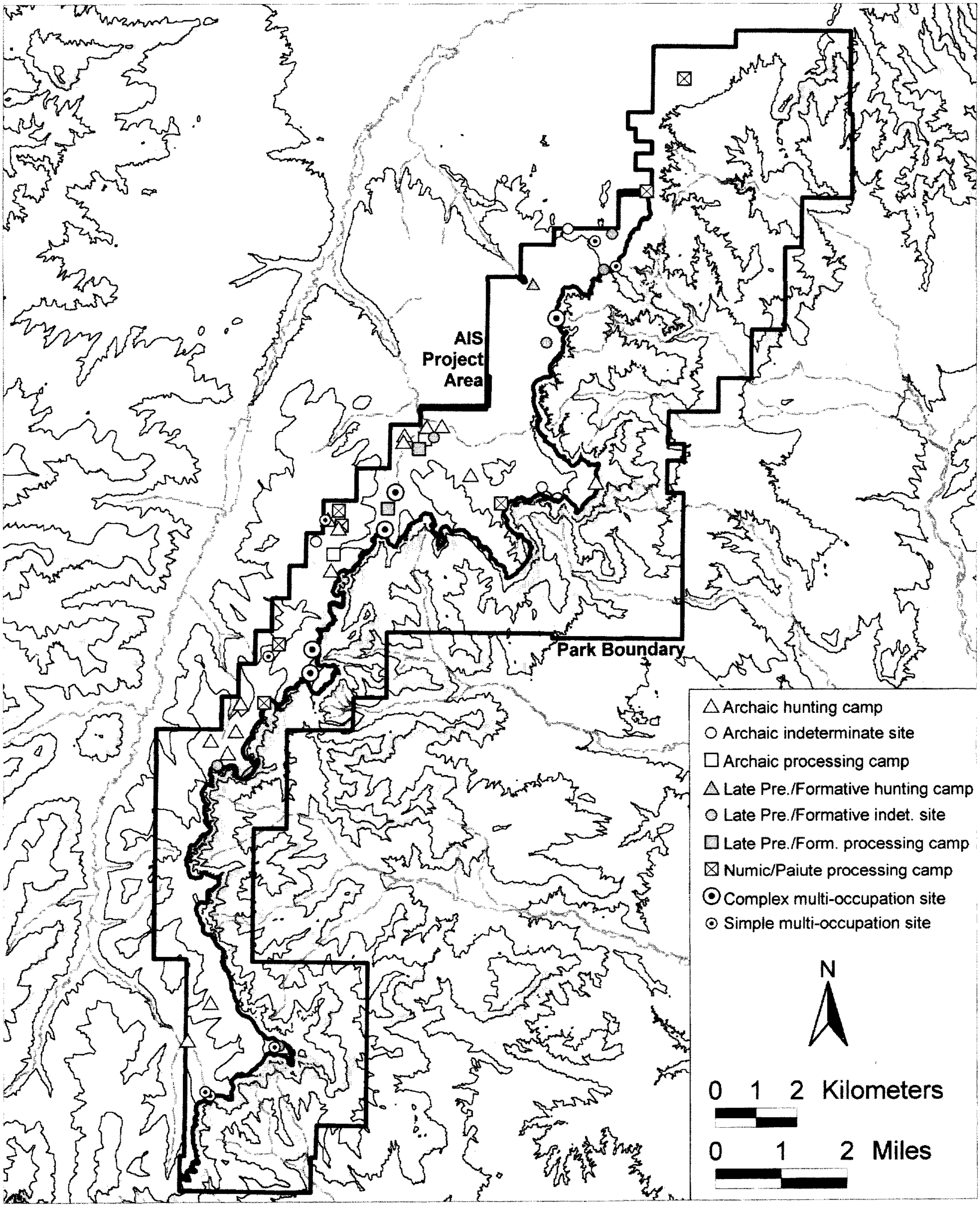


Figure 8.18. ***Distribution of single-component functional site types and multioccupation sites of all time periods in the project area.***

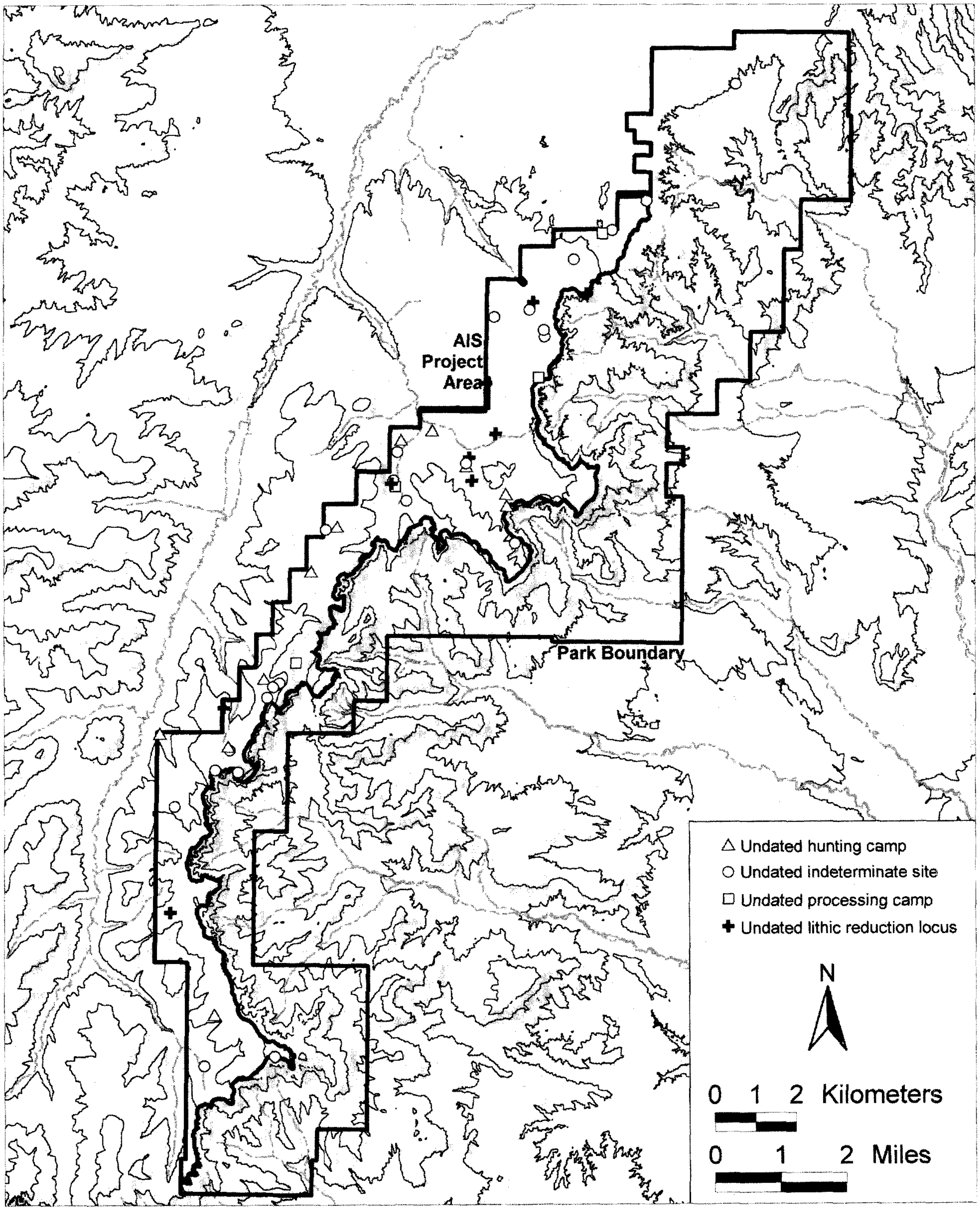


Figure 8.19. Distribution of undated single-component functional site types in the project area.

During their Kaiparowits Plateau survey, Geib et al. (2001) examined samples of nine different physiographic features across a 323,760 ha (800,000 acre) study area. The sampled areas encompassed various steps of the Kaiparowits Plateau ranging in elevation from roughly 1,334 to 1,981 m (4,375 to 6,500 ft) asl. The physiographic features were used as sampling frames to investigate differences in human settlement patterning among environmental zones. Geib et al. (2001:4) used this scale of inquiry "because locational decisions at this scale are more directly related to subsistence strategies, to the resource structure of the landscape, and to changes in this structure from environmental change."

Although Bryce Canyon National Park lies at least 40 km (25 mi) west and north of the Kaiparowits Plateau, the area encompassed by the inventory project can validly be considered an additional sampling frame in the context of regional archeological research. The level of survey intensity in the Bryce Canyon project area matches or exceeds any in the Grand Staircase-Escalante National Monument, and site-definition criteria generally correspond (e.g., Geib et al. 2001:12). The Paunsaugunt Plateau provides an especially valuable region to examine in the context of southern Utah's mesa and canyon country because it represents a high-elevation setting that is not represented in the Kaiparowits Plateau or Glen Canyon areas. The Bryce Canyon inventory area covers mesa tops and canyons ranging in elevation from 2,323 to 2,778 m (7,620 to 9,115 ft) asl, averaging 2,534 m (8,315 ft) asl. Granted, a significant elevational gap exists between the highest Kaiparowits Plateau sampling strata and the lowest end of the Bryce Canyon AIS. Spatially and topographically, several prominent ridges and canyons, not to mention the Paria River and the White and Pink Cliffs, also intervene between the Kaiparowits and Paunsaugunt Plateaus. Regardless of its elevational and spatial remoteness from the Kaiparowits Plateau, the Bryce Canyon project area can be viewed as a representative and comparable sampling frame of one of the highest steps in the Grand Staircase.

Fortunately, areas that encompass the elevational and physiographic zones between the Paunsaugunt and Kaiparowits Plateau study areas have also been examined by previous archeological surveys. For example, Kearns (1982) reports extensive archeological sample surveys in Tract III of the Escalante Project, which covers parts of the foothills of the Aquarius Plateau northeast of the park, at elevations slightly lower than the Paunsaugunt Plateau. Christensen et al. (1983), Halibirt and Gualtieri (1981), and Keller (1987) surveyed extensive sample parcels in the Alton area south and southwest of Bryce Canyon National Park, in the Gray Cliffs region immediately below the Paunsaugunt Plateau. Other comparative high-elevation data is provided by Canaday (2001), who describes an intensive archeological survey at Cedar Breaks National Monument on the Markagunt Plateau to the west, which is situated at a slightly higher elevation than Bryce Canyon National Park. Geib (1989) reports survey results from the lower Glen Canyon benches, in a setting that is generally lower than the Kaiparowits Plateau. Hauck (1979) also summarizes sample surveys throughout much of south-central Utah.

The following assessment of regional settlement trends does not attempt to synthesize all of the data presented by the above-cited projects. The differences in sampling strategies, field methods, site criteria, and site typologies among the projects renders some of the results difficult to reconcile with Bryce Canyon AIS data. By virtue of their similar site typologies, the results and interpretations presented by Kearns (1982) and Geib et al. (2001) are most easily compared with the Bryce Canyon project results. Information gleaned from the other projects will be incorporated when appropriate. The following sections summarize observations of regional land use from the low-elevation, desertscrub settings of Glen Canyon, through the mid-elevation pinyon-juniper woodlands of the Kaiparowits Plateau and Grand Staircase, to the montane High Plateaus such as studied in Bryce Canyon National Park.

Archaic Period Land Use

No permanent Archaic period settlement is apparent in low-elevation settings of the Glen Canyon benches region southeast of the Kaiparowits Plateau (lying at elevations of roughly 1,200 to 1,400 m [3,936 to 4,592 ft] asl). Geib (1989:61) views the benches above the Colorado River as a resource extraction zone where Archaic period foragers used short-term temporary residential camps to harvest grass seeds and opportunistically hunt game. Throughout the Glen Canyon region, Geib (1996a) notes changes in Archaic period occupational intensity and settlement patterns, but these changes are not yet well understood, so the early, middle, and late periods are not distinguished here.

On the Kaiparowits Plateau, hunting camps are the most common Archaic period site type, but together they only constitute one-third of all the recorded Archaic period sites. Residential and processing camps together constitute another one-third of the sites, and reduction loci and unknown sites make up most of the rest (Geib et al. 2001:Table 8.3). Geib's (1989, Geib et al. 2001) view of Archaic period residential mobility on the Colorado Plateau posits that foraging, rather than collecting was the primary mode of subsistence. Hunter-gatherers engaged in a foraging system perpetually move their residential bases to new resource areas, while collectors make use of logistical camps to procure remote resources and return them to a more stable base camp (see Binford 1980).

If a foraging system is presumed for the Archaic period, the distinction between residential and processing camps is problematic (e.g., Geib et al. 2001:332, 367), because processing camps should not be a discrete, common component of a foraging system. Instead, Archaic period processing camps may "simply be scaled-down residential camps" (Geib et al. 2001:367) that are not recognizable as such in the current site typology due to the vagaries of site formation processes or varying use histories and occupational intensities.

The lower steps of the Kaiparowits Plateau (including East Clark Bench, Nipple Bench, Brigham Plains, and Smoky Mountain, which range in elevation from roughly 1,334 to 1,646 m [4,375 to 5,400 ft] asl), lie just northwest of the lower Glen Canyon benches. These areas contain few sites, and "limited activity camps and reduction loci account for a substantial proportion of the sites for these strata" (Geib et al. 2001:367). Although, again, the low-elevation processing camps may actually represent residential camps, Geib (Geib et al. 2001:367) notes that these lower plateau benches can yield abundant botanical resources and, interestingly, proposes here that the "Archaic foragers exploited the resources on the lower elevation benches from camps that were situated in the best areas."

Roughly 93 percent of all Archaic period sites in the Kaiparowits Plateau survey area lie on the highest benches, between 1,829 and 1,981 m (6,000 and 6,500 ft) asl in average elevation. Archaic period residential camps are best represented in the higher-elevation steps of the Kaiparowits Plateau, and a substantially higher proportion of these residential camps date to the late Archaic period than to the early or middle periods. Although site formation processes (such as the disintegration of sandstone milling implements at the oldest sites) could account for part of this apparent difference, environmental change or increased population density may also have prompted more intensive use of the upper Kaiparowits Plateau in the late Archaic period (Geib et al. 2001:367). Hunting and processing camps are also much more numerous on the higher steps of the plateau. The density of hunting camps rises dramatically at an elevation of about 1,646 m (5,400 ft) asl, such as in the Smoky Mountain area (Geib et al. 2001:Table 4.1). Processing camps are not common on steps lying below roughly 1,829 m (6,000 ft) asl in elevation but are frequently found on the Fourmile Bench and on higher steps up to the 1,981 m (6,500 ft) asl level.

At slightly higher elevations, the Skutumpah and Kolob Terraces south and west of Bryce

Canyon National Park, respectively, range from roughly 1,707 to 2,560 m (5,600 to 8,400 ft asl) (Christensen et al. 1983:11; Keller 1987:6). Hence, the lower elevation and vegetation zones of the Alton (i.e., Skutumpah) and Kolob survey areas overlap the higher zones of the Kaiparowits Plateau survey areas, providing environmental continuity between sample frames. Further, the Skutumpah Terrace lies immediately below the Pink Cliffs of Bryce Canyon National Park, providing spatial continuity. Christensen et al. (1983:31–35) divide their study area into zones of high, medium, and low site density. In the Kolob area, most sites are present below 2,134 m (7,000 ft) asl in elevation. Similarly, the eastern Alton area "exhibited major clusters of archaeological sites from 7,000 to 7,200 feet [2,134 to 2,195 m] asl on fairly uniform terrain" (Christensen et al. 1983:34). Keller (1987:93) notes that most sites are found between 6,500 and 7,200 ft (1,981 and 2,195 m) asl in elevation in the Alton area, which matches well with Christensen et al.'s (1983) average Alton site elevation of 6,909 ft (2,106 m) asl. Few sites lie above 2,195 m (7,200 ft) asl in the Skutumpah Terrace area.

Over 90 percent of recorded sites in the joint Kolob-Alton survey area consist of simple lithic scatters or temporary camp sites that frequently contain hearths. No single-component Archaic period sites were identified during the Kolob-Alton survey, so "it is very difficult . . . to definitely state just what Archaic settlement and subsistence patterns were in the area other than to say that they were extensive and apparent across the entire project area" (Christensen et al. 1983:39). The general prehistoric settlement pattern (which presumably applies to the Archaic period sites) is interpreted as one of seasonal resource exploitation (Christensen et al. 1983:85). Keller (1987:106–107) notes that, although 50 to 70 percent of the Archaic period sites contain hearths, sites of later periods contain even higher frequencies of thermal features. Keller (1987:47) attributes this observation either to the erosion of the earlier hearths or to larger populations during later periods. Over two-thirds of all the sites recorded by Keller (1987:48–51) also contain ground stone artifacts, indicating a strong reliance on wild plant resources. Overall, Keller (1987:156) notes that the "sites exhibit a relatively restricted range of characteristics and probable functions in comparison with the range of sites in the region" and observes that "from the early or middle Archaic . . . to historic times, generally similar subsistence activities have been employed by local aboriginal groups, that is, seasonal occupation based in significant part on local wild plant resources" (Keller 1987:51–53). The frequencies of thermal features and milling tools indicate that many of the Archaic period sites on the Skutumpah Terrace may be classifiable as temporary residential or processing camps.

Closer to the Bryce Canyon AIS, the western parcel of the Escalante Project's Tract III area (Kearns 1982) occupies the eastern margin of Johns Valley, which grades gradually into the northern end of the Paunsaugunt Plateau. Only Tract III's western parcel is considered here because of its proximity and similarity to the lower valleys of Bryce Canyon National Park; the discontiguous eastern parcels are excluded because they cover a much greater elevational gradient and represent overly diverse environmental settings. The surveyed blocks of the western Tract III area lie at elevations between roughly 2,073 and 2,438 m (6,800 to 8,000 ft) asl, providing a good sample of elevational settings overlapping with and intermediate to the Bryce Canyon AIS and Skutumpah Terrace areas.

The western Tract III parcel contains 18 sites with Archaic period components (1 early, 3 middle, 5 late, and 9 general Archaic). Most (n=9) represent hunting locales that contain flake scatters with bifaces or projectile points and occasionally cobble unifaces, used flakes, drills, or other tools. The nine other sites contain ground stone artifacts (most commonly hand stones) in addition to other tools. Five of these are interpreted as short- or long-term camp sites, and three are indeterminate hunting/camp sites (the remaining site is multioccupational and the

Archaic component cannot be functionally interpreted). Low site counts in any period preclude the observation of any temporal patterning in the site types. Fire hearths or other features are entirely lacking at these sites, so Kearns's (1982) temporary camps could conversely represent processing camps in the Bryce Canyon typology. Regardless, the proportional increase in hunting camps and the decline in temporary or processing camps (marked especially by the complete absence of thermal features) indicate a substantial change from lower-elevation settings.

Atop the Paunsaugunt Plateau proper, Archaic period sites are almost entirely dedicated to hunting. A single late Archaic period processing camp containing a single piece of ground stone is present. The fact that this site is late Archaic in age perfectly reflects the temporal increase in late Archaic period processing camps also seen on the Kaiparowits Plateau (Geib et al. 2001). Hearths are entirely absent from single-component Archaic period sites in Bryce Canyon National Park, and only one multiple-occupation site with an Archaic period component contains a possible hearth. The paucity of processing or temporary residential camps on the Paunsaugunt Plateau cannot be entirely attributed to the natural deterioration of ground stone implements (cf. Geib et al. 2001), because the preponderance of flaked stone artifact types indicates that light, portable tool kits were the norm. Few bulky cores or cobble tools are present at any sites of this period. At this elevation, the processing camps of the lower Skutumpah Terrace, with their relatively abundant hearths and ground stone implements, appear to have been left behind.

Farther west, the western margin of the Markagunt Plateau occupies a nearly alpine setting at elevations of 3,078 to 3,438 m (10,100 to 11,278 ft) asl. Extensive surveys in Cedar Breaks National Monument (Canaday 2001) document abundant Archaic period sites, but virtually no thermal features or ground stone artifacts are present at sites of any period. Granted, the archeological record of the western rim of the Markagunt Plateau is skewed by the presence of extensive Brian Head chert outcrops, which undoubtedly attracted regional inhabitants for thousands of years. The presence of this extensive chert source probably dictates, to a large extent, the types of sites found in this region, because many visits to the plateau were probably oriented toward toolstone procurement. Tools such as scrapers, choppers, and used flakes are also occasionally present, however, and Canaday (2001:108–109) proposes that hunting was also conducted on the plateau, although on an opportunistic level. Aside from the stone-procurement activities, the Archaic period focus on hunting activities on the montane Paunsaugunt and Markagunt Plateaus appears remarkably similar.

The three main environmental zones covered by the canyon and mesa country of southern Utah (desertscrub, pinyon/juniper woodland, and montane forests) appear to generally coincide with three zones of different types of Archaic period land use. The low-elevation benches of Glen Canyon presently support abundant grass resources, and the types of sites found there indicate a focus on the collection and processing of botanical foodstuffs, probably grass seeds. The mid-elevation woodlands of the Kaiparowits Plateau and the White and Gray Cliffs step of the Grand Staircase support a wide range of floral and faunal resources, and this zone appears to have supported the vast majority of temporary residential camps, as well as many processing and hunting camps. The high valleys flanking the High Plateaus (such as Johns Valley) appear to represent transitional zones, and in the highest-elevation forests atop the plateaus, hunting camps become dominant, almost to the exclusion of other site types. Obviously the modern biotic environments are not representative of the environmental conditions that prevailed during the period of human occupation in the early Holocene Epoch (Chapter 2), but the elevational gradient formed by the topography of southern Utah probably provided a similarly diverse and vertically partitioned set of environmental zones during the Paleoindian and early and middle Archaic periods.

The typical sites found in the lowest and highest elevation settings (e.g., floral resource processing camps and hunting camps, respectively) generally lack certain characteristics indicating intensive, repeated, or long-term use. The settlement patterns in these areas differ markedly from that of the mid-elevation settings. Generally, Geib (e.g., 1989:48; Geib et al. 2001:332, 369) interprets Archaic period hunter-gatherers as foragers who were constantly or frequently moving their residential bases to new resource loci (e.g., Binford 1980). In some cases, however, Geib makes a case for Archaic period logistical procurement. In the lower benches of the Kaiparowits Plateau, Geib (Geib et al. 2001:367) proposes that the Archaic period exploitation of the abundant floral resources was conducted by residents who worked out of camps elsewhere on those same benches, a procurement approach evocative of a collector's strategy. From their bases on the lower Kaiparowits Plateau benches, these collectors could also have made use of the Glen Canyon benches as well.

A similar resource procurement pattern oriented toward faunal exploitation can be discerned at the opposite end of the elevational spectrum. The Archaic period sites that are highest in elevation generally contain portable tool kits oriented toward projectile points and bifaces, few if any hearths are present, and little overall evidence of processing or residential camps is present. These observations suggest that the Archaic period use of the montane plateau tops was limited to specially organized hunting forays that were conducted out of residential camps in the adjacent mid-elevation zones.

This postulated land-use strategy could be used to characterize Archaic period hunter-gatherers as either collectors or foragers, but the reality probably lies somewhere in between the two extremes. The land-use pattern outlined above could indicate that the residents of this time period were mainly collectors who restricted their occasional residential moves to the preferred mid-elevation zones (and occasionally the low-elevation zone) and sent logistical camps to the low or high elevation zones as the opportunity or need arose. Conversely, Archaic period residents may have indeed pursued a foraging subsistence strategy when they were living within their preferred mid-elevation zones, but when the time came to obtain resources from the low and high-elevation zones, it appears that a variant of the collector strategy was temporarily adopted. During these procurement trips, a subset of the residential group may have split off, leaving part of the group in what was essentially a base camp in the mid-elevation zone. The specialized work parties (Binford 1980:8–9) then apparently used logistical camps in the adjacent elevational zones until returning to the mid-elevation zone to reintegrate with the base group and resume a foraging strategy. The past decades of archeological survey now allow the basic strategies of Archaic period land use to be sketched out. Still, more abundant data relevant to artifact and site functions obviously need to be collected (probably from excavated contexts on a regional level) to validate any proposals based solely on survey data.

Late Prehistoric/Formative Land Use

The present inability to assign cultural affiliations to many of the late Prehistoric sites on the Paunsaugunt Plateau diminishes their interpretive value for understanding settlement patterns. If the unaffiliated sites are Fremont in origin, for example, their functional relationship with sites in other elevational zones would be different than if the sites are Puebloan in origin, simply by virtue of the dissimilar lifeways of these two groups. Further, the possible Numic origin of some of the unaffiliated late Prehistoric sites cannot presently be dismissed. A final mitigating factor is the generally equivocal nature of the late Prehistoric/Formative artifact assemblages; few of these sites are given specific functional assignations (Table 8.7).

Accordingly, only the sites that can be attributed to a Formative period origin will be evaluated here. These three sites, containing assemblages with Virgin Anasazi artifacts, are interpreted to represent occupation by Puebloan groups. One of these sites also contains Archaic period material, so its site function cannot be determined. As noted in previous sections, the two single-component Puebloan sites in the project area represent a processing camp and a site of unknown function. No habitation sites are evident in the survey area.

The Puebloan groups who occupied the Virgin Anasazi culture area of southwestern Utah pursued a horticultural lifeway. This subsistence focus is reflected "in the occurrence of permanent architecture accompanied by extensive storage facilities, ceramic production, horticultural implements, . . . and grinding implements" (Altschul and Fairley 1989:101). In the Grand Staircase, sites with structures generally lie between 1,525 and 2,135 m (5,000 and 7,000 ft) asl in elevation (Lyneis 1995). These limits mark the range of possible horticulture: the lower end is constrained by insufficient precipitation and the upper by frost (Fawcett and Latady 1998).

The degree to which these Puebloan groups specialized in horticulture or relied on a mix of horticulture, hunting, and gathering is presently debated (e.g., Fawcett and Latady 1998; Larson and Michaelson 1990; McFadden 1996; Martin 1998). Some who approach the resolution of this question hang the interpretation of specialization versus diversity on the presence or absence of special-activity sites.

> If the local [Virgin] Anasazi practiced a mixed economy, we should expect to find temporary camps and limited activity sites throughout the . . . area, with a higher concentration at higher elevations where dryland agriculture was not possible. If [the Virgin Anasazi pursued an] almost exclusive focus upon agriculture, then temporary camps and limited activity sites should be relatively rare, and settlement should be concentrated at lower elevations around agricultural (structural) sites. (Fawcett and Latady 1998:45)

Such an approach assumes, however, that upland temporary camps or limited activity sites were dedicated to food procurement. This perspective also fails to acknowledge that high-elevation, nonresidential sites are not infrequent in other contemporary Anasazi culture areas (e.g., DeBloois and Green 1978; Orcutt 1999), where a strong reliance on horticulture is generally acknowledged (Martin 1998). Virgin Anasazi diet breadth must be measured with more than a single line of evidence (cf. Fawcett and Latady 1998). Regardless, the common presence of nonstructural sites at high-elevation locales throughout the Grand Staircase indicates that local Puebloan groups either used logistical camps during forays away from their architectural home bases, or they occasionally took up a full-time foraging lifeway (which seems to be the crux of the debate; see Lyneis 1995:226–227 for a review).

South and west of Bryce Canyon National Park, Christensen et al. (1983) report a single Anasazi habitation/village site in the southern, lower end of the Kolob Terrace survey parcel, and note that the southern margins of both the Kolob and Skutumpah Terrace (i.e., Alton) parcels appear to lie just within the northernmost, highest reaches of the range of Anasazi architectural sites. In this area, architectural sites appear to be limited to settings lying below roughly 1,920 m (6,300 ft) asl in elevation. Christensen et al. (1983) conversely note that small, limited-activity Anasazi sites are present across the entire extent of both the Kolob and Skutumpah Terrace survey areas, at a density exceeding all preceding or subsequent time periods. Keller (1987:41) supports this observation in the Alton area. The observed site types consistently indicate seasonal exploitation of local resources.

The types of Puebloan limited-use sites recorded on the Paunsaugunt Plateau are not unexpected, but they do contain exceptionally depauperate artifact assemblages, even when compared to the material at the temporary camps on the Skutumpah Terrace, which is the step immediately below the southern Pink Cliffs. The sites on the Paunsaugunt Plateau are also completely lacking in features. The dramatic difference in site density between the Paunsaugunt Plateau and Skutumpah Terrace further indicates a precipitous drop in occupational intensity on the high plateau, despite its proximity to the relatively well-used terraces below. This difference in use is apparent even if all late Prehistoric/Formative period sites on the plateau are considered in addition to the known Puebloan sites. Apparently, the top of the plateau did not contain sufficiently unique resources that could not be acquired in other occupation zones. The time and energy expenditure that would have been needed to climb the roughly 500-m-high Pink Cliffs step from the south appears to have precluded substantial Puebloan period use of the plateau.

The site-specific locations in the project area indicate that, when Puebloan groups did climb the plateau, they stayed near the tops of passes through the Pink Cliffs. The near-absence of Puebloan sites from the interior of the Paunsaugunt Plateau supports this contention. Hauck (1979:233–241) reports two Puebloan artifact scatters at elevations of 2,134 m (7,000 ft) asl in a sample survey of the Paunsaugunt-Sevier Planning Unit, but both these sites actually lie well east of the park in the Kaiparowits Plateau area (cf. Dominguez and Danielson 2000:11). Hauck (1979:Figure 3-6) also maps a third Puebloan site in the Paunsaugunt-Sevier Planning Unit in a location north of the park, apparently along the west bank of the East Fork of the Sevier River, but this site is not described. Kearns (1982:269–270) questions the Anasazi affiliation of two of these sites, which may have been dated through projectile point typologies. The nearest substantial cluster of sites (consisting of temporary and extended camps) recorded by Hauck (1979) also lies in the Kolob Terrace to the south. To the east, Puebloan sites cluster around the town of Escalante and become more frequent to the south, on the Kaiparowits Plateau. High-elevation Puebloan sites are generally uncommon throughout Hauck's (1979:218) study area; all but two lie below 2,377 m (7,800 ft) asl in elevation. A lithic scatter attributed to the Anasazi lies at 2,951 m (9,680 ft) asl in elevation near the Aquarius Plateau, and a cist in the Kolob area was found at 2,597 m (8,520 ft) asl in elevation.

Conversely, a handful of Fremont sites are known on the top of the Paunsaugunt Plateau northeast and northwest of Bryce Canyon National Park. By extension, it is possible that some of the unaffiliated Formative period sites in the park may derive from Fremont use, although the regional affiliation (i.e., Parowan or San Rafael) remains unclear. Kearns (1982:403) proposes that the Fremont occupants of the eastern parcel of Tract III (east of the Aquarius Plateau) derived from the permanent settlements in the valley of the Escalante River, farther to the east. Many other unaffiliated late Prehistoric sites in the project area probably represent Numic/Paiute occupation, which is well represented within the park.

Numic/Paiute Land Use

On the Paunsaugunt Plateau, all single-component Numic/Paiute sites are classified as processing camps. Two additional multicomponent Native American sites with bark stripped trees can also probably be added to the list of Numic/Paiute processing camps. Similarly, processing camps constitute the most common post-Formative site type on the Kaiparowits Plateau (44 percent). Hunting camps are the next most frequent site type on the Kaiparowits Plateau (27 percent), and temporary residential camps make up only 15 percent of the identified Numic/Paiute sites (Geib et al. 2001:396). Many Kaiparowits Plateau sites that are classified as processing camps contain a similar range of artifact and feature types as residential camps, only in smaller quantities. Accordingly, Geib et al. (2001:332–335, 396) suspect that Numic/Paiute processing camps actually represent temporary residential camp sites that were occupied by small groups. The common presence of thermal features and ground stone artifacts at these sites makes this supposition tenable.

On the Kaiparowits Plateau, Numic/Paiute residential, processing, and hunting camps are absent in the lowest elevation zones and are most common in the highest zones (Geib et al. 2001). Paiute sites are also relatively common in the Alton area on the Skutumpah Terrace (Keller 1987:39–40). Nearly one-half of the Paiute sites in the Alton area contain clusters of ground stone artifacts, and 90 percent contain hearth features, including many hearth clusters (Keller 1987:106). As among the Archaic period sites, the frequencies of thermal features and milling tools indicate that many of the Paiute sites on the Skutumpah Terrace may be classifiable as temporary residential or processing camps. Christensen et al. (1983:85) identify these sites as pinyon nut gathering locales, but the common presence of thermal features and the consistent placement of sites near water sources (Christensen et al. 1983:67; Keller 1987:98) suggest more of a residential function.

Kearns (1982) reports a single Paiute temporary camp in the Johns Valley area. The Numic/Paiute sites in the Bryce Canyon project area carry this pattern of small processing or residential camp sites to the very highest step of the Grand Staircase. In their artifact assemblages, the plateau-top Numic/Paiute sites appear to functionally resemble sites in lower settings. The single Numic/Paiute site in Cedar Breaks National Monument, which lies above 3,200 m (10,500 ft) asl, contains ceramics and ground stone artifacts, suggesting that it too is classifiable as a "processing" camp (although this site also has Archaic period material that may obscure site functions; Canaday 2001:45). The primary difference seen at the high-elevation Numic/Paiute sites is an exceptionally low count of thermal features, but the few known hearths in Bryce Canyon National Park are almost entirely found at Numic/Paiute sites.

Overall, the plateau-top Numic/Paiute land-use strategy closely resembles the contemporary Paiute strategies of lower-elevation land use. This relationship differs from that of preceding periods. During the Archaic and late Prehistoric/Formative periods, the range and types of sites on the plateau differ substantially from those in lower-elevation settings. The plateau mainly appears to have been used logistically for the procurement of specialized resources during these early periods. Conversely, the Numic/Paiute use of the plateau top appears to represent simply an extension of the same land-use strategy that was pursued in lower elevation zones, a phenomenon that is explored in the concluding section.

Conclusions

Archeological interpretations of Great Basin Archaic period lifeways commonly draw behavioral analogues from Paiute, Shoshoni, and Ute ethnographies (e.g., Kearns 1982; Thomas 1973). The process of drawing analogies between these historic hunting and gathering groups and the Archaic period groups seems straightforward because of geographic proximity and perceived adaptational similarities, but the validity of this practice is coming into doubt. In short, archeological, ethnographic, or ethnohistoric examples of Numic lifeways may not provide a valid model against which to evaluate Archaic period lifeways.

Geib et al. (2001:369–373) point out significant differences between the archeological materials of Archaic period and Numic/Paiute hunter-gatherers on the Kaiparowits Plateau. Sites of these two periods show dissimilarities in the types of toolstone, proportions of tool types, site sizes, artifact densities, and, to a limited degree, distributions of site types across the landscape. The obvious question asks "why [does] the record left by Archaic foragers . . . appear different from that of Post-Formative Paiute foragers of [the] same region" (Geib et al. 2001:369)? After careful evaluation Geib et al. (2001) determine that these differences are not attributable to site-formation processes but appear to represent actual behavioral differences.

The differences between Archaic period and Numic/Paiute artifact assemblages from the Paunsaugunt Plateau have been previously discussed in this chapter. The most dramatic contrast between sites of these periods, however, lies in the proportions of functional site types. Virtually all of the single-component Archaic period sites are identified as hunting camps, whereas all of the single-component Numic/Paiute sites (and some of the multicomponent/multioccupation sites with Paiute material) are considered processing camps, which most likely represent small temporary residential sites, as discussed above. These observations highlight the greatly different uses to which the plateau-top resources were put during the two time periods. The Numic/Paiute land-use strategy for the plateau-top zone (as interpreted both from archeological material and from ethnohistoric accounts such as the Davies [n.d.] memoir) certainly cannot be used directly as a proxy for the Archaic period use of the Paunsaugunt Plateau.

The substantial ecological changes that attended the early-to-middle Holocene Epoch may underlie the different patterns of hunter-gatherer land use on the plateau. If this were true, the high-elevation Numic/Paiute sites should be expected to resemble lower-elevation early Archaic period sites, for example, which would have been located in more mesic, forested settings during their period of occupation (Chapter 2). The Numic/Paiute sites on the montane Paunsaugunt Plateau do not resemble Archaic period sites in other lower settings, however. Simple environmental differences cannot readily explain the consistent temporal disparities in land use within or between elevation zones.

That the differences between Archaic period and Numic/Paiute land-use strategies are real is apparent. What these differences mean is less so. Ethnographic and ethnohistoric accounts of Southern Paiute groups in southern Utah generally indicate these groups conform most closely to what Binford (1980) calls a foraging subsistence-settlement system. Foragers have high residential mobility and seasonally move their base camps into different resource areas. Food is collected daily and returned to the base camp. Few functionally specific task sites are necessary.

If Numic/Paiute archeological sites represent the residue of a known foraging system, and Archaic period archeological sites are acknowledged to be different from Numic/Paiute sites, the logical extension of the argument posits that Archaic period hunter-gatherer groups did not pursue a strictly foraging subsistence-settlement system (*contra* Geib 1989:48; Geib et al. 2001:332, 369), at least not one that is comparable to that of the historic-period Paiute. It is beyond the scope of these concluding remarks to completely reevaluate the Archaic period subsistence system of southern Utah, but in the Kaiparowits Plateau region, for example, the relatively common presence of large, artifact-rich, Archaic period residential camps, in conjunction with abundant evidence of special-function logistical sites such as hunting and plant-gathering camps, suggests that the Archaic period residents pursued a strategy that is closer to Binford's (1980) collector subsistence-settlement system. The data from Bryce Canyon National Park, which indicate a specific focus on Archaic period logistical hunting camps in the absence of residential camps, further support this inference. The collector-forager dichotomy is not mutually exclusive, however, and the Archaic period hunter-gatherer groups of Utah's mesa and canyon country may have adopted any number of strategies in the spectrum between these two extremes. Interpreting these groups as strictly foragers, however, is not presently supportable with regional survey data.

9

Euro-American Archeology

Sue Eininger

The historic presence of Euro-Americans is well documented atop the Paunsaugunt Plateau within the present-day boundaries of Bryce Canyon National Park. The Bryce Canyon AIS identified numerous archeological resources representing late nineteenth- and early twentieth-century Euro-American activities. A variety of cultural features including aspen dendroglyphs, checkdams, spring-development features, campsites, trash dumps, and artifact scatters are documented at 107 sites and 4,606 IOs. These resources comprise the physical evidence of Euro-American land-use patterns both before and after establishment of the park. Many of the sites are affiliated with seasonal use by livestock herders and represent several decades of livestock grazing on public lands. Some sites are associated with the development of early twentieth-century tourist facilities, indicative of a growing commercial presence on the plateau. Other sites are affiliated with the establishment of Bryce Canyon National Park and are the result of subsequent land management and administrative actions. The following chapter presents a discussion of these various Euro-American pursuits and explores the ways in which the archeological materials represent past activities.

Archeological Evidence of Livestock Grazing

Although livestock grazing atop the Paunsaugunt Plateau is well documented (e.g., Ahlstrom 1935; Alexander 1973; Bradley 1999; Broyles 1969; Condie 1963; Daughters of the Utah Pioneers 1949; Davies n.d.; Hansen n.d.; Newell and Talbot 1998; Riggs 1978; Robinson 1970; Rumberg 1956), archeological evidence of this activity is uncommon. The ranch complexes, permanent structures, established campsites, and corral areas that characterize large-scale livestock operations in other parts of the American west are absent from the park's plateau-top resources. In contrast, ranching sites in the park are more ephemeral. Their unobtrusive character is indicative of the small-scale family and community-run herding operations that characterize Mormon homesteading traditions. The mobility requirements of these seasonal herding activities and the remoteness of the high-elevation plateau provided little opportunity for the accumulation of substantial material goods, and as a result, the physical evidence of these activities is sparse across the landscape.

Two types of archeological resources in the project area are associated with ranching activities: historic inscriptions and water-impoundment sites. Although they represent limited-activity areas and are largely devoid of associated artifacts, these sites can be dated and affiliated with specific individuals or groups (unlike many ephemeral stock-raising sites). The data collected from these archeological remains, together with the vast array of written records detailing local history, provide a unique opportunity to explore the lifeways of historic herders atop the Paunsaugunt Plateau.

Historic Inscriptions

Historic inscriptions represent the most abundant and visible Euro-American resource identified during the survey. A total of 1,081 inscriptions was recorded at 74 sites and 57 IOs (Figure 9.1). This total includes 1,075 aspen dendroglyphs, 3 inscribed bark-stripped trees, 2 water troughs, and 1 rock inscription. Although not all of the inscriptions are attributed to livestock-herding activities, the vast majority appear to be associated with late nineteenth- and early twentieth-century herding atop the plateau.

Dendroglyphs

Nearly every aspen grove across the park's plateau top contains evidence of dendroglyph carvings. These groves are scattered throughout the southern two-thirds of the project area, extending from Yovimpa Pass at the southern end of the park to East Creek Meadow in the north-central portion (Figure 9.1). This distribution coincides with north-to-south changes in elevation and topography that define the extent of aspen habitat across the landscape. Most of the dendroglyphs lie in canyon bottoms along the western edge of Whiteman Bench. Others are concentrated in groves along the edges of high-elevation meadows. Some occur as IOs, where only one or two carvings exist in an aspen stand. Others occur in dense clusters, with as many as 65 dendroglyphs recorded at a single site. At most of the sites, the dendroglyphs are the primary, if not only feature type observed. In only a few instances was historic refuse noted at a dendroglyph grove.

Dendroglyphs range from carefully rendered inscriptions to crude carvings with little detail. For the most part, they appear to have required little time investment and no particular artistic talents. Text elements are predominant and consist of personal names, dates, place names, initials, and comments or exclamations. Script styles are as varied as the carvers who produced them. Block letters, cursive, decorative flourishes, and varying combinations of lower and upper-case letters create a wide range of presentations (Figure 9.2). Graphic imagery is even more varied in style and artistry. Drawings range from simplistic depictions to detailed, realistic representations. Most stand alone as single elements. Elaborate compositions comprised of multiple elements are rare.

Names and initials, identified at 887 of the 1,075 dendroglyph panels, are by far the most common element type. Mallea-Olaetxe (2000:29), in his study of Basque shepherd dendroglyphs in the western United States, concludes that "the sheepherder's primary purpose and ambition when approaching an aspen with his knife was to carve his name and date." The need to identify oneself and assert one's presence in the world is aptly demonstrated by the numerous names represented among the dendroglyph panels in Bryce Canyon National Park. First names, surnames, and initials were observed in various combinations with or without associated dates. More than 100 individual's names, 60 surnames, and 200 combinations of initials are identified. Many of the names recur frequently within the project area (Figure 9.2). One person's name might be carved several times on a single tree, found on different trees within a site, or seen at various site locations across the landscape. Commonly, two to four different names or initials are seen on a single dendroglyph tree. Some of the multiname

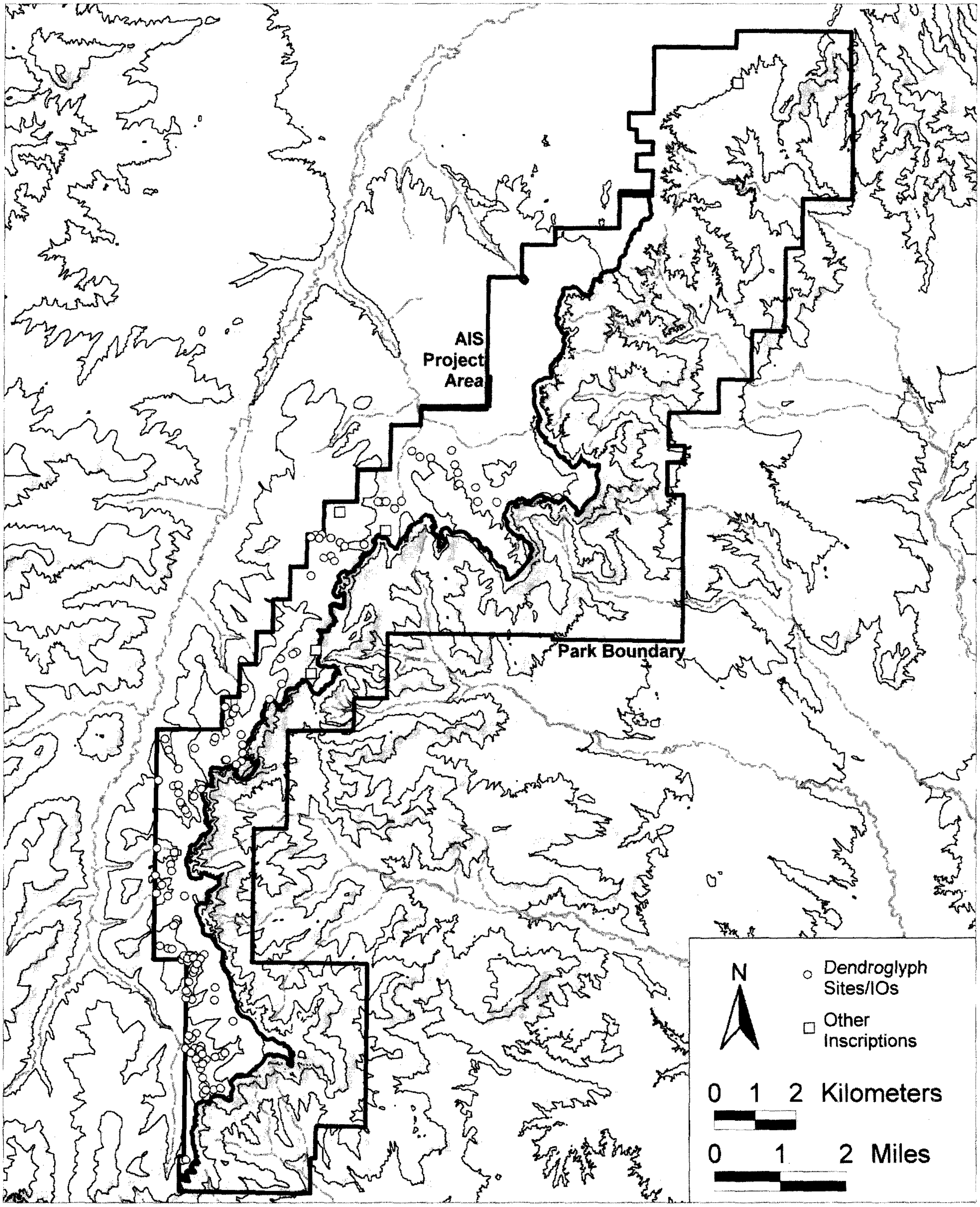


Figure 9.1. ***Locations of all aspen dendroglyphs and other inscriptions in the project area.***

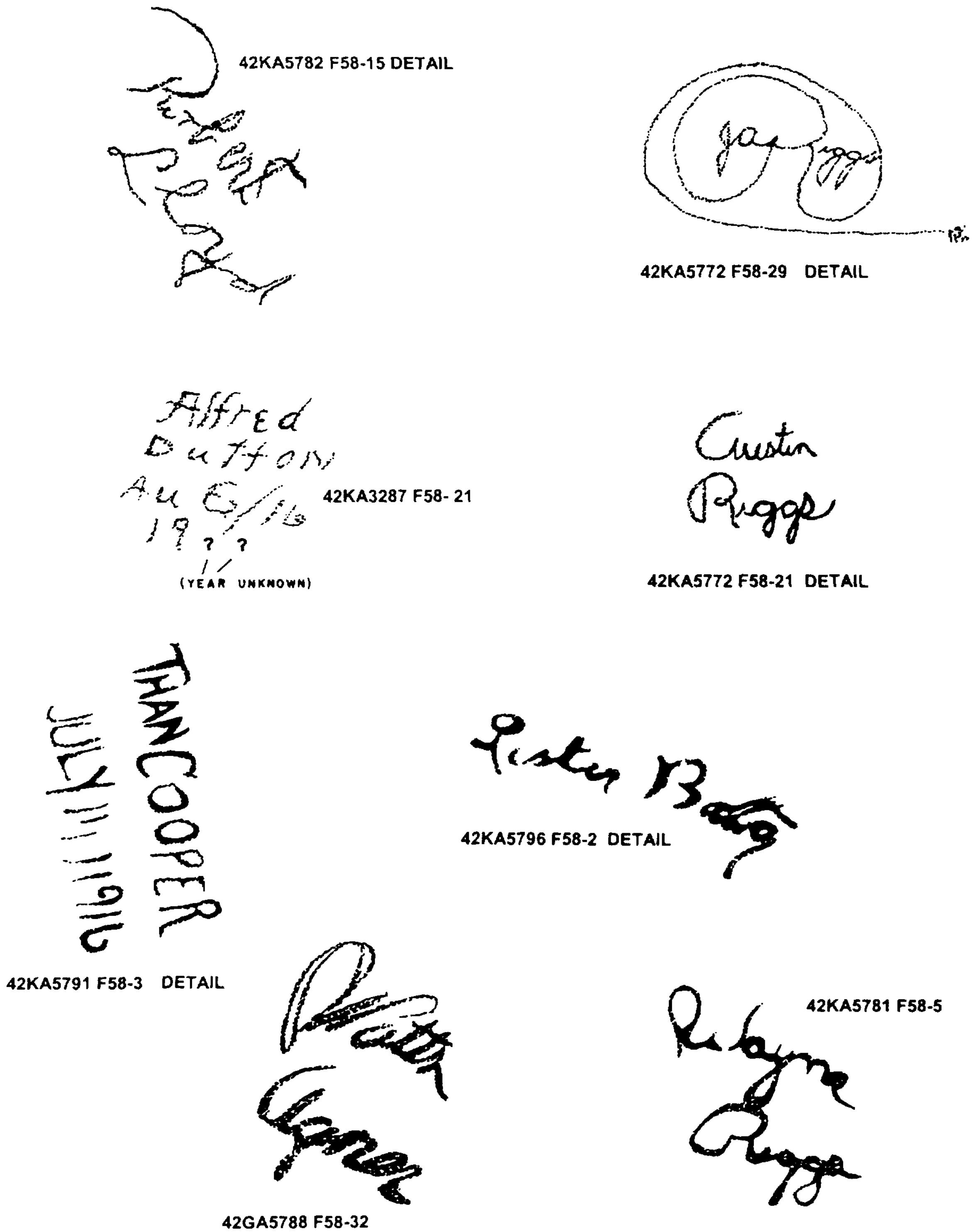


Figure 9.2. Examples of personal names carved at aspen dendroglyph sites. Not to scale.

Figure 9.3. ***Examples of complex aspen dendroglyphs with personal names and dates. Not to scale.***

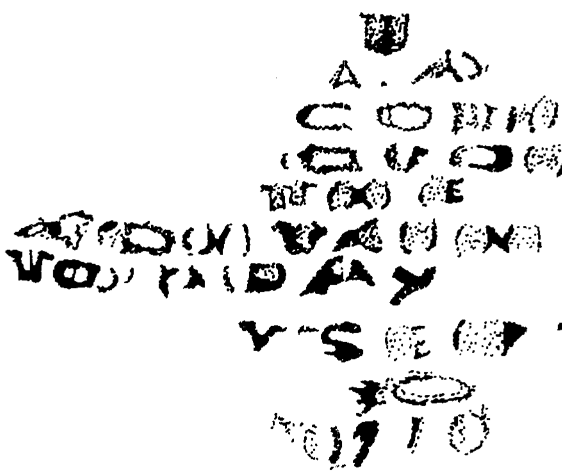
panels are the result of chronologically separate events, where subsequent carvers added their name to a previously carved tree (Figure 9.3, top and left). Others reflect a single carving episode, where each person present carved his or her own name. In some instances individual carvers included the names of family members, loved ones, or present companions in their inscriptions (Figure 9.3, bottom).

Dates are documented at slightly fewer than half the panels; most are found in association with names or initials (e.g., Figures 9.2 and 9.3). Chronological precision varies; the dated glyphs include various combinations of months, days, and years. With few exceptions these dates are interpreted as actual carving dates and are used to identify the sites' temporal affiliation. Legible dates within the project area range from 1893 through 1948. Most, however, mark dates between 1909 and 1937. More recent dates, many of which appear to be associated with modern tourist activity, are present, but due to their post-1959 time frame they were not recorded as archeological resources (Chapter 5). In numerous instances, individual trees with multiple dates represent several carving episodes spanning broad time intervals. At Site 42GA5232, five different dates ranging from 1893 to 1946 are present on a single panel (Figure 9.3, left). Among the 34 dendroglyphs identified at Site 42KA3287, 27 carved dates representing 16 different years between 1911 and 1941 are present.

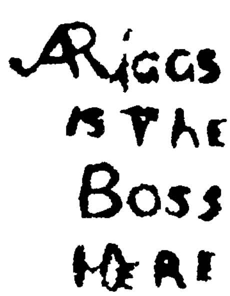
Geographic place names and places of employment are recorded at 15 sites. These elements, typically found in association with personal names and initials, presumably reflect the carvers' need to further identify themselves and their origins. Not surprisingly, place names noted among the park's dendroglyphs include nearby towns of Tropic, Panguitch, Cannonville, Hatch, and Escalante. More distant locations, such as "Lake Shore Utah" (280 km [175 mi] to the north), and "New Mexico" are also represented in the dendroglyph record. Assuming the abbreviations "NYC" and "NY" have been interpreted correctly, there are also two references to New York, certainly a more distant destination. Work-related elements suggest, in some cases, a governmental affiliation for the carver (such as "USFS," see Figure 9.3, left). Other panels mark the presence of CCC workers (see below).

Brief textual elements that convey information, report events, or express frustration constitute a small but interesting part of the dendroglyph record. Carvings such as "Watts Agner herding again / July 2 / going home in the ----" (Figure 9.4, right) or "Lloyd LE-FEVRE Camped HERE" tell of the comings and goings atop the plateau. These statements may be a form of self-declaration or serve as a message to others concerning one's whereabouts. "I am going off of the mountain today / Sept 10 / 1910" (Figure 9.4, upper left) sounds like the statement of a relieved shepherd or cowboy. Some statements are more obscure in intent. The carving "JARiGGS IS THE BOSS HERE" (Figure 9.4, bottom left) could be a personal declaration of status, or conversely could be an underling's comment on his boss. The words alone do not convey the full meaning of the text. Is it an expression of pride or one of frustration?

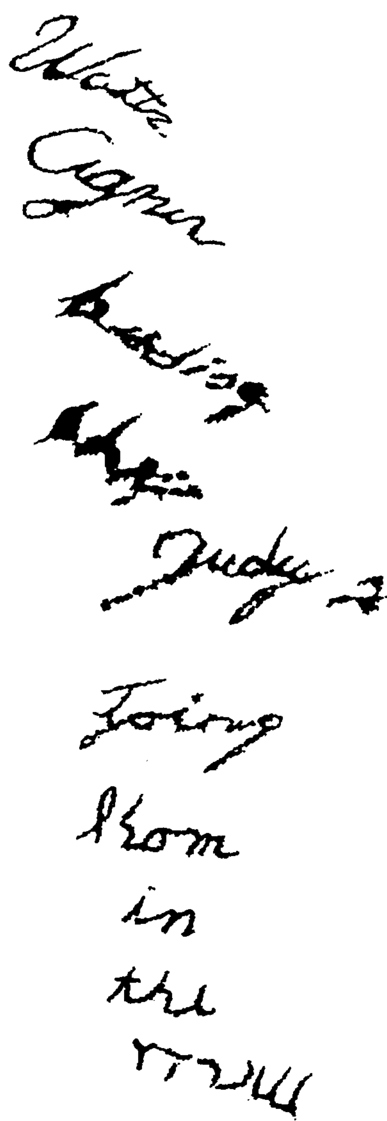
Human figures are the most abundant type of graphic element. Both male and female figures are depicted. These figures range from full-length representations to facial profiles, and from simple stick figures to realistic portrayals (Figures 9.5 to 9.11). Female figures are predominant. Most are scantily clad. The figures presumably reflect the male carvers' longing for female companionship. Most are carefully executed, with lifelike proportions and realistic details. Others are roughly drawn or highly stylized, containing just enough detail to identify gender. Only a few appear to be overtly erotic. The few definitively male figures, presumably self-portraits, are often identified by their headgear and, in one case, by an unmistakably erect penis. Other figures lack the detail or artistry needed to identify specific gender.



42GA5196 F58-1



42KA5770 F58-06



42KA5797 F58-10

Figure 9.4. Examples of aspen dendroglyphs with text messages. Not to scale.

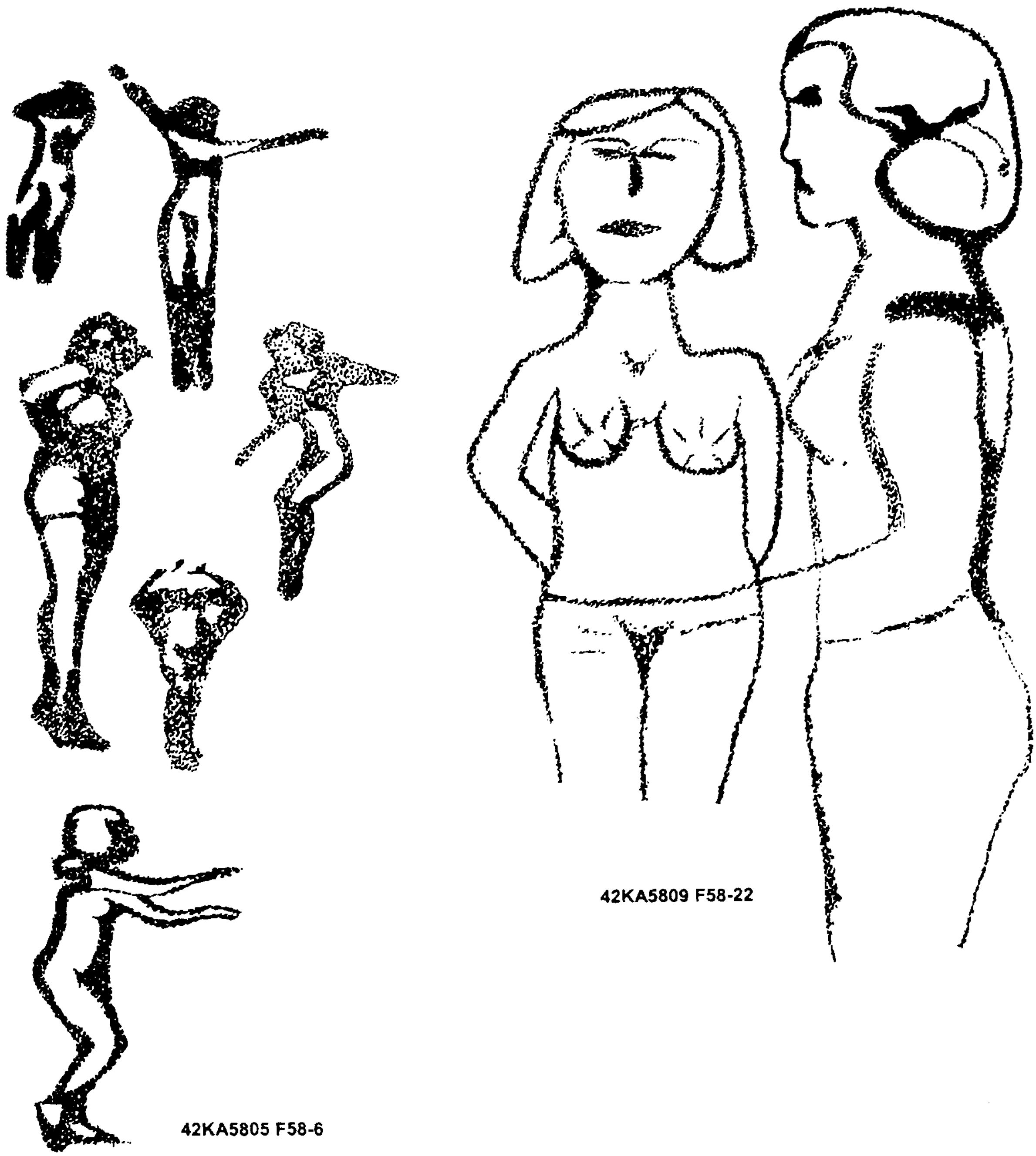


Figure 9.5. Examples of aspen dendroglyphs depicting female figures. Not to scale.

Figure 9.6. ***An aspen dendroglyph of an elegant female nude.***

Figure 9.7. ***A comparatively crude aspen dendroglyph depicting a female figure. Note scale.***

Figure 9.8. ***An aspen dendroglyph depicting a pregnant female.***

Figure 9.9. ***An aspen dendroglyph probably depicting a mother and child. Note scale.***

***Figure 9.10.** An aspen dendroglyph depicting a male figure, possibly representing a shepherd's or cowboy's self-portrait.*

Possible livestock brands are recorded at a dozen sites. These brand elements include small geometric shapes such as rectangles, arrows, and semi-circular designs. Single or paired letters that are underlined, framed by arced lines, or are decoratively presented may also represent brands (Figures 9.12 and 9.13). Roughly 20 different brand symbols are identified. At Site 42KA5809, a cattle brand is represented by a small downward-pointing arrow (or a vertical "TV") on a cow's flank (Figure 9.12, top). This same motif is commonly observed at other sites atop the plateau (Figure 9.13).

Utah State brand registers for the years between 1907 and 1948 were reviewed to confirm the brand symbols recorded in the project area and to identify the registrants (Jewkes 1909; Kelly 1912; Redmond 1920; Tingley 1907; Utah State Board of Agriculture 1922, 1923, 1927, 1930, 1932, 1933, 1934; Utah State Department of Agriculture 1941, 1942, 1944, 1946, 1948). Only a few of the dendroglyph elements matched well with any registered brands, although many design elements are at least similar in form to the registered brands. Some of the registered brands that match dendroglyphs in Bryce Canyon National Park were associated with ranchers in distant parts of the state, however. This observation suggests that the brands illustrated in the dendroglyphs may have belonged to other, presumably unregistered, owners. Conversely, numerous dendroglyphs contain the names of local people that were listed as brand registrants whose brands were not seen among the dendroglyphs (e.g., WJ Henderson; Sam Pollock; and the Chynoweth, Dutton, Findlay, Henrie, Johnson, LeFevre, and Riggs families). Although their associated brands were not observed in the field, their listing in the brand registries at least confirms the association of these families with the local livestock industry.

Eight animal figures, including cows, horses, and birds, are present among the dendroglyphs (Figures 9.12, top, and Figures 9.14 to 9.16). Although sheep were periodically abundant on the plateau, drawings of sheep are noticeably absent from the dendroglyph record. The word "SHEEP" was crudely carved in one panel at IO 2080 (Figure 9.12, bottom). Mallea-Olaetxe (2000) observes a similar scarcity of livestock depictions in Basque shepherd dendroglyphs. Mallea-Olaetxe's explanation of this phenomenon is best expressed by his musing: "Why would I want to carve the figure of a sheep when I was sick and tired of the thousands of real ones?" (Mallea-Olaetxe 2000:83).

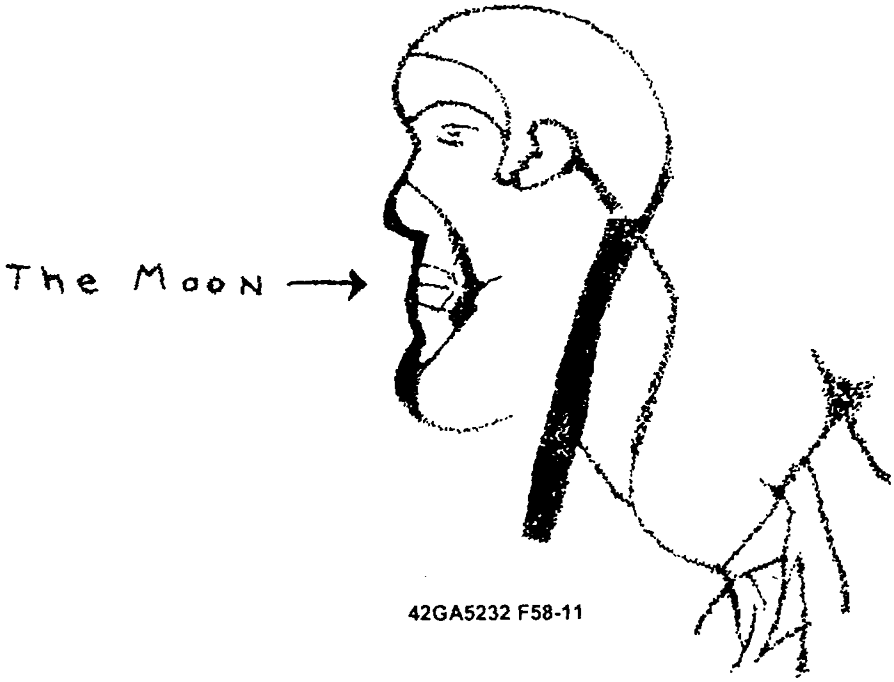


Figure 9.11. A fanciful aspen dendroglyph depicting a human figure. The meaning of the lunar personification is unknown. Not to scale.

Geometric and abstract designs such as stars, hearts, tick marks, and curvilinear shapes are noted at a few sites. Unique elements or panels include an arrangement of the four playing-card suits (Figure 9.16). Other elements include a pistol (Figure 9.17) and a leaf. The dendroglyph with card suits at Site 42KA5809 (Figure 9.16) is particularly noteworthy as it is one of the few dendroglyphs that represents a planned composition with multiple elements.

Other Historic Inscriptions

Less abundant than the dendroglyphs, but equally significant in content, are three other types of historic inscriptions: those on bark-stripped trees, water troughs, and rock outcrops. Three sites contain historic inscriptions carved onto Paiute bark-stripped ponderosa pine trees. Conifers are not typically used for dendroglyph carvings in the project area due to their dark and rough-textured bark, but the smooth, light-colored scar resulting from earlier Native American use of these trees (Figure 6.6) provided a usable carving surface for later Euro-Americans. Two of the three inscribed bark-stripped trees occupy sites that also contain aspen dendroglyphs. Like the dendroglyph carvings, these inscriptions include names, initials, and dates. One graphic, representing a possible brand, is also noted.

Site 42GA5241 contains two water troughs hewn from solid logs (Figure 6.9). Both sides of the troughs exhibit historic inscriptions (Figure 9.18). These inscriptions include names, initials, and dates ranging from 1849 through 1923. The 1849 date is the earliest date represented among all inscriptions in Bryce Canyon National Park. In light of the historic context of early homesteading and grazing activity in the region, and given the location and condition of the trough upon which it was carved, this date seems too early to be interpreted as an actual carving date.

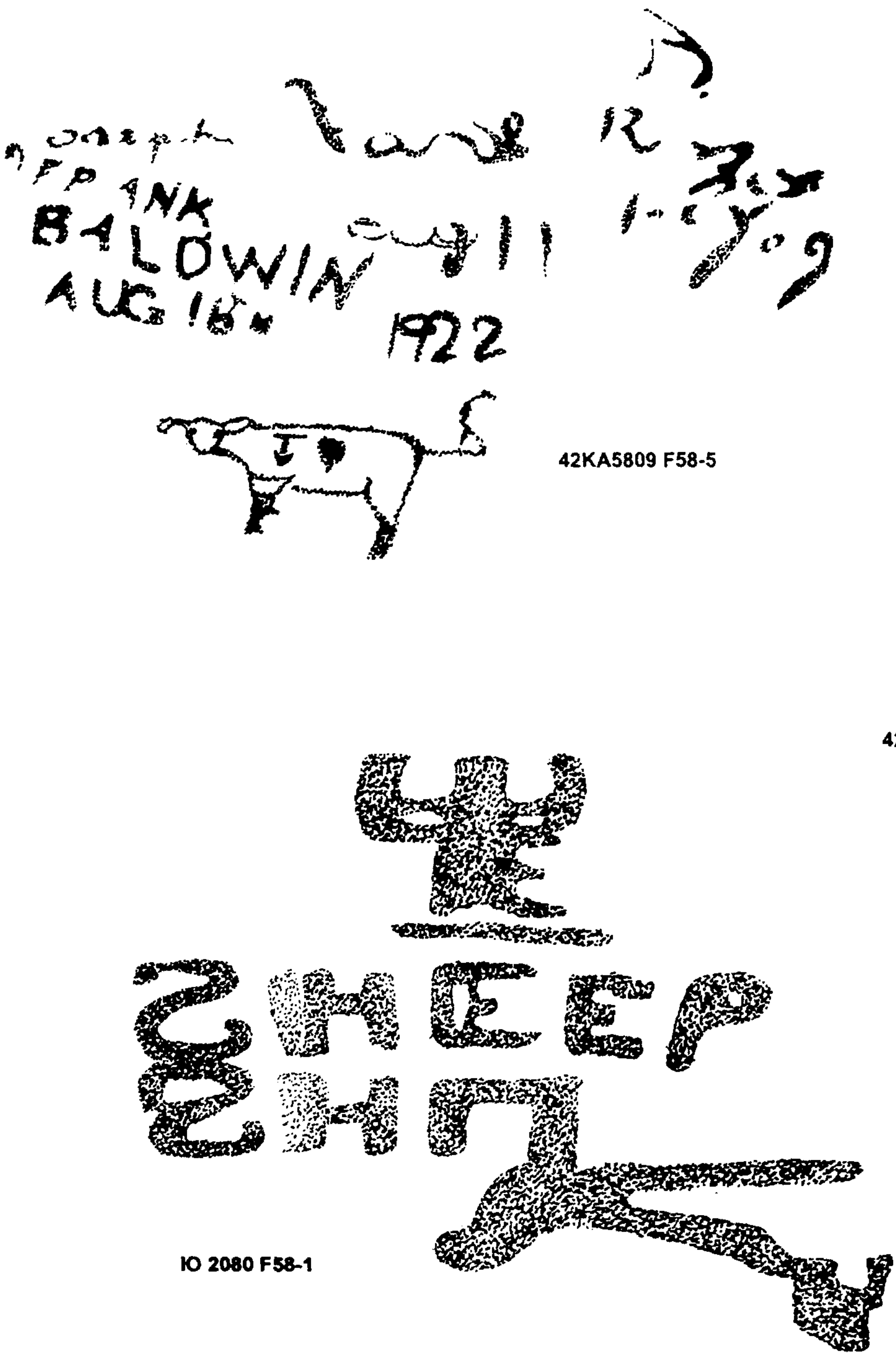


Figure 9.12. Examples of aspen dendroglyphs related to livestock. Not to scale.

Figure 9.13. Possible livestock brands executed as aspen dendroglyphs. Note scale.

Figure 9.14. An aspen dendroglyph depicting portraits of two horses.

Figure 9.15. An aspen dendroglyph depicting a bird. Scale is 3 cm long.

Figure 9.16. A unique aspen dendroglyph depicting a horse's profile, a man's profile, and the four playing-card suits.

Figure 9.17. An aspen dendroglyph depicting a pistol. Note scale.

One historic rock inscription is present at a pictograph panel at Site 42GA5287 (Figure 6.7). This inscription is singular in the project area by virtue of both its medium and its contents. The inscription, "Joseph W. Thompson / June 23, 1891 / July 4" represents the oldest definitive carving date recorded by the project. Its authenticity as an actual carving date is supported by the presence of two dendroglyphs elsewhere in the park. One dendroglyph contains a "Jos W Thompson" and an 1896 date; the other reads "Joe Thompson" and exhibits a possible 1889 date. Archival research identifies a Joseph Wallace Thompson who lived in Henrieville from 1872 to 1953 (http://history.utah.org). A history of Garfield County written by the Daughters of the Utah Pioneers (1949) refers to a Joseph Thompson who lived in Cannonville during the 1870s.

Water-Development Features

Water-development features constitute the second class of livestock-related archeological remains. Features including log watering troughs, stone catchments, and water-flow devices are identified at four sites in the vicinity of natural springs. Two sites lie along the eastern edge of Whiteman Bench near the Pink Cliffs rim, and two occupy the plateau top along the western park boundary.

One badly decomposed log trough was observed at Trough Spring, near Whiteman Bench. This spring was dry during the inventory project, but a dismantled fence immediately upslope suggests that the trough was adjacent to the spring's old location. Trough Spring's water rights were held by the UPC from 1923 through 1972, at which time they were donated to the National Park Service (Czarnowski 1991:13; Scrattish 1985:137). Although these water rights were filed to support UPC's tourist facilities, the presence of the trough implies livestock use. Presumably the agricultural use of the spring predates establishment of UPC's water rights and may have continued after the UPC's claim.

As noted above, two troughs are recorded at Site 42GA5241 (Figure 6.9), also at a spring near Whiteman Bench. The troughs are hewn from single logs, each 5–6 m (16–20 ft) long and are situated to allow runoff from the upper trough to fill the lower trough. A cobble-lined sump hole lies directly above the troughs and immediately below the spring. As previously mentioned, both sides of the troughs exhibit historic inscriptions dating to 1918, 1921, and 1923. An aspen dendroglyph with a 1937 date is nearby.

Similar trough features have been recorded at nearby sites in the Dixie National Forest (Jacklin 1993b, Kearns 1982). One such site, 42GA3903, lies a few miles west of the park and consists of a series of log water troughs laid out in a zigzag pattern. Like the two troughs at Site 42GA5241, their placement allowed flow from the upper troughs to fill the lower troughs. Local informants suggested the troughs were constructed by shepherds in the early 1900s. Nearby dendroglyphs containing dates ranging from 1910 to 1957 suggested a much broader period of use (Jacklin 1993b, Kearns 1982).

Figure 9.18. Detail of inscriptions on a log water trough. Scale is 3 cm long.

At Shaker Spring, 0.5 km (0.3 mi) north of Trough Spring, spring-development features include a concrete-and-rock subterranean spring box, a small checkdam, a large pit and backdirt pile, and various lumber and log piles. A cluster of cut posts, possibly indicating the location of a corral, occupies the top of a small ridge immediately west of the spring. Three aspen dendroglyphs, two with 1920s dates, are also associated with the spring. Water rights to Shaker Spring were first claimed by Ruby Syrett in 1923 and acquired by UPC later that year (Czarnowski 1991:13, Scrattish 1985:51) As with Trough Spring, the use of Shaker Spring for livestock watering probably predates the water-rights claim and may have continued concurrently with its domestic use.

These three springs are all accessible from established stock trails leading up the plateau from the Paria River valley to the east. Trough Spring and Shaker Spring lie within roughly 1.6 km (1 mi) of the Sheep Creek stock trail. The spring at Site 42GA5241 is on a trail that may have been part of the Willis Creek stock trail. Both these trails were in use well before the establishment of the park. The use of the Willis Creek stock trail was discontinued in the 1920s, but the Sheep Creek stock driveway was used through 1956 (Broyles 1969). All three springs would have provided a ready water source for livestock reaching the rim of the plateau and would also have been accessible from the grazing areas in East Creek Meadow and on the northern end of Whiteman Bench.

Two spring-improvement features are also known from the meadows along Podunk Creek, in an area that historically appears to have been heavily grazed. One feature is a small stone water catchment placed at a small spring near the head of Podunk Creek. Seventeen dendroglyphs, including known ranching names and dates from 1908 to 1932, are recorded in the immediate vicinity. The Yovimpa Pass stock driveway, which predates the establishment of the park, crosses roughly 0.8 km (0.5 mi) to the south. A more recent spring improvement is noted farther downstream to the north, where a single metal pipe protrudes from a spring on a hillside above the meadow.

A Glimpse into Historic Herding Activities

The role of the livestock raising and the importance of public-land grazing to the economic viability of southwestern Utah has been discussed or inferred in numerous regional, state, and local histories (e.g., Beckstead 1991; Crampton 1965; Daughters of the Utah Pioneers 1949; Davies n.d.; Palmer 1974; Peterson 1973, 1989; Roberts 1963; Rowley 1985). These histories are presented from a variety of perspectives and vary in scope and detail. Much of the regional historic research focuses on the initial period of Mormon settlement, the growth of Garfield and Kane County communities, the evolution of government land-management policy, and the development of the local tourist industry. Personal memoirs of local residents and family histories provide a more intimate perspective of herding practices, livestock holdings, and the events and personalities who participated in the livestock industry. Despite these numerous documents, historic accounts of the activities on the land now encompassed by Bryce Canyon National Park are relatively uncommon. Due to a lack of primary historical information, land-use patterns, herd populations, and the day-to-day lifeways of historic herders in the park are poorly understood.

The identification of numerous historic inscriptions, specifically those carved upon the many aspen trees scattered across the landscape, help diminish this information shortfall. The dendroglyphs are, in effect, another form of primary historical document. Though their meanings may sometimes be obscure and their data potential more limited than other forms of written documentation, the carved words and drawings represent a first-hand account of historical herding events atop the plateau.

People on the Plateau

At the very minimum, the dendroglyphs provide a partial "who's who" list of the people who frequented park lands from the late 1800s through the 1940s. This assemblage of names can hardly be considered a complete roster of plateau users, although it presumably constitutes a significant sample. The sample is certainly biased, because many of the glyphs are illegible, and the barkless trunks of numerous dead trees imply that other glyphs have long since been erased from the dendroglyph record. Furthermore, probably not all plateau users had the opportunity or inclination to inscribe their names upon the nearest tree or carvable surface.

Of the 100 personal names and 60 surnames identified in the Bryce Canyon National Park dendroglyph record, roughly one-half—49 individuals and 37 surnames—are identifiable in modern documents. Kane and Garfield County histories, personal memoirs, National Park Service administrative documents, and genealogical and vital records available on the Internet provided information about these people and the role they played in the local community. Local archives or personal interviews would have provided more information, but these research tasks were beyond the scope of this project.

Based on the available data, the majority of recognized names appear to be associated with communities in the Paria River amphitheater and Johns Valley, including the towns of Cannonville, Henrieville, Tropic, and Widstoe. Several stock trails winding up the eastern flanks of the plateau provided the lowland communities access to the high country (Broyles 1969). Tropic is the town best represented in the dendroglyph record. Twelve individuals and 15 family names are documented in association with the community. Residents of the Panguitch area, 29 km (18 mi) northwest of the park along the Sevier River, apparently also utilized the plateau resources. Fifteen individuals and 10 family names have Panguitch affiliations. In comparison, residents from Kane County and the nearby Long Valley communities west and southwest of the park are rarely represented. Affiliations with the community of Hatch, 19 km (12 mi) west of the park, are identified for only two individual and five family names. The proximity and accessibility of other high-elevation resources closer to Long Valley may have been a factor in their less intensive use along the eastern edge of the Paunsaugunt Plateau.

A review of the names represented in the dendroglyph record also provides some insight into the economic and social dynamics of early livestock-raising communities. It is unlikely, given the demands of early homesteading, that the heads of these families were able to spend much time atop the plateau watching over their herds. Other family members are likely to have shared in the responsibility, or in the case of larger livestock holders, local residents may have been hired to work for wages or trade. For example, John Davies (n.d.) recounts several episodes of employment with the Kanarra Cattle Company, and Davies himself reports hiring several local cowboys. In another example, two Dutton brothers, Leo and George, were hired by the Henderson family to watch over their herds (Young 2000).

Unlike other regions in the intermountain west, there is no evidence of Basque shepherds (Lane 1971; Mallea-Olaetxe 2000) or other ethnic groups herding on the plateau, although Keller (1987:113) reports that some herd owners in the Alton area had hired Mexican immigrants as shepherds. With few exceptions, the 100 personal names and 60 surnames identified by the dendroglyph text can be traced to local Mormon families. In only a few instances (n=19) is a family name not identifiable in the local histories of nearby Garfield or Kane County communities. Henderson, Riggs, and Pollock are the three family names that are best represented on the plateau. All three of these families were considered major livestock operators in the area (Daughters of the Utah Pioneers 1949) (Gayle Pollock, personal communication 2002) and all held permits within park lands atop the plateau during the early twentieth century (Rumberg 1956).

Periods of Use

Dates, when they occur, can provide a temporal context with which to interpret the names and associated land-use patterns. The range and frequency of legible dates are presented in Table 9.1. As previously mentioned, dated dendroglyphs range from 1893 to 1948. An earlier 1891 date associated with a rock inscription represents the earliest definitive inscribed date recorded during the inventory project.

The low frequency of late nineteenth- and early twentieth-century dendroglyphs and their complete absence prior to 1893 cannot be interpreted as a direct measure of the Euro-American presence on the plateau. Local grazing patterns, including the intensive, unfettered summer use of the high-plateau areas by anyone who desired, were well established by the end of the nineteenth century (Buchanan 1960:7; Crampton 1965:204; Davies n.d.:13; Peterson 1973; Roberts 1963; Rowley 1985; Walker 1964). Use of the Paunsaugunt Plateau for livestock range is documented as early as the 1870s, and the intensity of use increased during the following decades (Crampton 1965; Daughters of Utah Pioneer 1949; Davies n.d.). The low frequency of dendroglyph inscriptions dating to this period is more likely a function of tree-deterioration rates than an indication of grazing-activity levels. The life span of an aspen tree typically ranges from 60 to 80 years, although some live considerably longer (up to 200 years) depending on environmental conditions (Harlow and Harrar 1958:256; Mallea-Olaetxe 2000:33). Recognizing that the death of a tree is synonymous with the loss of the dendroglyph, the likelihood of finding pre-1900 dendroglyphs is low. Even if long-lived trees are present, the recognition and legibility of the dendroglyph elements is further diminished by age-roughened bark.

Table 9.1. ***Frequency of legible inscription dates within the project area.***

Dated Inscriptions	Date Range						
	<1900	1900–1909	1910–1919	1920–1929	1930–1939	1940–1949	1950–1959
Isolated Occurrences	–	6	–	4	12	–	–
Sites	8	23	42	42	42	12	5
Count of Individual Elements	8	49	113	121	121	20	6

The vast majority of dendroglyph dates occur between 1909 and 1937. This interval coincides with what appears to have been a period of intensive livestock use on the Paunsaugunt Plateau. The establishment of the USFS and the implementation of a grazing-permit system during the early 1900s produced little immediate change in the intensity of grazing atop the plateau. Sevier National Forest records from 1907 indicate that all grazing-permit applications were approved at the same level of use as previously allowed, with the exception of those involving very large numbers of cattle and sheep (Daughters of the Utah Pioneers 1949). The onset of World War I substantially boosted the local livestock industry, and increased market demands prompted an expansion of forest grazing privileges (Rowley 1985:245). Similar patterns of use are noted in historic winter range lands directly east of the park on the Kaiparowits Plateau. This area also contains a high frequency of ranching-related sites occupied between 1910 and 1935, which suggests a similar period of intensive use during the first three decades of the twentieth century (Geib et al. 2001; Kearns 1982).

The establishment of Bryce Canyon National Monument in 1923, and later the park in 1928, had no immediate effect on the grazing activities within the protected area (Rumberg 1956; Scrattish 1985). Administration of the grazing permits remained under the jurisdiction of the USFS through 1929. Existing grazing rights were allowed to continue, although after the National Park Service assumed management of the park the long-term goal was to reduce and eventually eliminate livestock grazing on all park lands. Any transfer or sale of grazing rights in the park required National Park Service approval and was linked to a mandatory reduction in the allotted livestock.

The earliest archival documentation regarding livestock use of the park dates to 1931 (Rumberg 1956). Ten permittees had grazing rights across plateau-top lands at that time. Only one of the permittees, the East Fork Horse and Cattle Association, ran cattle. The other nine permits allowed sheep grazing. A total of 3,216 sheep and 717 cattle was permitted on National Park Service plateau-top ranges. This overwhelming focus on sheep had characterized southwestern Utah's grazing industry since the end of the nineteenth century. The National Park Service sheep-grazing permits were held by various Riggs and Henderson family members. Both of these families are well represented in the dendroglyph record.

Waterworth (1988, cited in Dominguez et al. 1992) places livestock belonging to the Riggs family in the park during the 1920s and 1930s. The Riggs' tenure on park lands apparently ended with the 1940 transfer of their grazing permits to the Findlay Cattle Company. The dendroglyph record documents the common presence of the Riggs family between 1909 and 1937, with the majority of dated glyphs spanning the 1930s. Riggs family members account for almost 200 carvings and are identified at 40 sites. The family's penchant for carving dendroglyphs certainly factors into the high frequency of dendroglyphs dating to this period.

The dramatic drop in dendroglyph frequency during the 1940s and early 1950s, and the disappearance of many of the early ranching-related names, reflect the continued reduction and eventual elimination of livestock grazing on park lands. Changes among the permittees and implementation of various livestock-reduction programs resulted in major decreases in livestock use. By 1940, only three permittees (two for cattle and one for sheep) held grazing rights on plateau lands in the park. Sheep numbers were dramatically reduced, and the grazing season continued to be shortened throughout the 1940s. By 1946, permitted livestock included 845 cattle and 628 sheep. Deteriorating range conditions, changing markets, and USFS grazing policies once again favored cattle. The sale of the last sheep permit, in 1947, completely eliminated sheep grazing from the park. In 1964, cattle grazing was also eliminated, ending over seven decades of livestock use on park lands.

The frequency of dendroglyph dates appears to parallel local livestock industry trends of growth and decline (Table 9.1). Similarly, the monthly distribution of dated dendroglyphs can be used to study the seasonality of public-land grazing. Roughly 300 dated carvings include references to specific months, all of which date between May and mid-October. The vast majority mark the months of July and August, which is not an unexpected pattern given the short growing season on the plateau. In contrast, ranching-related inscriptions found on the Kaiparowits Plateau date between November and May (Geib et al. 2001), indicating winter use of the area. As Roberts (1963:102) explains, "under long custom, cattle in southern Utah in the spring had followed green grass up the mountain slopes as fast as it appeared below retreating snow lines; and with the breath of winter they drifted back to winter lowlands." The seasonal fluctuations in dendroglyph date frequencies coincide with and confirm established seasonal grazing patterns. For example, one herder documented his departure from the Paunsaugunt Plateau on an aspen near East Creek Meadow. This glyph reads "I am going off of the mountain today / Sept 10 / 1910" (Figure 9.4, upper left). This date coincides closely with the permitted grazing season, which in 1931 ran from May 21 to September 30 (Rumberg 1956).

Tracking Land Use on the Plateau

The names and dates in the dendroglyph record contain some discernible spatial patterns possibly indicative of intra-park herding dynamics and land-use patterns. Dendroglyphs in the southwestern portion of the park provide the most extensive data with which to explore these patterns. The usefulness of this data, however, is hampered by the park's proximity to USFS lands. Although these administrative boundaries did not affect land use during much of the livestock-grazing period, the survey—and the area from which dendroglyph data have been collected—is limited to the park, even though the herders were not. Given the extensive grazing potential of adjacent USFS lands, it is likely that the dendroglyphs in Bryce Canyon National Park constitute a small sample of those created by the herders throughout the entire livestock range. With such a small and spatially restricted sample of grazing-activity locations, only tentative inferences can be drawn about herding practices and livestock ranges.

Despite these limitations, six of the most common dendroglyph names were selected for analysis. Robert Lloyd is the best represented herder, having left his name or initials on 91 trees at 20 different sites. Other commonly noted individuals include Watts Agner, Austin Riggs, Les Bolton, Than Cooper, and Alfred Dutton, who are each represented at 16 to 76 dendroglyph panels. Chronological information is sporadically associated with the names of these herders. Many dates lack the precision that would be necessary to track an individual's movement on a daily or seasonal basis, but several interesting patterns are evident that hint at the data potential of these inscriptions.

For example, Les Bolton's presence is documented on the plateau on eight separate days between May 6 and August 11, 1925. Based on genealogical data (www.familysearch.org), Bolton would have been 17 years old at the time. His carvings lie along a 3.2 km (2 mi) section of the park's western boundary extending north from Yovimpa Pass. The distribution of these dates is sporadic (one day in May, three days in June, and four days in August), and no conclusions concerning his travel patterns can be drawn, although the gaps in the dendroglyph record suggest that some of his time may have been spent on nearby USFS land. Assuming Bolton was herding livestock, the temporal distribution of dendroglyph dates suggests a focus on shepherding rather than cattle herding. This interpretation is based on the premise that cattle, once driven to their summer pasture, are largely left alone to fend for themselves, while sheep are actively herded and require constant care (Roberts 1963:56).

Than Cooper's name was recorded in association with eight dates in 1916. Waterworth (1988, cited in Dominguez et al. 1992) confirms that Cooper was involved in raising sheep. Cooper's ventures on park lands covered at least a 6.4 km (4 mi) stretch along the present-day park boundary and included several canyons and adjacent ridgetops in the Podunk Creek vicinity. Only three of Cooper's dates indicate a month and a day. Two of these dates, carved ten days apart on the same tree, imply either at least a ten-day stay or a revisit to that particular area. Another carving, dated one day later, shows that Cooper had traveled roughly 1.6 km (1 mi) to the north. Cooper's daily travel certainly falls within the range reported by other regional shepherds. In the Cedar City, Utah area, Palmer (1974:182) noted that sheep herds ranged from two to three miles a day and returned to a known water source at night.

Al Dutton's presence is documented during six different years: 1926 through 1929 and again in 1936 and 1937, with two to four carvings recorded per year. Except for one May 17 date and two mid-September dates, the remaining glyphs were carved in July and August. Two 1928 dates spanning a 17-day period are carved 4.8 km (3 mi) apart. These two glyphs represent the northernmost and southernmost extent of Dutton's travels on park lands. Dutton carved eight different dates during six separate grazing seasons at Yovimpa Pass alone. Three of these dates span a five-week period in 1929. The exceptionally high density of dendroglyphs carved by Dutton and others near Yovimpa Pass can be attributed to the presence of a historic stock trail and the proximity of several water sources and abundant forage. The Yovimpa Pass stock driveway, which predates the establishment of the park, was one of seven stock trails connecting the lowlands to the east with the plateau top (Broyles 1969). From Yovimpa Pass, Podunk Creek provides a likely access route to the valley of the East Fork of the Sevier River, 5 km (3 mi) to the northwest.

Due to the limitations noted above, few other patterns are evident in the dendroglyph data. Archeologically and historically, these inscriptions represent one of the few primary sources of information documenting early grazing activities on the Paunsaugunt Plateau. As with all types of archeological resources, the dendroglyphs offer a key to reconstructing patterns of historic use and to better understanding the people and culture that supported those activities. Whether viewed as a medium of communication, a form of art, or as thoughtless doodles, these inscriptions are a tangible link to the rural lifestyles and historic traditions of early Utahns.

The Paunsaugunt Plateau as a Scenic Resource

Until the second decade of the twentieth century, the subsistence-based economy of the local homesteaders found little value in the scenery atop the Paunsaugunt Plateau. A tourist-based industry quickly flourished once the economic potential of this previously untapped resource was realized. Groups interested in both preservation and profit led the push to establish Bryce Canyon National Park and to build the numerous visitor and administrative facilities atop the plateau. The Euro-American archeological sites associated with this period of park development, from the early 1920s through the 1940s, represent numerous government, commercial, and visitor activities.

U.S. Forest Service Archeological Material

Despite more than 20 years of USFS administration and its pivotal role in the establishment of Bryce Canyon National Monument, archeological evidence of the agency's activities atop the plateau is minimal. This paucity of cultural material associated with early USFS management is not unexpected, however. The vastness of the land managed by the USFS and the limited financial resources that were available provided little opportunity for regular USFS presence on the plateau during the early days of its administration. Even with the establishment of Bryce Canyon National Monument in 1923, the USFS apparently invested little in the monument's early administration and development (Caywood 1994).

Dendroglyph site 42GA5232, near a spring roughly 190 m (623 ft) from the present western park boundary line, provides the only definitive evidence of USFS activities within the project area. One of the 15 dendroglyphs at this site reads, in part, "L.C. / W.N.S. / U.S.F.S. / 6-20-11" (Figure 9.3, left). The first timber survey conducted on the Sevier National Forest (now the Dixie National Forest) took place in 1911. The "LC" initials could correspond with the name of Lincoln Crowley, who was one of the crew members who worked on this timber survey (Daughters of the Utah Pioneers 1949:259). Although this association can only be inferred, Crowley may have carved this dendroglyph during the 1911 work assignment.

National Park Service Archeological Material

With the establishment of Bryce Canyon National Park in 1928, the National Park Service assumed administrative responsibility for the park. Initially, the National Park Service presence on the plateau was minimal, largely because the park was managed remotely from Zion National Park. Early records show that none of Zion National Park's permanent staff served more than 20 percent of their duty time at Bryce Canyon National Park, although three seasonal employees were hired to work at the park during the summer months (Scrattish 1985:122). Maurice Cope, from nearby Tropic, was one of the first park rangers to be hired. His tenure in the park from 1929 to 1943 is commemorated by a dendroglyph near a trail leading to Yovimpa Pass that reads "MNCope May 2 1934."

The first National Park Service facilities, constructed in 1929, included a checking station, two comfort stations, and a custodian's residence (Caywood and Grant 1994:29). The custodian's residence (numbered HS-1 in the park's List of Classified Structures) is no longer standing, having burned to the ground in 1988. The archeological remains of this feature, however, were located during the inventory and recorded as Site 42GA5278. Extant features include a driveway, a rock foundation wall with a flight of stairs, and a footpath. Structural debris and artifacts were presumably removed from the area during cleanup efforts. Although there is little at the site to indicate the cabin's original appearance, comparison with other National Park Service residences provides some insight into its possible construction. As the first National Park Service residential structure built on park land, the custodian's residence was probably used as a prototype for subsequent construction. Its original appearance is probably mimicked by other nearby buildings in the original housing district. These buildings exhibit simple rustic-style architecture with massive stone foundations and chimneys, steeply pitched gable roofs, multipane double-hung windows, and weatherboard siding.

Long-term development plans and rapidly increasing visitor use stimulated the need for additional park facilities. Primary among these was a road to provide access to the southern portions of the park. One of the first major tasks undertaken by the National Park Service was to extend the existing USFS road from the Bryce Canyon Lodge another 26 km (16 mi) south to Rainbow Point. The new road was constructed in three major segments between 1931 and 1935 (Dammann 1993). Several archeological sites appear to be associated with these early construction efforts.

Site 42GA5224 consists of a long-abandoned gravel pit near the head of East Creek. An abandoned dirt road connects the pit with the Rim Road roughly 200 m (656 ft) to the east. Other features include a blazed tree, two piles of logs and discarded fence posts, a linear depression or possible trail, and three dendroglyphs with 1914, 1930 (or 1931), and 1937 dates. The location of this site coincides with a gravel quarry described in a contemporary construction report (Finch 1935). The quarry was reported to be in existence prior to the 1932–1933 phase of rim road construction, and it may have been originally excavated during the previous road construction phase from 1931 to 1932. According to Finch (1935:10), "operations relative to a crushing and screening plant were begun" at the quarry in 1932. The pit was abandoned within one month, however, and quarrying activities were moved to a source outside the park (Finch 1935:11).

Despite the 1935 report, little evidence of any structure is present at this site, although some logs containing bolts may represent structural debris. The lack of construction material may indicate that the crushing plant was never built or it was disassembled and hauled to the new pit location. Conversely the processing area may not have been located at the quarry site. The dendroglyph dates suggest other occasional use of the area before and after the pit was in operation. Artifacts are sparse (n=6) and consist of miscellaneous items that may postdate the gravel operation.

A second gravel pit is recorded in the southern portion of the park on a high ridge between the Rim Road and the Pink Cliffs rim. This pit represents the Agua Canyon gravel quarry, which was in use mainly between 1931 and 1943 (NPS 1983). The gravel quarry was originally mined to provide material for the Rim Road, and the pit was used occasionally through the mid-1980s (NPS 1983). The quarry site and access road were closed and reclaimed in 1995. No definitive evidence of a processing plant exists at this site, although Bryant (1997) refers to large quantities of crushed shale in the pit area.

Two formal campsites also appear to be associated with 1930s road construction. The area encompassed by Site 42GA3561, which is primarily known as the site of a 1934–1942 CCC camp, was also used as a work camp by the Union Construction Company in 1931 and 1932 (Madrid 1993:14). Archeological remains attributable to this earlier occupation were not recognized during the Bryce Canyon AIS or during previous investigations (Dominguez and Danielson 2000), although a water pipeline from the Trough/Shaker Spring area to the camp may originally date to this period. The establishment of the CCC camp in 1934 and its subsequent dismantling in 1945 apparently obscured the evidence of the earlier occupation.

A second possible long-term campsite dating to the 1920s through 1940s lies at the southern end of Whiteman Bench. Site 42GA5219 contains two side-by-side outhouse foundations and an extensive historic refuse scatter that includes several burned refuse piles. No structural remains other than the outhouses are present, although a wood pile, 10 aspen dendroglyphs, and several rock piles are noted. This campsite lies 170 m (557 ft) north of the Rim Road, along "Section 1-B2" which was constructed from 1934 to 1935 (Madrid 1993). The site location and artifact assemblage supports the interpretation of this site as a road-construction work camp. Conversely, the CCC may have used this location as a spur camp during their tenure, because many CCC projects would have brought work crews into the southern portion of the park. Due to the close contemporaneity and similar cultural background of road crews and the CCC, distinguishing between these two work groups is not possible using the available survey data. No archival records mention this camp's origin. Two dendroglyph dates, 1900 and 1923, and two sun-colored purple glass shards suggest a pre-Great Depression-era occupation at this site, but this use may be associated with livestock-grazing activities. Other time-sensitive attributes in the artifact assemblage (e.g., church-key opened cans, Owens-Illinois trademarks, clear glass shards) are indicative of a later, post-1930 occupation. Several hundred meters north of this campsite, a small historic refuse scatter surrounds a low earthen mound (Site 42GA5222). This discrete feature may represent a buried dump associated with the campsite. An Owens-Illinois bottle trademark in this scatter dates from 1929 to 1954 (Toulouse 1971:403).

Telephone-line construction also brought workers into the southern portion of the park during the mid-1930s. Telephone service had been extended to the Bryce Canyon Lodge by 1927 (Scrattish 1985:84), and the rapid expansion of visitor facilities in the southern portion of the park required more extensive communication facilities. A telephone line running the length of the park to Rainbow Point was completed in 1935 (Dammann 1993:43) and was extended to Yovimpa Pass in 1944. The archeological remains of this line were recorded as Site 42GA5288/42KA5814. Discontinuous segments of the telephone line corridor are marked by the presence of collapsed or dismantled pole fragments, pieces of hardware, glass and ceramic insulators, wire fragments, trees with wire and insulators attached, and linear clearings through the forest. It is unclear when the line was abandoned, but it appears to have been purposely dismantled. The absence of wire and poles from most of the line suggests that the material was salvaged, and fallen poles from the northern portion of the line were later used to construct checkdams (see below).

The Civilian Conservation Corps in Bryce Canyon National Park

Scrattish (1985) and Dominguez and Danielson (2000) report extensively on the CCC's activities in the park. This section summarizes that work and highlights new discoveries of the inventory project.

The most substantial and best-known historic campsite in the park is the CCC spike camp at Site 42GA3561, located along the southern margin of East Creek Meadow (Figure 2.4). Bryce Canyon National Park's camp was built and occupied by CCC Company 962, which was based at Zion National Park. The seasonal spur camp at Bryce Canyon National Park, designated NP-3, was in use from 1934 through 1941, and it was systematically dismantled in 1945.

The present-day site consists of a wide distribution of artifacts and features scattered across a 560-x-505-m (1837-x-1657-ft) area. Remaining features include a gravel-capped water pipeline corridor, a refuse pit, several dirt roads, and a series of seven outhouse depressions with associated structural timbers. Despite the general lack of above-ground structural remains, the appearance of the camp can be inferred by reviewing a combination of written records (Baldridge 1971; Paige 1985; Salmond 1967; Scrattish 1985), photographs (Scrattish 1985), and archeological materials (Dominguez and Danielson 2000). Characteristic of CCC camps throughout the western United States, NP-3 contained high-peaked canvas tents with wood frames and central roof-support poles (Scrattish 1985:188). Several wooden buildings, including a mess hall, maintenance shop, and recreation building, were also erected at the site (Scrattish 1985:153). Archeological investigations conducted in 1990 and 1991 identified various locations of the camp's permanent and temporary facilities as well as several dump locations (Dominguez and Danielson 2000).

When operating at full capacity, 200 CCC workers lived and worked in the park. Their seasonal presence resulted in the construction of erosion-control checkdams, park buildings, fence lines, trails, and road improvements, and the implementation of a variety of insect-control activities throughout the park's forests (Dammann 1993; Garfield County News 1987; Madrid 1993; Scrattish 1985). Historic photographs of trucks loaded with timber and rocks (Scrattish 1985) suggest that CCC crews worked along roadways and other vehicle-accessible areas to retrieve construction materials. Other tasks such as tree thinning and fence building took them into more remote sections of the park. According to Scrattish (1985:156), insect-control activities conducted by the 1936 CCC crews covered a 4,047-ha (10,000-acre) area.

Several short-term campsites may be associated with these back-country CCC work ventures, although these camps may also represent herding camps or recreational camps used by tourists or off-duty workers. These camps generally contain fire hearths and small refuse scatters indicative of a brief overnight stay. One such site lies across the road from the possible road-construction camp (42GA5219) described above. Two dendroglyph sites provide more conclusive evidence of a CCC presence in remote portions of the park. At Site 42GA5197, the "CCC" acronym is associated with 1935 dates at two separate dendroglyph panels carved by two different people. Bob Dickinson's carving at this site (Figure 9.19, right) includes the number "962," which corresponds with the CCC company number.

Another dendroglyph near Yovimpa Pass reads, in part, "BRYCE CCC CAMP / GUY / MCNELLY ESCALANTE UTAH / Agust 1 1938" (Figure 9.19, left). This site lies along a dirt road to Yovimpa Pass that Finch (1935) reports was in existence by 1935. A variety of projects such as boundary-fence construction, road maintenance, and tree thinning would have drawn CCC crews into the area.

The Development of Tourism on the Paunsaugunt Plateau

Since the establishment of the Syretts' makeshift camp in 1919, the land above the Bryce Canyon rim has seen the construction of most of the park's tourist-related accommodations (Figure 2.2). The numerous standing historical buildings are well-documented (e.g., Caywood 1994; Caywood and Grant 1994; James R. McDonald Architects 1999; Scrattish 1985). Some historic features, however, have been impacted by decades of development and use and are only recognized based on their archeological remains. Numerous artifact scatters, some with associated features, are recorded in the vicinity of the lodge. Based on their artifact assemblages and information gleaned from various park documents, these sites appear to be the result of concessionaire-related activities.

Site 42GA5270, located 1,000 m (3,280 ft) west of the Bryce Canyon Lodge, represents the most intact campsite found in the park. Prominent features include four leveled, graveled tent platforms; a ramada platform; and a series of graveled, rock-lined pathways connecting the tent platforms to a rock-lined parking area (Figure 6.5). A possible outhouse depression and an abundant scatter of coal and cinders (suggestive of a stove or furnace) indicate the presence of additional camp facilities. Several dense refuse scatters and dumps are present, and a variety of "luxury" artifacts are noted in the assemblage. Shards of sun-colored purple glass parfait or sherbet cups and drinking tumblers are liberally scattered across the site. This site also contains numerous beverage bottle bases. Sherds from white earthenware cups, plates, bowls, and pitchers decorated with the Harriman Blue pattern, a special design used by the Union Pacific Railroad (Luckin 1990:258), are common. Other specialty items include sherds from at least three historic Hopi Yellow Ware vessels. These Hopi

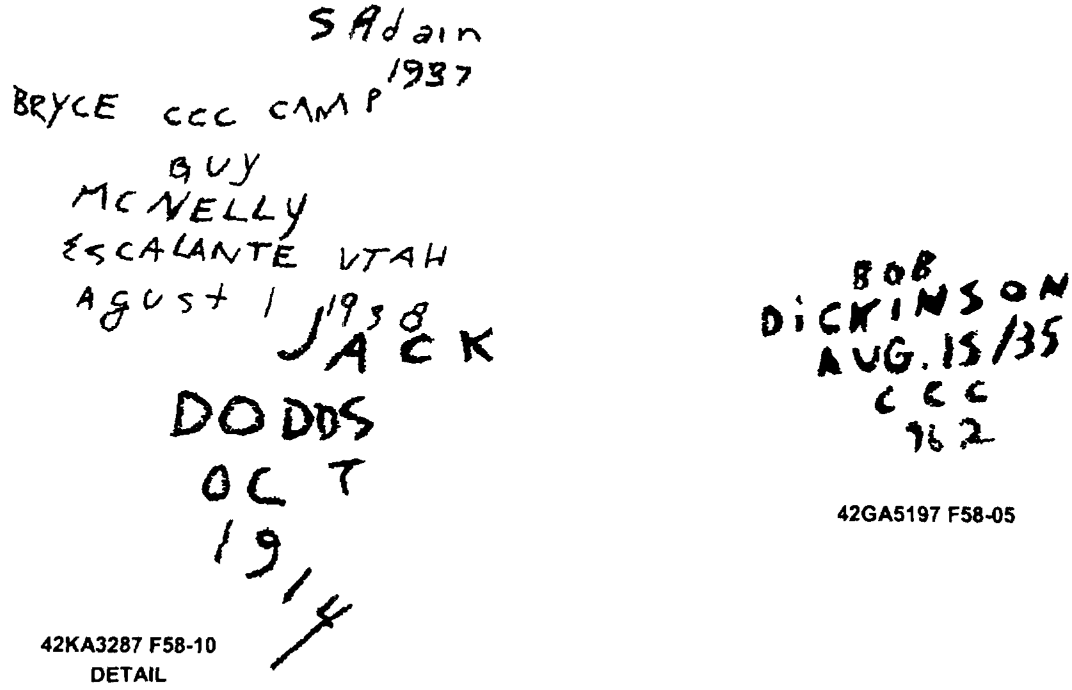


Figure 9.19. ***Examples of aspen dendroglyphs related to the presence of the Civilian Conservation Corps. Not to scale.***

pots were probably either purchased by tourists or were used at the camp as serving dishes. The refuse deposits contain virtually no food cans, and other refuse from mundane domestic activities is uncommon. The features and artifact assemblages suggest this site's use as a long-term, established campsite. Based on the formalized layout of the camp, and the types, diversity, and numbers of artifacts present, the site appears to represent a resort camp. The site may have served as an entertainment center for park visitors who chose not to reside at the lodge or park campground. No references to this type of facility are noted in the park archives, however. Chronologically diagnostic artifacts suggest a 1920s to 1930s period of use, although later artifacts are present. Both the Syretts and the UPC operated tourist facilities during this time interval. Due to the abundant Harriman Blue ceramics, the site is probably attributable to UPC operations. The "luxury" items are characteristic of UPC's approach to park recreation, which was designed to attract affluent tourists (Caywood and Grant 1994:17–18), while the Syretts were known for their more modest, home-style hospitality (Scrattish 1985).

Another UPC-related site lies between the resort camp and the Bryce Canyon Lodge. This site, 42GA5263, consists of a heavily impacted historic refuse scatter with several areas of concentrated refuse and structural debris such as concrete, brick, stone, and lumber. Several hundred artifacts including cans, glass, and ceramics litter the site. No identifiable foundations or extant structures are present, but the area has been heavily disturbed by abandoned dirt roads, water-diversion channels, checkdams, and modern utility lines. The site location indicates that these materials represent the ruins of the UPC's utility area. This locale once contained a power house, a garage, and a studio, all of which probably date to UPC's initial phase of construction in 1925. A realignment of the Rim Road in 1957 necessitated that the utility area be dismantled. Some of the buildings are known to have been moved to other areas of the park (Caywood and Grant 1994), but others were apparently destroyed. The layout of the utility area is known from a variety of blueprints and construction plans, but its general appearance is not well reported. A photograph taken in 1961, one day before demolition, shows several gable-roofed, warehouse-like, frame buildings with corrugated steel siding hung horizontally behind external studs, brick chimneys, and multipane (probably casement) windows and bay doors (Figure 9.20). Since the site was dismantled in 1961, the structures and the roads that led to the utility area have been obliterated (Figure 9.21). The degree to which this once-substantial site has been erased from the landscape speaks to thoroughness of the National Park Service's meadow-rehabilitation efforts, but it also highlights the difficulties that archeologists can encounter when interpreting purposefully destroyed sites (e.g., Smith 2001).

Another example of a concessionaire-related site lies roughly 300 m (984 ft) north of the Bryce Canyon Lodge at Site 42GA5277 (Figure 6.4).

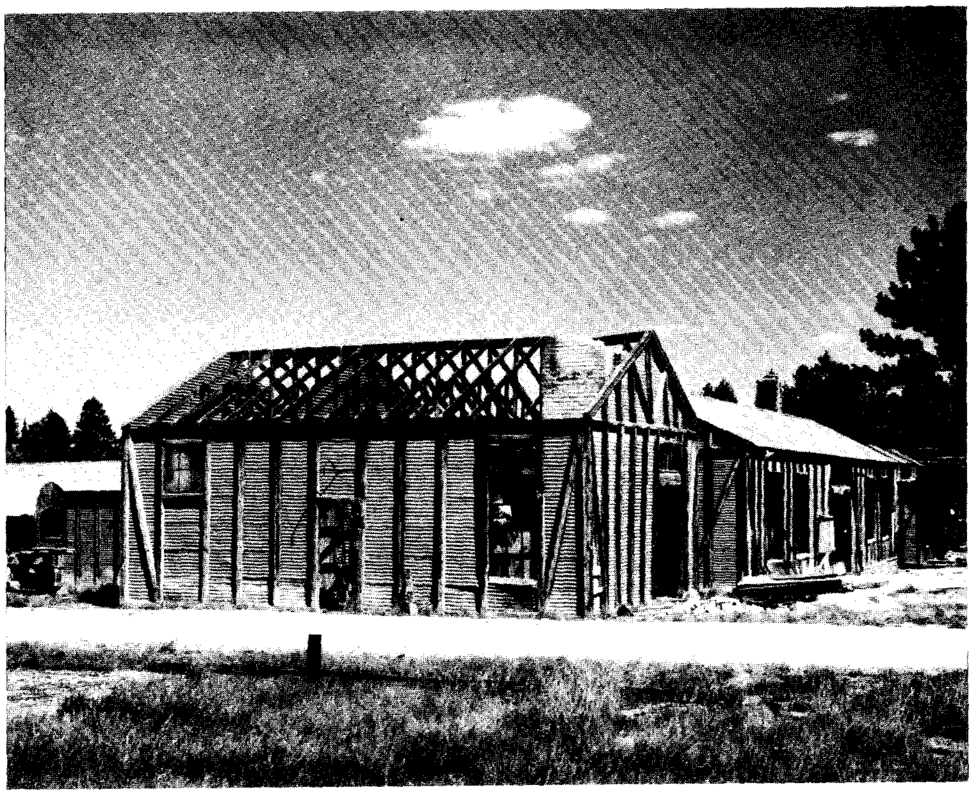


Figure 9.20. ***A 1961 view of the Utah Park Company's utility area, now recorded as Site 42GA5263. View direction and photographer unknown. Unaccessioned photograph on file, Bryce Canyon National Park.***

Figure 9.21. A modern view, facing north, of Site 42GA5263, once the Utah Park Company's utility area. The relationship of this view to that shown in Figure 9.20 is unknown.

This site contains a leveled, graveled pad that may mark a structural location in association with an extensive refuse scatter. Over 900 artifacts including bottle, jar, and window glass shards; cans; ceramics; miscellaneous metal fragments; asbestos tile; coal chunks; sewer pipe; and pieces of milled lumber are scattered across the site. The variety of artifact attributes suggests a broad date range for the site, although some of the more time-sensitive artifacts indicate use during the 1920s. This site may have been part of the nearby UPC utility area or may have been used as a dump. The presence of an Eastman Kodak film can lid at this site suggests a relationship with the studio that once existed in the nearby utility area.

Other artifact scatters are abundantly scattered around the lodge. These sites are most parsimoniously interpreted as UPC dump sites and special-use areas. Food and beverage containers are well-represented in the artifact assemblages, as would be expected for sites deriving from the food-service industry. Construction debris and pieces of miscellaneous hardware are also common, probably indicating maintenance and remodeling activities.

Site 42GA5286, a small dump site, is interpreted as UPC-affiliated refuse and represents a typical example of this site type. Fifty artifacts are noted in a 35-x-7-m (115-x-23-ft) area. These include Harriman Blue plate and cup sherds, shards from purple glass stemware and tumblers, and a variety of food and beverage cans. The artifact assemblage characterizes tourist-facility refuse and contains many artifacts similar to those found at the resort camp's scatter. Another site, 42GA5280, is a particularly large and dense artifact scatter, probably a dump, located about 1 km (.6 mi) west of the Bryce Canyon Lodge along the historic road to the domestic water wells in East Creek. Two broad, deep, linear furrows cross through the site; these depressions may represent the original dumping pits. Several hundred artifacts are visible on the surface, and abundant additional artifacts and charcoal fragments are visible in the numerous prairie dog burrows at the site. Artifacts consist of a variety of bottle and jar fragments, ceramic sherds (some of which are

Harriman Blue), can and metal fragments, concrete and asphalt pieces, window glass, and wire. This site may represent a main National Park Service or UPC dump that was used during the 1920s to 1960s.

Only two sites outside the vicinity of the Bryce Canyon Lodge are associated with UPC operations: Shaker Spring (42GA5216) and Trough Spring (42GA1902). Both of these sites were also discussed above in relation to livestock herding activities, but the material at Shaker Spring is more closely affiliated with its use as a post-1923 domestic water supply. Ruby Syrett established water rights to Shaker Spring, and possibly Trough Spring, in 1923, during the time UPC was negotiating its lease with the State of Utah (Farnsworth 1992). When the UPC purchased the Syretts' "Tourist Rest" later that year, the purchase included the water rights to Shaker Spring. UPC then re-filed for Trough Spring's water rights due to legal uncertainties associated with the Syretts' original filing. The UPC constructed concrete boxes at both Trough and Shaker Springs and built a 3-inch diameter pipeline to the lodge in 1925 (Union Pacific Railroad 1944). An earlier pipeline may also have been constructed by Syrett, however, because a map of the railroad's proposed tourist facilities shows a 4-inch waterline already in existence.

The archeological site at Shaker Spring contains a concrete-and-rock subterranean spring box, a large pit and backdirt pile, log and lumber piles, and a scatter of construction-related artifacts. Although there are historical records of a cast-iron pipe leading from the spring, no pipe was observed at Shaker Spring during the inventory project. A fence at Trough Spring may be related to the UPC's spring development, but no evidence of a spring box exists at this locale. The water pipeline leading from Trough Spring to the lodge can be traced over much of its length, however.

Conclusion

The Euro-American archeological resources identified during the inventory provide information that can be used together with the numerous historical research reports and archival records to develop a better informed, more thoroughly integrated history of Bryce Canyon National Park. The information gained from the identification and study of these Euro-American sites and IOs complements the abundant written records and provides a level of detail not available in written texts. The wide range of data contained in these diverse archeological resources illuminates the general character of people, work practices, and daily activities that took place atop the plateau. These archeological resources, in combination with the written record, provide a first-hand understanding of historic lifeways, resource utilization patterns, tourist industry growth, and park management strategies that have contributed to the history and development of Bryce Canyon National Park.

10

Prescribed Fires and Native American Archeology

Chris T. Wenker

The need for Bryce Canyon National Park to implement a prescribed fire program provided the impetus for the Bryce Canyon AIS. The inventory was designed to discover and document all of the visible archeological sites in the park's plateau-top fire-management areas. The park identified 16 separate FMUs, encompassing a total area of 4,148 ha (10,251 acres), that delineate the zones to be treated with prescribed fire (see Figure 5.1; Tables 5.1 and 10.1). Individual FMUs range in size from 9 to 1,581 ha (23 to 3,907 acres). The FMUs cover nearly the entire area between the western park boundary and the Pink Cliffs escarpment on the east. Between 1983 and 2001, park managers ignited prescribed fires totaling 2,221 ha (5,490 acres) in 12 of the FMUs (Table 10.1).

This chapter explores two separate issues concerning the effects of prescribed fire on Native American artifact-scatter sites. First, the frequencies of Native American artifact scatters recorded in the FMUs before and after the inventory are compared to determine if site-visibility characteristics are altered by the park's prescribed fires. The relationships between artifact visibility, survey intensity, and site identification have significant ramifications for evaluating the reliability of data collected from surface surveys (Alexander 1983; Sundstrom 1993; Wandsnider and Camilli 1992). For example, the presence of a significant bias in site visibility could negate any behavioral inferences derived from site-frequency or spatial-patterning data. The second main subject of this chapter is a review of the artifact-condition data to determine if and how recent prescribed fires are damaging flaked lithic artifacts. A wealth of experimental data on the heat alteration of lithic materials (e.g., Ahler 1983; Griffiths et al. 1987; Mandeville 1973) suggests that analytically important characteristics of stone artifacts can be adversely affected by post-depositional heating, and it is important for future researchers and park managers to understand the degree to which artifacts are damaged during prescribed fires.

Prescribed Fire and Artifact Scatter Visibility

All of the 16 FMUs had received some level of archeological survey prior to the beginning of the Bryce Canyon AIS, but the proportions of coverage were variable. In the entire FMU area, 1,063 ha (2,626 acres) had been previously inventoried (26 percent of the project area). Within the FMUs that were burned prior to the inventory, 639 ha (1,577 acres) had been surveyed (38 percent of the total burned area). Most of these previous archeological surveys followed narrow corridors for trail maintenance or road-construction projects, and few block surveys were

Table 10.1. Comparison of changes in Native American archeological site frequency in previously surveyed areas of burned and unburned fire management units.

FMU Designation	Total FMU Area	Year of Previous Archeological Surveys	Previously Surveyed Area	Count of Previously Recorded Sites*	Year of Prescribed Fires	Total AIS Site Count in Previously Surveyed Areas*	Percent Increase of Site Count in Previously Surveyed Areas
Burned FMUs							
Monument	384 ha / 949 acres	1979, 1988, 1990	79 ha / 194 acres	4	1994	5	25%
Residential Area	197 ha / 486 acres	1979, 1983, 1988, 1990	197 ha / 486 acres	–	1990, 1991, 1998, 1999	3	Not calculable
Sunset Campground	121 ha / 300 acres	1979, 1988	113 ha / 280 acres	–	1992	1	Not calculable
Test Run	74 ha / 183 acres	1979, 1990	7 ha / 18 acres	–	1983	–	0%
East Creek Meadow	160 ha / 396 acres	1979, 1988, 1990	20 ha / 49 acres	3	2000†	3	0%
Paria/Bryce Point	393 ha / 972 acres	1979, 1988, 1990	138 ha / 341 acres	2	1993	3	50%
County Line	28 ha / 70 acres	1979	11 ha / 26 acres	–	1995	–	0%
Agua 3	52 ha / 128 acres	1979, 1988	28 ha / 70 acres	–	2000†	–	0%
Agua 2	9 ha / 23 acres	1979	6 ha / 14 acres	–	1999	–	0%
Agua 1	21 ha / 52 acres	1979	12 ha / 30 acres	–	1999	–	0%
Yovimpa	213 ha / 526 acres	1979, 1988	28 ha / 69 acres	1	1995	2	100%
Subtotal*	1,652 ha / 4,085 acres	-	639 ha / 1,577 acres	9	-	17	89%
Unburned FMUs							
Unnamed; AIS # 2/ Lodge	139 ha / 344 acres	1979, 1983, 1988	139 ha / 344 acres	1	unburned	5	400%

Table 10.1 (continued)

FMU Designation	Total FMU Area	Year of Previous Archeological Surveys	Previously Surveyed Area	Count of Previously Recorded Sites*	Year of Prescribed Fires	Total AIS Site Count in Previously Surveyed Areas*	Percent Increase of Site Count in Previously Surveyed Areas
East Creek Ridge	569 ha / 1405 acres	1979, 1988, 1990	36 ha / 89 acres	4	2001‡	8	100%
Yovimpa 2	1,581 ha / 3,907 acres	1979, 1988, 1989	208 ha / 515 acres	3	unburned	10	233%
Unnamed; AIS # 15/ Cougar Hollow Ridge	113 ha / 279 acres	1988	19 ha / 47 acres	2	unburned	2	0%
Unnamed; AIS Unit 16/Podunk Creek	94 ha / 231 acres	1979, 1988	22 ha / 54 acres	–	unburned	1	Not calculable
Subtotal*	2,496 ha / 6,166 acres	–	424 ha / 1,049 acres	10	–	25	150%
Total*	4,148 ha / 10,251 acres	–	1,063 ha / 2,626 acres	17	–	41	141%

* Some sites overlap FMU boundaries; these sites are counted once in the row of each FMU that they occupy. To avoid counting sites twice, the Subtotal rows include all sites within burned or unburned zones as a whole and may not represent the sum of the FMUs. Some sites overlap burned and unburned FMUs; these are counted once in each respective Subtotal row if they overlap burned/unburned areas. Only the Total row reflects the true site count and includes all sites that fall within previous survey areas, regardless of FMU or burned area boundaries.

† The East Creek Meadow and Agua 3 FMUs were surveyed by the AIS after the prescribed fires of 2000.

‡ The East Creek Ridge FMU was surveyed by the AIS prior to the prescribed fire of 2001.

conducted specifically for the prescribed fires. The inventory project re-surveyed all previously surveyed blocks and linear corridors within the FMUs.

The inventory documented many new archeological sites in the FMUs, including many in areas of previous archeological work. Due to the nature of archeological survey techniques, the presence of undiscovered sites in previously surveyed areas is not unexpected. For example, even during an "intensive" survey, only a sample of the landscape can actually be examined because crew members are generally spaced at least 10 to 15 m (33 to 49 ft) apart, if not more, and it is impossible for crew members to view every area of exposed soil (e.g., Wandsnider and Camilli 1992). Changes in vegetation, duff cover, and erosion patterns can significantly affect the surface visibility of archeological material over time.

Changing perceptions of site significance also influence the types of archeological resources that are recorded as sites. For example, it appears that some previous surveys in Bryce Canyon National Park either entirely declined to consider Euro-American material as being of archeological interest or only recorded the remains cursorily. The Bryce Canyon AIS thoroughly recorded all archeological material identified or estimated to be greater than 50 years in age (Chapter 5). Different site-definition criteria can also affect the counts of sites recorded during follow-up surveys as well. These procedural differences alone appear to account for much of the increase in overall site counts in many of the park's FMUs. For example, aspen dendroglyphs represent the single most common feature type at project-area sites, and these features have consistently been visible to all surveyors, but they were not consistently recorded as sites during most prior investigations. During the inventory, a substantial proportion of the dendroglyph groves were recorded as sites rather than IOs (Chapter 5), and this practice probably contributes greatly to the project's overall two-fold increase in site density (Chapter 6). Similarly, a substantial number of highly visible sites containing Euro-American above-ground refuse scatters and dumps (consisting mainly of cans and glass) are presently recorded around the Bryce Canyon Lodge. The survey reported by Hartley (1980a) covered precisely the same area in which these scatters and dumps are now recorded, but none had been previously noted. These two examples mainly illustrate the effects that different archeological field practices and site definitions can have on site frequency and density, because the visibility of these sites to archeological surveyors almost certainly remains unchanged from past projects.

The rest of this discussion focuses on possible changes in the frequencies and densities of nonobtrusive site types such as Native American flaked lithic artifact scatters. Because these sites lack virtually any objects that project more than one or two centimeters above the ground surface, they do not arrest the attention of archeological surveyors from a distance. Instead, the small artifacts at these sites lie on or are embedded in the ground surface, and in a forested environment the artifacts can often be covered by pine duff or obscured by vegetation. Crew members are generally obliged to walk onto these types of sites and locate exposed artifacts in areas where soil is visible through the duff and leaf litter.

All previous investigators who worked in the park probably carefully sought to locate and record Native American sites (in contrast to the conscious or unconscious bias against Euro-American sites noted above). Hence, any increases in Native American site densities in previously surveyed parcels cannot be attributed to changes in archeological field practices or site definitions. The most parsimonious explanation is that the sites themselves became more visible during the interval since the last survey occurred.

In the montane forests that cover the Paunsaugunt Plateau, changes in vegetation, duff cover, and erosion patterns are the most likely factors producing changes in site visibility. In Bryce Canyon National Park, prescribed fire is the primary modern environmental process that can rapidly influence conditions of vegetation, duff cover, and erosion. Hence, prescribed fires should be expected to correlate with changes in site visibility; presumably this correlation is a positive one.

Site Visibility in Fire Management Units

To evaluate the effects of prescribed fires on Native American site visibility, Table 10.1 presents a comparison of site frequencies before and after the inventory project. The data used in this comparison derive only from areas that were previously surveyed. The FMUs that were burned prior to the inventory provide the data to evaluate the effects of prescribed fires on site visibility. The unburned FMUs provide the control sample that measures the success of the inventory in locating new sites in previously surveyed areas without the influence of prescribed fires.

Previously undiscovered sites were newly recorded during the Bryce Canyon AIS in almost all FMUs where other Native American sites were already known. The proportion of the increase in site counts among all previously burned FMUs (from 9 to 17 sites, an 89 percent increase) is exceeded by the increase in site counts in the unburned FMUs (from 10 to 25, a 150 percent increase). Still, a chi-square test of independence indicates no significant difference between these site-count increases ($\chi^2 = .25$; df = 1; $p > .6$). This result indicates that the proportion of the increase in Native American site frequencies in FMUs is not meaningfully influenced by the prior entry of prescribed fires.

Furthermore, even within the burned FMUs themselves, little difference in the amount of increase is apparent between the units that were burned nine years before the survey (e.g., Sunset Campground, which increased from zero to one site) versus those that were burned as recently as two years before the survey (e.g., Residential Area, which increased from zero to three sites). Further, FMUs that were burned immediately before the survey (such as East Creek Meadow and Agua 3) show no increases, but the low overall site counts and limited prior survey coverage reduce the usefulness of data from these individual units.

A subjective evaluation of the locations of newly recorded Native American artifact scatters may partially explain why the effects of fire do not play a significant role in increasing scatter visibility in the project area. Many of the newly recorded Native American artifact scatters lie along the margins of dry sagebrush meadows rather than in heavily forested areas. Intuitively, the surface visibility of the meadow sites was probably not greatly enhanced by fire. Apparently these sites simply were not discovered during prior surveys for reasons unrelated to visibility. Conversely, the inventory recorded many new artifact scatters in heavily wooded upland areas (both burned and unburned) that were also previously surveyed, indicating that vegetation communities do not consistently influence the relationship between site visibility and prior burning. Further, newly sprouted forbs and low shrubs are common in some of the previously burned FMUs. This increase in ground cover (which is a goal of prescribed fires) may actually decrease site visibility, suggesting that if surveys are going to occur after a fire, they should occur relatively soon thereafter.

These conclusions are of course hindered by the use of the FMUs as the units of analysis. When a prescribed fire is ignited in a management unit, not all areas of the unit burn with equal intensity, and some portions remain unburned. Prescribed fires are not single-event treatments; only the repeated ignition of the burn unit over time achieves the desired goals. Sometimes the fires are of low intensity and only burn light ground fuels, while in other cases the fire can ignite the tree canopy or heavy dead logs. Unfortunately, in some management units that had not been burned for several years, the archeological crews were unable to determine if past fires had physically crossed particular sites. Hence, consistent data collection was not possible across the project area. A more direct approach to evaluating the effects of prescribed fire on archeological site visibility might involve an experimental program that compares the results of duplicate surveys conducted immediately before and after a prescribed fire.

In the Bryce Canyon AIS project area, site frequencies consistently rose in most FMUs. The prior entry of prescribed fire in a management unit, however, does not influence the proportion of the increase. The factors that influenced the overall projectwide increase in site frequency probably include simply (1) the inventory's use of a comprehensive, systematic survey strategy that covered large blocks of land; (2) the multiyear duration of the survey, which allowed project staff to use intensive field methods; and (3) the use of different site-definition criteria from previous surveys. Furthermore, the project was conducted with the straightforward goal of locating and documenting all observable archeological sites and IOs. The degree to which the survey project succeeded in achieving this goal is indicated by the fact that, in addition to the 192 sites recorded within the project area, an additional 951 IOs and 3,909 log-and-rock checkdams were also recorded. Additional sites may certainly exist in areas of thick duff cover or heavy vegetation, but the inventory results probably provide a representative sample of the quantity and distribution of the park's plateau-top archeological resources.

Prescribed Fire and Flaked Stone Artifacts

The effects of prescribed and wildland fire on archeological material have been recognized in many recent studies. Most studies focus on the surface and subsurface effects of wildland fire to artifacts and features (e.g., Ruscavage-Barz 1999; Traylor et al. 1990), but relatively few focus on prescribed fire effects (Sayler et al. 1989). The lack of research on prescribed fire effects is partially mitigated by the fact that prescribed fires can be expected to produce effects that are similar to those caused by wildland fires. Prescribed fires, however, represent a different class of event from wildland fires, because prescribed fires are closely managed. Fuels may be manipulated, specific areas may be excluded from ignition, and the seasonality and meteorological conditions are closely monitored. Many prescribed fires in Bryce Canyon National Park focus on underbrush and other light ground fuels, resulting in low-intensity fires. Conversely, depending on accumulated fuel loads and short- and long-term weather conditions, unmanaged wildland fires can ignite forest canopies and produce abundant flames and high heat. Hence, the effects of prescribed fires on archeological materials can be expected to differ in subtle ways from those of wildland fires.

Heat Effects on Flaked Stone Artifacts

The effects of heating and combustion on Native American flaked lithic artifacts vary according to rock or mineral type and the temperature and duration of the fire. In general, fine-grained materials such as high-quality silicates and obsidian, and some coarser materials such as quartzite, show changes in their properties at low temperatures. Other coarse-grained materials such as poor-quality silicates and certain metamorphic and igneous rocks are altered only at higher temperatures. Experimental studies show that changes in color, luster, tractability, and translucence of chert and flint are affected by heating to temperatures as low as 200° C. Heating to temperatures higher than 300° C can cause crazing and cracking, decreased tensile strength, and increased brittleness. Under extreme heat (greater than 600° C), chert and flint can become brittle and crumbly. Color changes and crazing can inhibit raw material identification. Changes to an artifact's color and luster from postdepositional fires can also destroy evidence of cultural heat treatment of lithic material. Heat spalling or "pot-lidding" can also have serious effects on stone artifacts. A heat-induced effect that is particular to obsidian is vesicularization, which occurs when volatiles trapped in the volcanic glass expand and turn the artifact into a frothy mass (Ahler 1983; Crabtree and Butler 1964; Griffiths et al. 1987; Mandeville 1973; Schindler et al. 1982; Trembour 1990). By damaging the surface or altering the appearance of an artifact, the effects of heat can alter an item to such an extent that formal attribute analysis is not possible. If the alteration is extreme, an artifact may be essentially destroyed and its information potential lost.

An investigation into the degree of damage caused by prescribed fires is primarily an exercise that provides information about site-formation processes to land managers. This exercise at first appears to provide little behavioral information about the original site residents, but the degree to which fire alters a lithic assemblage can have important implications for the correct interpretation of past activities. For example, artifacts may become so badly fragmented or spalled by heat that they retain few analyzable attributes and contain little information. The presence of heat-treated lithic material in an assemblage can also be obscured by post–depositional heat damage. Further, the identification of fire-cracked rocks on site surfaces could also be complicated by past fire effects. Accordingly, modern fires can affect lithic assemblages in two ways: through destruction of important attributes or through the production of falsely positive data. Hence, the degree to which modern activities are shaping the archeological record should be measured.

Burned and Unburned Assemblages in the Project Area

Ninety Native American sites fall within the FMU boundaries. Lithic-assemblage data collected during the inventory are available from 85 of these sites. Two sites that overlap adjacent burned and unburned FMU boundaries are excluded, producing a total of 83 sites from which valid data can be used. Fifty-four of the sites occupy FMUs that were unburned at the time of the inventory's flaked stone artifact analysis. The remaining 29 sites occupy FMUs in which prescribed fires had been ignited prior to the survey project.

Due to the patchy nature of prescribed fire coverage in any particular FMU, field crews were occasionally unable to determine if specific sites had been burned during prescribed fires, particularly if the sites were located in an FMU that had not been ignited for several years. Accordingly, this condition assessment must group the assemblages by FMU for the analysis. The grouped artifact assemblages from sites in burned FMUs probably include some individual site assemblages that have not been burned, but currently these data cannot be segregated. As in the site-visibility assessment above, sites are classified as burned or unburned simply by virtue of their presence in a burned or unburned FMU.

This condition assessment can only measure the effects of modern prescribed fires on site assemblages. The park also frequently hosts natural or human-caused wildland fires. No major wildland fires have occurred in Bryce Canyon National Park, but at least one fire on the northern end of East Creek Ridge in the 1960s was large enough to require mechanical equipment during suppression efforts. Most wildland fires are small; many are ignited by lightning and involve one or a few trees. No significant spatial patterning is evident in the distribution of past wildland fires, but human-induced wildland fires are generally clustered around the park's developed areas (data on file, Bryce Canyon National Park, Division of Resource Management). Wildland fires that occurred before the park was established are assumed to have been similarly arrayed in an arbitrary pattern. Accordingly, the effects of natural wildland fires on flaked lithic assemblages can be assumed to be randomly distributed across all sites, regardless of their present membership in an FMU group. Hence, the underlying effects of natural fires on the assemblages are assumed to be constant at all sites. Any observed differences between burned and unburned FMU assemblages can therefore be attributable to the modern prescribed fire program.

Only micro- or cryptocrystalline silicates such as chert, chalcedony, jasper, and petrified wood are evaluated, because these materials are most vulnerable to fire effects that are recordable in the field. During the analysis, all artifacts were examined for the following classes of heat effect: *crazing*, *potlidding*, *discoloration*, and "*other*." The presence of any of these effects in an assemblage will be taken as a positive sign of a post-depositional fire effect. *Luster changes* were also evaluated in the field, but this class is not considered a certain sign of fire-induced damage because purposeful heat treatment could also have produced this effect.

The grouped assemblage of flaked lithic artifacts from 29 sites in seven burned FMUs includes 524 items (Table 10.2). One FMU (with

Table 10.2. ***Frequency of fire-affected flaked lithic artifacts in burned and unburned fire management units.***

	Total Grouped Assemblage Size	Total Fire-Affected Items	Fire Effect		
			Crazing	Potlidding	Discoloration
Burned FMUs	524	78 15*	58 74†	12 16†	8 10†
Unburned FMUs	1,026	149 15*	91 61†	23 15†	35 24†
Total	1,550	227 15*	149 66†	35 15†	43 19†

* Row percent of total grouped assemblage.

† Row percent of only fire-affected items.

two sites) contains no heat-affected artifacts,. Eighty-five percent of the overall grouped assemblage from burned FMUs shows no macroscopic evidence of heat effects. Of the remaining 81 heat-affected items, three show only a change in luster; these are excluded. The 78 damaged artifacts derive in varying proportions from 24 sites in six different FMUs. The frequency of damaged artifacts is proportional to each FMU's site density. No relationships between the frequency of damaged artifacts, the number of prescribed burn entries, or the year of the prescribed fires are evident.

The grouped assemblage of flaked lithic artifacts in five unburned FMUs includes 1,026 items from 54 sites (Table 10.2). Again, 85 percent of the grouped assemblage shows no heat effects. Of the 151 heat-affected items, two with luster changes are excluded from further consideration. The remaining 149 fire-damaged artifacts derive in varying proportions from 44 sites in all five FMUs. The frequency of damaged artifacts again appears proportional to the site density in each FMU.

Identical proportions of flaked lithic artifacts from burned and unburned FMUs show evidence of fire damage. This observation indicates that the prior entry of prescribed fire in an FMU is not associated with the proportion of fire-affected artifacts in the FMU as a whole. The frequencies of the different types of fire effects (Table 10.2) do, however, show significant differences between burned and unburned FMUs ($\chi^2 = 6.11$; df = 2; $p = .047$). A visual assessment of the damage types indicates that burned FMUs contain higher-than-expected frequencies of crazed artifacts but lower-than-expected counts of discolored artifacts. This contradictory observation is not readily explainable.

The Native American sites in the project area have probably witnessed centuries of sporadic wildland fires. The presence of fire damage in the unburned FMU assemblages can be attributed to past wildland fires. Because the unburned and burned FMU assemblages contain identical proportions of damaged artifacts, the natural wildland fires appear to account for most or all of the observed damage, regardless of prescribed fire entry. Modern prescribed fires do not appear to significantly influence the proportion of fire-damaged artifacts present in the overall fire-management areas, although the types of damage may be influenced.

The limitations of the project data, however, preclude the analysis of damage occurring at individual sites. As with the site-visibility assessment, a better approach to the study of prescribed fire effects might involve pre- and post-burn analyses at archeological sites (or at modern scatters of experimentally created flaked stone artifacts) that are known to be crossed by prescribed fires.

Summary

The results of this evaluation are somewhat surprising and run counter to general expectations. Newly recorded sites would be anticipated to be located in FMUs that have witnessed one or more prescribed fires, due to the expectation that ground-surface visibility increases after a fire. A projectwide increase in site density is apparent, but the increase does not appreciably vary according to burn status. The survey results indicate that the increase in site counts is not linked to the prior entry of prescribed fire in a burn unit. Unfortunately, this assessment is entirely based on postfire observations and relies heavily on prior data from numerous previous surveys. The Bryce Canyon AIS data, however, could be profitably used to compare with future research results, if postfire surveys can be conducted in prescribed fire areas before new vegetation obscures the ground surface.

Burned FMUs also contain assemblages that show identical proportions of fire-affected artifacts as unburned FMUs. The necessity of viewing the proportion of damaged artifacts at the level of the entire FMU probably masks significant site-level changes, however. The conclusion that prescribed fires have no effect is also particularly tentative because this assessment necessarily assumes that the prefire proportions of damaged artifacts in burned FMU assemblages were identical to those in the assemblages of unburned FMUs. The actual prefire proportion of fire-damaged artifacts in the burned FMUs can never be calculated or recreated. Now that baseline data are available, however, the effects of future fires may be tracked.

11

Project Summary and Future Directions for Archeological Research

Chris T. Wenker

Bryce Canyon National Park was originally established as a national monument by presidential proclamation on June 8, 1923 to preserve its spectacular geologic and geomorphologic phenomena for the enjoyment and education of the American public. This goal has been admirably achieved.

Conversely, 75 years later, when the park's first Archeological Overview and Assessment was written (NPS 1998), the state of Bryce Canyon National Park's archeological information was still extremely limited. Archeological survey coverage was patchy, much information was outdated, and most of the recent work was heavily weighted toward the plateau-top highway corridors. Test excavations at a small number of roadside sites provided little additional data. Overall, the types, distribution, and condition of archeological sites in the park remained poorly understood. This lack of information perpetuated the assumption that few significant archeological resources existed in the park.

Park managers, archeologists, and the public are now presented with an opportunity to view the park's archeological record at a scale never before available. This opportunity arises as a result of the recent Bryce Canyon AIS. This inventory, which was conducted over two field seasons (2000–2001), was the first large-scale, intensive archeological survey conducted in the park. The survey results provide a comprehensive and detailed view of the archeological resources in nearly 11,000 acres on the Paunsaugunt Plateau. The inventory was born out of the park's need to implement a hazard-fuel reduction and ecosystem-restoration program that relies heavily on the use of prescribed fire. Although driven by the specific planning and compliance requirements of the prescribed fire program, the project also provides abundant information and suggests new avenues of research into past Native American and Euro-American lifeways on the plateau.

Bryce Canyon Archeological Inventory Survey Summary

Two hundred twenty-three archeological sites are currently recorded in Bryce Canyon National Park; 192 of these lie within the 4,370 ha (10,799 acre) plateau-top project area. Only a few sites are known below the Pink Cliffs, primarily due to a lack of survey coverage. The Native American archeological resources recorded during the survey generally consist of scatters of flaked stone artifacts dating to the Archaic or late Prehistoric periods, but the park's first Anasazi and Paiute sites and a possible late Paleoindian site were also recorded. The Anasazi and Paiute sites also contain the park's first prehistoric ceramics, and four additional Paiute sites contain the first culturally modified ponderosa pine trees recorded in the park. Although no permanent habitation sites are present, the park's archeological resources are important for their potential to reveal changes in Native American seasonal use of high-elevation forest and meadow resources over the past 10,000 years.

Historic Euro-American sites generally consist of small and unobtrusive aspen dendroglyphs, campsites, or refuse scatters. These sites are also important for their potential to provide information about historic period changes in the economic use of the plateau before and after the national park was established, as well as historic developments in the park's infrastructure.

Native American Archeology

The Native American archeological sites in Bryce Canyon National Park represent a wide range of temporal and cultural affiliations extending from the late Paleoindian/early Archaic period transition (ca. 9500 B.P.) to the protohistoric or historic period (late 1800s). The archeological cultures represented in the park include possible late Paleoindian; Great Basin early, middle, and late Archaic; Virgin Anasazi; generalized late Prehistoric; and Numic/Southern Paiute. No above-ground architectural features have been identified at any sites in the park. This phenomenon is not unexpected, because almost all work in the park has focused on the high-elevation settings of the plateau top, where permanent habitation is unlikely. Architectural features might be anticipated along the lower watercourses east of the park, however, and some potential for rock shelters or cliff dwellings might be present in the steep-walled eastern canyons as well.

The most common sites found in the park are artifact scatters, and most of these consist entirely of flaked stone tools and manufacturing debris. The vast majority of the flaked stone artifacts are made of multicolored chert, which probably represents material obtained from Brian Head formation outcrops found in nearby locations outside the park. Coarse quartzite is available as lag gravel deposits within the park, and some artifacts are made of this material. Obsidian is present in low frequencies at many sites, but jasper, petrified wood, and other imported materials are less common. Few sites contain ground stone items on the surface, and fewer yet contain ceramic artifacts. Dominguez and Danielson (2000) report that some faunal material, as well as low frequencies of burned macrobotanical material, were recovered from their test excavations, so these artifact classes may also be expected at some of the sites recorded by the survey. Several sites may contain subsurface features such as hearths or roasting pits, but these features are exceptionally uncommon. Isolated artifacts found on the plateau top also generally consist of single flakes, sparse lithic scatters, or isolated tools such as used flakes, pressure-flaked biface fragments, or projectile points. Several isolated ground stone artifacts were also recorded, but these mostly include sandstone slabs or quartzite cobble manuports that were probably carried in from elsewhere.

Functionally, Archaic period sites overwhelmingly represent hunting locales. An abundance of broken bifacial tools including projectile points, as well as the common presence of flaking debris from biface reduction and pressure flaking, indicate that the Archaic period residents of the plateau used lightweight, portable tool kits that were well-suited to the pursuit of game. A single late Archaic period site contains a grinding stone, and that site is tentatively identified as a processing camp. Compared with regional patterns of land use, the Archaic period land-use strategy of the Paunsaugunt Plateau appears relatively ephemeral. Sites of this period in lower-elevation settings commonly exhibit hearths, ground stone tools, and more diverse tool kits. The high-elevation forests on the plateau were probably used during logistical forays away from the more settled base camps in lower-elevation zones.

Late Prehistoric or Formative period sites represent a variety of functions, but no clear pattern is evident. The few sites that contain Virgin Anasazi ceramics are of equivocal function, but one at least is a processing camp. Compared with Puebloan sites on the Skutumpah Terrace immediately below the Pink Cliffs to the south, the occupation of the plateau top appears remarkably sporadic and ephemeral. On the lower terrace, Christensen et al. (1983) and Keller (1987) report abundant Puebloan sites with hearths and grinding stones, indicating relatively intensive use of wild resources. The top of the Paunsaugunt Plateau does not contain a similarly rich archeological record of Puebloan use, suggesting that the Pink Cliffs may have marked nearly the northern boundary and elevational limit of the Grand Staircase's Virgin Anasazi catchment area.

Numic or Southern Paiute sites are relatively common on the plateau. Every single-component Paiute site in the project area is classified as a processing camp, which Geib et al. (2001) propose can also be interpreted as temporary habitation sites that were occupied by small groups. If this is true, the Paiute occupancy represents the most intensive period of residential use the plateau has ever witnessed. In most respects, the Paiute sites on the plateau closely resemble those in surrounding, lower-elevation areas. This observation suggests that the Paiute used the plateau not for special-purpose forays, but as part of their normal transhumant rounds. The difference between the Archaic and Paiute use of the plateau supports a growing body of evidence that the lifeways of these Great Basin hunting and gathering peoples differed dramatically, contrary to many prior expectations.

Euro-American Archeology

The majority of the park's Euro-American archeological sites consist of groves of aspen dendroglyphs, which are historic inscriptions carved into tree trunks. These sites each contain from 2 to 60 or more carved trees. The majority of inscriptions consist of personal names or initials and dates. The earliest dates come from glyphs carved in 1893, 1896, and 1897, but most inscriptions with dates were carved between the 1910s and the 1930s. Dendroglyphs showing human figures, animals, and other drawings (such as a deck of cards, and a pistol) are occasionally present. Some of these figures are elegantly drawn and aesthetically pleasing while others are carved with a crude hand or are pornographic in nature. These sites appear to be primarily related to the use of the plateau's high meadows, streams, and springs for sheep and cattle grazing in the 1910s through 1930s, and most of the names and initials carved on the trees appear to be those of local shepherds and cowboys.

Other important historic Euro-American sites in the park are temporary or seasonal campsite locations. The best-known of these is an abandoned CCC camp. Another historic campsite west of the Bryce Canyon Lodge appears to have been a "resort camp" where early park visitors were entertained and housed. This camp site consists of several leveled and graveled tent platforms connected by gravel pathways, and it contains several dense refuse scatters that include many broken pieces of purple glass stemware and other relatively "expensive" items that would not be expected at a work camp or a herder's residential camp. The other historic campsites in the park are much less substantial and probably represent work camps. One contains two outhouse depressions and burned refuse piles, another contains a large hearth and the structural remains of a possible outhouse, and the rest consist only of stone campfire rings and associated sparse refuse scatters.

Small historic refuse scatters or dumps are also abundantly scattered throughout the park. Many consist of food cans and bottles, but many oil and fuel cans and pieces of hardware or vehicle parts are also present. Most of these sites and isolated occurrences probably date to the 1920s through 1940s. During this period, the park's forests were logged to provide building material for park construction projects. The CCC also conducted forest-thinning work to control insect infestations. Extensive road construction and pipeline installation projects were also undertaken during this period. Historic photographs show that heavy trucks were used to haul lumber and rocks into the meadows for checkdam construction, and most of the drivable areas on the plateau top probably experienced heavy vehicular use during logging and checkdam installation. The archeological manifestation of this use is now visible in the common small refuse scatters left by the loggers and construction crews, as well as in the numerous abandoned dirt roads that cross the plateau-top. Conversely, refuse scatters and dumps around the Bryce Canyon Lodge probably indicate work sites or disposal areas created by the park concessionaire.

The most common historic archeological features in the park are log-and-rock checkdams; nearly four thousand small checkdams were recorded. Historic records indicate that the CCC started building an erosion-control system consisting of hundreds of checkdams in the late 1930s. After the CCC disbanded, the park developed a Soil and Moisture Control program to continue the work. Other Euro-American archeological resources include gravel pits (probably related to Rim Road construction) and rock quarries (probably related to the construction of park buildings). Several improved springs are known, some of which include axe-hewn logs used for livestock troughs. A historic telephone line crosses the park, as do several historic water pipelines. Many trail segments, blazed trees, rock piles, rock cairns, and stone alignments are also present, as are a variety of fence lines, park boundary markers, inscriptions on rock outcrops and on pine trees, wood piles, depressions, and miscellaneous small concrete features.

Although many historians have written about the Bryce Canyon area, these studies generally cover only a few standard themes such as the initial Mormon settlement of the area, the early tourist days at Ruby Syrett's lodge, and the development of Bryce Canyon National Park. The everyday lives of local shepherds, ranchers, and loggers are rarely, if ever, described, even though the economic livelihood of the region has always relied on the resources of the Paunsaugunt Plateau. The history of this important facet of pioneering life has not been adequately described or interpreted, mainly due to a lack of primary historical documentation. Although the information that can be gleaned from the aspen dendroglyph inscriptions is often obscure, these sites provide a unique and alternative glimpse into the daily lives of the early settlers who worked on the plateau.

These sites are also important as works of vernacular art and for their ability to connect directly with modern descendants who carry on a similar rural lifestyle. During the homesteading period, Utah's Mormons developed a distinctive village-based strategy for herding livestock that differed from that of the sprawling ranches of the stereotypical American west. Utah's modern population

> has a surprisingly deep but unfortunately largely uninformed affinity for the traditions that livestock enterprises bequeathed the state. There is great danger of Utah's particular cultural past being consumed by the mythic memory of the larger frontier past. Thus, in terms of the lessons it teaches for quality of life as well as for what it tells us about the technicalities of resource utilization, the different past of one state is important. (Peterson 1989:319)

In the general absence of large, centralized ranches or other grazing facilities, the small-scale archeological remains of Utah's pioneering ranchers and shepherds constitute some of the only remaining tangible links to this historic tradition.

Sites created during National Park Service activities are directly related to the development of Bryce Canyon National Park's infrastructure and, hence, are unique to the park. Some documentary or archival information is available for some of these sites, but others are known only from their archeological remains. The wide range of data contained in these diverse sites illuminate the general character of work practices, daily activities, concessionaire-management activities, and tourist demographics that prevailed during the historic period of park management and development.

Directions for Future Archeological Research

Survey Data Collection

At the conclusion of the Bryce Canyon AIS, a total of 4,915 ha (12,146 acres), or 34 percent of Bryce Canyon National Park has been archeologically inventoried, but the intensively surveyed areas focus entirely on the densely forested Paunsaugunt Plateau, which covers only the upper one-third of the park. Below the Pink Cliffs, the pinyon/juniper woodlands of the canyons and foothills zone covers the remaining two-thirds of the park. Virtually none of this area (only 262 ha [648 acres], less than 3 percent) has been surveyed, and only nine sites have been recorded below the canyon rim. All of the existing surveys below the rim were conducted for compliance projects between 1980 and 1997, and all of the surveys follow narrow road, trail, or fence-line corridors. As a result, these scattered survey projects do not provide a representative sample of the landscape.

Anecdotal reports by park staff and others indicate that unrecorded Native American artifact scatters (including abundant ceramics) and Euro-American dendroglyphs, log cabins, and corrals are present below the canyon rim, but no scientifically collected information is available. Until surveys are performed, the existence of these sites must remain unconfirmed. Surveys in the canyons and foothills will expand the scope and usefulness of the plateau-top survey results by collecting data from a completely different environmental and topographic setting that has not been previously investigated.

The known plateau-top sites north of the Bryce Canyon AIS boundary also lack current data. The shortage of useful information from these sites precluded their integration into the interpretive section of this report. Based on their high frequency and large sizes, these sites appear to represent an occupational intensity unlike any observed in the project area, despite the fact that these sites lie less than 3 km (1.9 mi) from the northern boundary of the survey. These northern sites probably reflect an intensive use of lower-elevation plateau-top settings similar to that noted by Dykmann (1976) and Kearns (1982) in the Johns Valley region farther to the north. The factors contributing to the variable intensity of use across the plateau remain unknown, but areas of high- and low-site density at the northern end of the park may relate to environmental characteristics. For example, a visual examination of surficial geology maps (Bowers 1991) reveals a close (but not statistically evaluated) correlation between low site densities and areas underlain by the Claron limestone. Conversely, areas such as East Creek Meadow, and the area north of the survey, which are underlain by Quaternary alluvium and colluvium or other non-Claron rock types, show relatively high site densities. These associations, and the processes driving them, remain for future evaluation.

Archeological Excavations

Dominguez and Danielson (2000) summarize a series of small test-excavation projects at 11 sites, most of which lie along the Rim Road corridor. These excavations were primarily intended to assess the sites' integrity and information potential, and the results were used to evaluate the sites' eligibility for nomination to the National Register of Historic Places (NPS 1991). The usefulness of Dominguez and Danielson's (2000) results is limited by several factors. The sites were arbitrarily selected for excavation solely by virtue of their proximity to construction areas (only a single site outside a construction area was excavated). Accordingly, the tested sample fails to represent the range and frequency of Native American site types distributed throughout the biotic and abiotic zones that can be defined in the park (e.g., ecological, geomorphological, etc.). Further, the excavation strategies were designed to recover a limited range of data about site condition and data potential, and relatively small proportions of the sites' overall surface areas were actually excavated.

The nature of the buried archeological record also proved a limiting factor. Except for one site where thermal features were visible on the modern surface, no excavated sediments revealed any intact cultural stratigraphy, even at sites where surface materials indicated multiple occupations over long time spans. Even at apparent single-occupation sites, no discrete buried cultural deposits were identifiable, and no concrete stratigraphic relationships between past forest fire events and human occupations could be determined. The apparent conflation of cultural materials and residues from superimposed human occupations precludes many meaningful synchronic or diachronic functional interpretations of these open-air sites.

Despite the paucity of artifacts and the general absence of buried cultural deposits or features at most sites, further archeological excavations at Native American sites on the Paunsaugunt Plateau may prove fruitful if carefully planned sampling strategies are implemented. Sites representative of the various functional types should be selected from different geomorphic or vegetative zones to explore possible differences along the plateau's elevational gradient. Due to low artifact counts, excavation procedures should be designed to maximize artifact and sample-recovery rates. Areally extensive excavation units and intensive, close-interval augering or shovel testing may be necessary to recover adequate artifact sample sizes and identify cultural strata or buried features. Detailed geomorphological evaluations of the formation of the park's Holocene landscape would add tremendously to any such research program by identifying depositional settings that may contain intact buried archeological material. The efficacy of these methods remains undetermined, but future researchers should plan to grapple mainly with small, shallow, possibly disturbed sites. Still, additional excavations should produce data bearing on site function, age, occupational intensity and seasonality, and cultural affiliation that would enable testing of many of the interpretations derived from the Bryce Canyon AIS data.

Material-Culture Studies

Obsidian-source analyses of artifacts from Bryce Canyon National Park consistently show a focus on source areas in the eastern Great Basin. All analyzed artifacts from this survey and a substantial proportion of those analyzed by Dominguez and Danielson (2000) represent projectile points and other tools. Source data from items of flaking debris are lacking, and this information should be collected to provide data for comparison to the tool assemblages. More obsidian from sites of different ages should be sought for source analysis to allow any temporal shifts in procurement strategies to be discerned.

The great variability in the visual attributes of Brian Head chert and the broad distribution of Brian Head chert outcrops across the landscape presently prevent archeologists from attributing particular artifacts to specific source areas. The range of artifact material types analyzed during the project and the varieties of natural chert observed by the author hint that research to create a more fine-grained typology of chert types on the Paunsaugunt Plateau may be productive. For example, the range of cherts present in Casto Canyon, north of the park, is different from that observed at either Panguitch Lake or at Brian Head Peak. The Casto Canyon material presumably derives from Brian Head formation outcrops at the canyon head, but it could derive from other non-Brian Head deposits mid-canyon; details such as this require clarification. Little information is available about the chert sources at Flake Mountain (Dominguez and Danielson 2000) or about the chert-bearing alluvial lag gravels along the Sevier River. The Casto Canyon, Flake Mountain, and Sevier River source areas need to be compared and contrasted. Petrographic analyses (Bakewell 2001) could help differentiate material from these sources.

Further, the nature of the lithic-procurement archeological sites scattered along the foothills of the Sevier Plateau near Flake Mountain (Dykmann 1976) should be examined more thoroughly. The intensity of lithic procurement should be measured and compared to better-known source areas such as Cedar Breaks National Monument (Canaday 2001). If a major chert procurement area were to be identified immediately north of Bryce Canyon National Park, the archeological picture of regional Native American land use would require reevaluation. Quantities of natural chert are also reported below the Pink Cliffs in the park (Gayle Pollock, personal communication 2001), and the abundance of those sources and their possible influence on the artifact assemblages of the plateau-top sites require further clarification as well.

Wooden Archeological Features and Data Collection

Bryce Canyon National Park contains at least 16 standing ponderosa pine trees that were used by protohistoric or historic Paiute people. The dendrochronological data that these trees contain (Stryd 1998) can provide information about not only the period of site occupation, but possibly even about the seasonality of feature use. The dates of bark-stripping events can also be used to measure the periodicity of the creation of these features, which can be used to infer subsistence stress (Martorano 1981). Core samples or cross sections should be recovered from these trees to prevent the loss of chronometric information from these fragile, perishable, and flammable features.

Finally, aspen dendroglyphs constitute a substantial proportion of the archeological record in the park. Due to the relatively short life spans of most aspen trees, these historic dendroglyphs are disappearing yearly. This loss of information makes the recordation of bark carvings a matter of some urgency. Additional unrecorded dendroglyph groves are known to exist below the canyon rim. Information from many of those trees is expected to duplicate that found on the plateau top, but the expansion of the database may reveal additional patterns in the seasonality or use of discrete grazing areas. Adjoining areas of the Dixie National Forest also surely contain an immense quantity of aspen dendroglyph data. Future dendroglyph recording projects in the forests of the Paunsaugunt Plateau will also surely be rewarded with abundant and illuminating results.

Conclusion

Bryce Canyon National Park occupies the highest step of southern Utah's Grand Staircase. The lifeways of all past residents of this province were structured by the different types of biotic and abiotic resources available on the staircase's stepped terraces. Archeological investigations in this elevationally partitioned landscape can not only view past occupational strategies on individual steps of the staircase but can compare and contrast the strategies that were used on nearby steps containing different resources. Information from recent, large-scale surveys covering each of the steps of the Grand Staircase now allows the Native American and Euro-American culture history of the entire province to be sketched out. Nonetheless, a general lack of excavation data from well-preserved contexts throughout the staircase presently hinders detailed interpretation of past lifeways. Archeological excavations are necessary at sites of all time periods (not just Anasazi or Fremont sites) to provide the robust data sets needed for accurately assessing the interpretations of regional surveys.

The High Plateaus that frame the Grand Staircase occupy a geographic boundary zone between the eastern Great Basin and the western Colorado Plateau. Through the entire 8,000-year Archaic period, the material culture of the residents of this boundary zone shows a strong affinity to that of the contemporary archeological cultures inhabiting the Great Basin to the west. No such affinity to the Southwest culture area of the Colorado Plateau to the south and east is evident. This pattern is striking because of the dramatic dissimilarities between the environments of the Grand Staircase (which is typical of Colorado Plateau grasslands and woodlands) and the Great Basin, with its lacustrine basins and cold-desert settings. Identifying the processes through which the material culture of Great Basin-focused archeological cultures came to be used on the Colorado Plateau remains an important archeological problem. One key to the interpretation of this pattern involves working out the temporal and spatial relationships of diagnostic Archaic period projectile point styles in southern Utah. The relationship of local projectile point styles to those of traditions in neighboring areas (e.g., the northern Southwest's Oshara Tradition) must also be clarified. Simple points-equal-people interpretations will probably fail as explanations. Other technological, environmental, geographic, social, and economic factors also surely played important roles in promoting or constraining the nature of the Great Basin Archaic period adaptation to southern Utah's canyons and mesas. Data from throughout the Great Basin/Colorado Plateau interface, and places like Bryce Canyon National Park in particular, will contribute to the resolution of this question and many others about the past.

Appendix 6.1

Site Summary

Appendix 6.1. ***Site Summary***

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42GA1896	AIS-5	Native American	Lithic Scatter	4,759	None	Flaked lithics including 1 unknown corner-notched dart point
42GA1899	AIS-148	Native American	Lithic Scatter	5,640	None	Flaked lithics including 1 Elko Eared point, 1 Rosegate Corner-notched point, and 1 unknown corner-notched arrow point; ground stone
42GA1900	AIS-999	Native American	Lithic Scatter	157	None	Flaked lithics
42GA1901	AIS-33	Native American	Lithic Scatter	1,600	None	Flaked lithics
42GA1902	AIS-80	Native American and Euro-American	Multicomponent - Lithic Scatter / Improved Spring	1,769	Wooden trough and fence	Flaked lithics including 1 unknown side-notched dart point, cans, miscellaneous historic artifacts
42GA1903	AIS-1	Native American	Lithic Scatter	30,402	None	Flaked lithics including 1 Great Basin Stemmed/Jay point, 1 Gypsum point, 1 Northern Side-notched point, 1 Elko Side-notched point, 1 unknown dart point, 1 unknown corner-notched dart point, and 1 unknown arrow point
42GA1904	AIS-112	Native American and Euro-American	Multicomponent - Lithic Scatter / Culturally modified trees / Dendroglyph	33,435	4 bark stripped ponderosa pines, 1 with an historic inscription; 19 dendroglyphs, 2 fire hearths, 2 rock concentrations, a modified tree, and a benchmark	Flaked lithics including 1 Elko Eared point, 1 Bull Creek point, 1 San Rafael Side-notched point, 1 Desert Side-notched point, and 1 unknown arrow point; ground stone, glass, cans, miscellaneous historic artifacts
42GA2634	AIS-188	Native American	Lithic and ceramic scatter	1,306	None	Flaked lithics including 1 Rosegate Stemmed point, ground stone, and ceramics including unidentified Virgin series black-on-gray and Paiute brownware
42GA3383	AIS-32	Native American	Lithic Scatter	3,645	None	Flaked lithics including 1 Gypsum point
42GA3384	AIS-45	Native American	Lithic Scatter	160	None	Flaked lithics
42GA3387	AIS-65	Native American	Lithic Scatter / Culturally modified trees	861	2 bark stripped ponderosa pine trees	Flaked lithics
42GA3388	AIS-66	Native American	Lithic Scatter	4,199	None	Flaked lithics including 1 Gypsum point
42GA3488	AIS-58	Native American	Lithic Scatter	308	None	Flaked lithics, ground stone
42GA3558	AIS-75	Native American	Lithic Scatter	420	None	Flaked lithics including 1 unknown side-notched dart point

Appendix 6.1. (continued)

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m²)	Features	Artifacts
42GA3559	AIS-178	Native American	Lithic Scatter	250	None	Flaked lithics
42GA3560	AIS-83	Native American and Euro-American	Multicomponent - Lithic Scatter / Euro-American refuse scatter	15,088	None	Flaked lithics, ground stone, glass, cans
42GA3561	AIS-13	Native American and Euro-American	Multicomponent - Lithic Scatter / Euro-American formal campsite	153,667	7 privy depressions, 1 unknown depression, and a gravel pathway	Flaked lithics, miscellaneous historic artifacts
42GA5176	AIS-2	Native American	Lithic Scatter	1,758	None	Flaked lithics, ground stone
42GA5177	AIS-3	Native American	Lithic Scatter	367	None	Flaked lithics including 1 Pinto point
42GA5178	AIS-4	Native American	Lithic Scatter	2,586	None	Flaked lithics
42GA5179	AIS-6	Euro-American	Dendroglyph	6,878	28 dendroglyphs	Cans
42GA5180	AIS-7	Euro-American	Dendroglyph	142	3 dendroglyphs	None
42GA5181	AIS-8	Euro-American	Dendroglyph	2	2 dendroglyphs	None
42GA5182	AIS-9	Native American	Lithic Scatter	1,323	None	Flaked lithics including 1 Pinto point
42GA5183	AIS-12	Euro-American	Euro-American informal campsite	175	3 firehearths	Cans, miscellaneous historic artifacts
42GA5184	AIS-14	Native American	Lithic Scatter	591	None	Flaked lithics
42GA5185	AIS-15	Native American	Lithic Scatter	467	None	Flaked lithics
42GA5186	AIS-16	Native American	Lithic Scatter	752	None	Flaked lithics including 1 unknown point
42GA5187	AIS-17	Native American	Lithic Scatter	909	None	Flaked lithics
42GA5188	AIS-18	Native American	Lithic Scatter	167	None	Flaked lithics
42GA5189	AIS-19	Native American	Lithic Scatter	295	None	Flaked lithics, ground stone
42GA5190	AIS-21	Native American	Lithic Scatter	3,444	None	Flaked lithics including 1 Pinto point and 1 Elko Corner-notched point
42GA5191	AIS-22	Native American	Lithic Scatter	483	None	Flaked lithics
42GA5192	AIS-27	Native American	Roasting or thermal feature with lithic and ceramic scatter	623	Small fire-cracked rock concentration	Flaked lithics including 1 Desert Side-notched point, Paiute brown ware ceramics
42GA5193	AIS-30	Native American	Lithic Scatter	547	None	Flaked lithics including 1 unknown corner-notched arrow point
42GA5194	AIS-31	Native American	Lithic Scatter	335	None	Flaked lithics
42GA5195	AIS-42	Native American	Lithic Scatter	411	None	Flaked lithics

Appendix 6.1. ***(continued)***

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42GA5196	AIS-43	Euro-American	Dendroglyph	1,590	6 dendroglyphs	Cans
42GA5197	AIS-44	Euro-American	Dendroglyph	8,046	13 dendroglyphs and a blazed ponderosa pine tree	None
42GA5198	AIS-46	Euro-American	Dendroglyph	3,502	19 dendroglyphs	Cans
42GA5199	AIS-47	Native American	Lithic Scatter	613	None	Flaked lithics
42GA5200	AIS-48	Native American	Lithic Scatter	1,348	None	Flaked lithics including 1 Elko Corner-notched point
42GA5201	AIS-49	Native American	Lithic Scatter	5,432	None	Flaked lithics including 1 Elko Eared point and 1 Desert Side-notched point, ground stone
42GA5202	AIS-50	Native American	Lithic Scatter	1,011	None	Flaked lithics including 1 unknown side-notched arrow point
42GA5203	AIS-51	Native American	Lithic Scatter	786	None	Flaked lithics including 1 Rosegate Corner-notched point
42GA5204	AIS-52	Native American	Lithic Scatter	8	None	Flaked lithics
42GA5205	AIS-53	Native American	Lithic Scatter	3,434	None	Flaked lithics including 1 Parowan Basal-notched point
42GA5206	AIS-54	Native American	Lithic Scatter	5,293	None	Flaked lithics
42GA5207	AIS-55	Native American	Lithic Scatter	1,245	None	Flaked lithics
42GA5208	AIS-56	Native American	Lithic Scatter	751	None	Flaked lithics
42GA5209	AIS-57	Native American	Lithic Scatter	373	None	Flaked lithics including 1 unknown corner-notched dart point
42GA5210	AIS-59	Native American	Lithic Scatter	758	None	Flaked lithics including 2 Gypsum points
42GA5211	AIS-60	Native American	Lithic Scatter	3,074	None	Flaked lithics
42GA5212	AIS-62	Native American	Lithic Scatter	771	None	Flaked lithics
42GA5213	AIS-63	Native American	Lithic Scatter	1,543	None	Flaked lithics including 1 Gypsum point and 1 unknown corner-notched dart point
42GA5214	AIS-64	Native American	Lithic Scatter	7,697	None	Flaked lithics
42GA5215	AIS-67	Native American	Lithic Scatter	2,457	None	Flaked lithics including 1 Elko Eared point and 1 unknown arrow point

Appendix 6.1. ***(continued)***

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42GA5216	AIS-68	Euro-American	Improved spring	665	Spring box, small dam, 3 dendroglyphs, a large excavated pit and backdirt pile, 2 log piles, and a cluster of fence posts	None
42GA5217	AIS-69	Native American	Lithic Scatter	400	None	Flaked lithics
42GA5218	AIS-70	Native American	Lithic Scatter	1,699	None	Flaked lithics including 1 Elko Corner-notched point and 1 unknown stemmed dart point, bone
42GA5219	AIS-71	Euro-American	Euro-American formal campsite	12,312	10 dendroglyphs, 2 privy foundations, a log pile, and 5 rock piles	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5220	AIS-72	Native American	Lithic Scatter	1,601	None	Flaked lithics including 1 unknown point
42GA5221	AIS-73	Native American	Lithic Scatter	1,541	None	Flaked lithics
42GA5222	AIS-74	Euro-American	Euro-American refuse dump	54	Earthen mound (possible buried refuse dump)	Glass, miscellaneous historic artifacts
42GA5223	AIS-76	Native American	Lithic Scatter	5	None	Flaked lithics including 1 Elko Corner-notched point
42GA5224	AIS-77	Euro-American	Gravel pit	8,501	Gravel pit depressions, linear depression, 2 log piles, and 3 dendroglyphs	Miscellaneous historic artifacts
42GA5225	AIS-79	Native American	Lithic Scatter	355	None	Flaked lithics
42GA5226	AIS-81	Euro-American	Dendroglyph	837	11 dendroglyphs	None
42GA5227	AIS-82	Euro-American	Dendroglyph	2,280	24 dendroglyphs	Cans, miscellaneous historic artifacts
42GA5228	AIS-84	Euro-American	Dendroglyph	438	5 dendroglyphs and a cairn	None
42GA5229	AIS-85	Euro-American	Dendroglyph	736	7 dendroglyphs	None
42GA5230	AIS-86	Euro-American	Dendroglyph	970	23 dendroglyphs	None
42GA5231	AIS-87	Native American	Lithic Scatter	114	None	Flaked lithics
42GA5232	AIS-88	Euro-American	Dendroglyph	1,386	15 dendroglyphs	None
42GA5233	AIS-89	Euro-American	Dendroglyph	1,556	9 dendroglyphs	None
42GA5234	AIS-90	Euro-American	Dendroglyph	4,732	5 dendroglyphs	Cans, miscellaneous historic artifacts
42GA5235	AIS-91	Native American	Lithic Scatter	554	None	Flaked lithics including 1 Elko Corner-notched point and 1 Elko Eared point

Appendix 6.1. *(continued)*

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42GA5236	AIS-92	Euro-American	Dendroglyph	912	7 dendroglyphs	None
42GA5237	AIS-93	Native American	Lithic Scatter	2,128	None	Flaked lithics including 1 Pinto point and 1 unknown side-notched dart point
42GA5238	AIS-94	Euro-American	Euro-American refuse scatter	750	None	Cans
42GA5239	AIS-99	Native American	Lithic Scatter	1,243	None	Flaked lithics including 1 unknown point
42GA5240	AIS-100	Native American and Unknown	Multicomponent - Roasting or thermal feature with lithic scatter / Unknown rock feature	1,361	2 rock concentration, a fire-cracked rock concentration, and a cairn	Flaked lithics including 1 Pinto point, 1 Rosegate Stemmed point, and an unknown side-notched arrow point; ground stone
42GA5241	AIS-101	Euro-American	Improved Spring	168	2 wooden troughs with historic inscriptions, a cobble-lined spring sump, and a dendroglyph	None
42GA5242	AIS-102	Native American and Euro-American	Multicomponent - Lithic Scatter / Culturally modified trees / Dendroglyph	71,581	9 bark stripped trees, one with an historic inscription; and 55 dendroglyphs	Flaked lithics including 1 Elko Eared point, ground stone, cans, miscellaneous historic artifacts
42GA5243	AIS-103	Native American	Lithic Scatter	1,447	None	Flaked lithics, ground stone,
42GA5244	AIS-104	Native American	Lithic and ceramic scatter	1,180	None	Flaked lithics, ground stone, Shinarump corrugated ceramics
42GA5245	AIS-107	Native American	Lithic and ceramic scatter	1,227	None	Flaked lithics, ground stone, Shinarump red ware and Paiute brown ware ceramics
42GA5246	AIS-108	Native American	Lithic Scatter	144	None	Flaked lithics
42GA5247	AIS-109	Native American	Lithic Scatter	297	None	Flaked lithics
42GA5248	AIS-110	Native American	Lithic Scatter	64	None	Flaked lithics
42GA5249	AIS-111	Native American	Lithic Scatter	541	None	Flaked lithics
42GA5250	AIS-116	Euro-American	Euro-American refuse scatter	88	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5251	AIS-120	Euro-American	Euro-American refuse dump	338	None	Glass, cans, miscellaneous historic artifacts
42GA5252	AIS-121	Native American	Lithic Scatter	240	None	Flaked lithics
42GA5253	AIS-122	Euro-American	Euro-American refuse scatter	546	None	Glass, historic ceramics, miscellaneous historic artifacts
42GA5254	AIS-123	Euro-American	Dendroglyph	533	6 dendroglyphs	None
42GA5255	AIS-124	Euro-American	Dendroglyph	435	5 dendroglyphs	None

Appendix 6.1. (continued)

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42GA5256	AIS-125	Euro-American	Dendroglyph	5	3 dendroglyphs	None
42GA5257	AIS-126	Euro-American	Euro-American formal campsite	2,418	Possible privy depression and a fire hearth	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5258	AIS-127	Euro-American	Euro-American refuse scatter	187	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5259	AIS-128	Euro-American	Euro-American refuse dump	156	None	Cans, miscellaneous historic artifacts
42GA5260	AIS-129	Euro-American	Euro-American refuse scatter	3,132	None	Glass, cans, miscellaneous historic artifacts
42GA5261	AIS-133	Native American	Lithic Scatter	91	None	Flaked lithics
42GA5262	AIS-137	Native American	Lithic and ceramic scatter	858	None	Flaked lithics, ground stone, Paiute brown ware ceramics
42GA5263	AIS-140	Euro-American	Euro-American structural complex (Utah Park Company Utility Area)	18,750	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5264	AIS-141	Euro-American	Euro-American refuse scatter	14,580	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5265	AIS-142	Euro-American	Euro-American refuse scatter	299	None	Glass, cans, historic ceramics
42GA5266	AIS-143	Native American	Lithic Scatter	850	None	Flaked lithics
42GA5267	AIS-144	Native American	Lithic Scatter	672	None	Flaked lithics including 1 unknown point
42GA5268	AIS-145	Native American	Lithic Scatter	517	None	Flaked lithics
42GA5269	AIS-146	Euro-American	Euro-American refuse scatter	2,000	Sign post	Glass, cans, miscellaneous historic artifacts
42GA5270	AIS-147	Euro-American	Euro-American formal campsite	10,812	4 leveled tent platforms, 1 leveled ramada like structure, one possible privy depression, 3 trails, and a parking area with driveway	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5271	AIS-149	Euro-American	Euro-American refuse scatter	1,352	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5272	AIS-160	Euro-American	Euro-American refuse scatter	1,200	None	Cans, historic ceramics, miscellaneous historic artifacts
42GA5273	AIS-161	Euro-American	Euro-American refuse scatter	1,248	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5274	AIS-162	Native American	Lithic Scatter	1,225	None	Flaked lithics

Appendix 6.1. ***(continued)***

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42GA5275	AIS-163	Euro-American	Euro-American refuse scatter	2,622	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5276	AIS-164	Native American	Lithic Scatter	1,650	None	Flaked lithics
42GA5277	AIS-165	Euro-American	Euro-American refuse scatter / possible structure	1,700	Leveled structure pad	Glass, cans, historic ceramics, miscellaneous historic artifacts
42GA5278	AIS-166	Native American and Euro-American	Multicomponent - Lithic and ceramic scatter / NPS building foundation	2,650	Rock alignment, wall, path, driveway/parking area	Flaked lithics, Shinarump plain and unidentified Virgin series (St. George Black-on-gray?) ceramics, glass, cans, miscellaneous historic artifacts
42GA5279	AIS-167	Native American	Lithic Scatter	189	None	Flaked lithics, ground stone
42GA5280	AIS-168	Euro-American	Euro-American refuse dump	2,550	None	Glass, cans, historic ceramics
42GA5281	AIS-174	Native American and Euro-American	Multicomponent - Culturally modified tree / Historic inscription	2	1 bark stripped ponderosa pine tree with an historic inscription	None
42GA5282	AIS-181	Native American	Lithic Scatter	416	None	Flaked lithics
42GA5283	AIS-183	Euro-American	Dendroglyph	1,545	11 dendroglyphs	Cans
42GA5284	AIS-185	Native American	Lithic Scatter	120	None	Flaked lithics including 1 Elko Eared point
42GA5285	AIS-186	Euro-American	Dendroglyph	650	5 dendroglyphs	None
42GA5286	AIS-187	Euro-American	Euro-American refuse scatter	235	None	Glass, cans, historic ceramics
42GA5287	AIS-193	Euro-American and Unknown	Multicomponent - Historic rock inscription / Unknown Pictograph	2	Pictograph and historic inscription	None
42GA5288, 42KA5814	AIS-61	Euro-American	Telephone Line	96,450	Telephone line remains	Miscellaneous historic artifacts
42KA1989	AIS-192	Native American	Lithic Scatter	400	None	Flaked lithics
42KA3284	AIS-189	Native American	Lithic Scatter	272	None	Flaked lithics including 1 unknown stemmed dart point
42KA3287	AIS-24	Euro-American	Dendroglyph	4,007	34 dendroglyphs and a small rock concentration	Historic ceramics

Appendix 6.1. (continued)

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42KA3288	AIS-36	Native American and Euro-American	Multicomponent - Lithic and ceramic scatter / Euro-American refuse scatter	1,440	None	Flaked lithics including 2 Elko Eared points, 2 Elko Corner-notched points, 1 unknown corner-notched arrow point, Shinarump corrugated ceramics, glass, cans, miscellaneous historic artifacts
42KA3289	AIS-35	Native American	Lithic Scatter	320	None	Flaked lithics
42KA3290	AIS-34	Euro-American	Dendroglyph	3,462	18 dendroglyphs	Cans
42KA5756	AIS-10	Native American	Lithic Scatter	9	None	Flaked lithics including 1 unknown side-notched arrow point
42KA5757	AIS-11	Native American	Lithic Scatter	5	None	Flaked lithics
42KA5758	AIS-20	Euro-American	Dendroglyph	630	4 dendroglyphs	None
42KA5759	AIS-23	Euro-American	Dendroglyph	976	18 dendroglyphs	None
42KA5760	AIS-25	Euro-American	Dendroglyph	4,547	36 dendroglyphs	None
42KA5761	AIS-26	Euro-American	Dendroglyph	1,680	15 dendroglyphs	None
42KA5762	AIS-28	Euro-American	Dendroglyph	9,419	28 dendroglyphs	Glass, cans, historic ceramics, miscellaneous historic artifacts
42KA5763	AIS-29	Native American and Euro-American	Multicomponent - Lithic Scatter / Dendroglyph	2,640	5 dendroglyphs	Flaked lithics, glass, cans
42KA5764	AIS-37	Euro-American	Dendroglyph	2,880	17 dendroglyphs and a rock alignment associated with spring improvement	None
42KA5765	AIS-38	Euro-American	Dendroglyph	575	8 dendroglyphs	None
42KA5766	AIS-39	Euro-American	Dendroglyph	348	7 dendroglyphs	None
42KA5767	AIS-40	Euro-American	Euro-American refuse scatter	251	None	Glass, cans, historic ceramics, miscellaneous historic artifacts
42KA5768	AIS-41	Euro-American	Dendroglyph	292	8 dendroglyphs	None
42KA5769	AIS-78	Euro-American	Dendroglyph	24	3 dendroglyphs	None
42KA5770	AIS-95	Euro-American	Dendroglyph	1,683	10 dendroglyphs	None
42KA5771	AIS-96	Native American	Lithic Scatter	200	None	Flaked lithics
42KA5772	AIS-97	Euro-American	Dendroglyph	12,589	65 dendroglyphs	Cans

Appendix 6.1. *(continued)*

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42KA5773	AIS-98	Native American	Lithic Scatter	294	None	Flaked lithics including 1 Elko Corner-notched point and 1 unknown point
42KA5774	AIS-105	Native American	Lithic Scatter	369	None	Flaked lithics, ground stone
42KA5775	AIS-106	Euro-American	Dendroglyph	832	4 dendroglyphs and a probable fire hearth	Cans
42KA5776	AIS-113	Euro-American	Euro-American informal campsite	792	2 fire hearths and small pile of firewood	Cans
42KA5777	AIS-114	Euro-American	Dendroglyph	912	6 dendroglyphs	None
42KA5778	AIS-115	Euro-American	Dendroglyph	44	4 dendroglyphs	None
42KA5779	AIS-117	Euro-American	Dendroglyph	760	34 dendroglyphs	None
42KA5780	AIS-118	Euro-American	Dendroglyph	450	13 dendroglyphs	None
42KA5781	AIS-119	Euro-American	Dendroglyph	656	5 dendroglyphs and a small rock concentration	None
42KA5782	AIS-130	Euro-American	Dendroglyph	2,250	19 dendroglyphs	None
42KA5783	AIS-131	Euro-American	Dendroglyph	4,045	12 dendroglyphs	None
42KA5784	AIS-132	Euro-American	Dendroglyph	2,200	35 dendroglyphs	None
42KA5785	AIS-134	Euro-American	Dendroglyph	14,000	40 dendroglyphs	None
42KA5786	AIS-135	Euro-American	Dendroglyph	25	2 dendroglyphs	None
42KA5787	AIS-136	Native American	Lithic Scatter	28	None	Flaked lithics
42KA5788	AIS-138	Euro-American	Dendroglyph	6,400	33 dendroglyphs	None
42KA5789	AIS-139	Euro-American	Dendroglyph	1,376	12 dendroglyphs	None
42KA5790	AIS-150	Euro-American	Dendroglyph	714	7 dendroglyphs	None
42KA5791	AIS-151	Euro-American	Dendroglyph	520	7 dendroglyphs	None
42KA5792	AIS-152	Euro-American	Dendroglyph	27	3 dendroglyphs	None
42KA5793	AIS-153	Euro-American	Dendroglyph	5	2 dendroglyphs	None
42KA5794	AIS-154	Euro-American	Dendroglyph	5	3 dendroglyphs	None
42KA5795	AIS-155	Euro-American	Dendroglyph	990	6 dendroglyphs	None
42KA5796	AIS-156	Euro-American	Dendroglyph	925	11 dendroglyphs	None
42KA5797	AIS-157	Euro-American	Dendroglyph	22,880	51 dendroglyphs	None

Appendix 6.1. ***(continued)***

Site No.	Field No.	Cultural Affiliation	Site Type	Size (m^2)	Features	Artifacts
42KA5798	AIS-158	Native American, Euro-American, and Unknown	Multicomponent - Lithic scatter / Improved spring / Unknown rock concentration	4,050	Spring improvement pipe and a rock concentration	Flaked lithics including 2 Sudden Side-notched points
42KA5799	AIS-159	Euro-American	Dendroglyph	125	5 dendroglyphs	Glass
42KA5800	AIS-169	Euro-American	Dendroglyph	12	2 dendroglyphs	None
42KA5801	AIS-170	Euro-American	Dendroglyph	1,120	36 dendroglyphs	Cans, miscellaneous historic artifacts
42KA5802	AIS-171	Euro-American	Dendroglyph	250	5 dendroglyphs	Cans
42KA5803	AIS-172	Euro-American	Dendroglyph	150	4 dendroglyphs	None
42KA5804	AIS-173	Euro-American	Dendroglyph	2,300	23 dendroglyphs	None
42KA5805	AIS-175	Euro-American	Dendroglyph	1,584	8 dendroglyphs	None
42KA5806	AIS-176	Euro-American	Dendroglyph	470	3 dendroglyphs	None
42KA5807	AIS-177	Native American	Lithic Scatter	380	None	Flaked lithics
42KA5808	AIS-179	Euro-American	Dendroglyph	250	5 dendroglyphs	None
42KA5809	AIS-180	Euro-American	Dendroglyph	4,800	26 dendroglyphs	Cans
42KA5810	AIS-182	Euro-American	Euro-American refuse dump	80	None	Cans, miscellaneous historic artifacts
42KA5811	AIS-184	Euro-American	Gravel pit	28,360	Gravel pit with 2 areas of construction debris	Glass, cans, historic ceramics, miscellaneous historic artifacts
42KA5812	AIS-190	Native American	Lithic Scatter	315	None	Flaked lithics
42KA5813	AIS-191	Native American	Lithic Scatter	392	None	Flaked lithics including 1 unknown dart point

Appendix 6.2

Isolated Occurrences

Appendix 6.2. Isolated Occurrences

IO No.	Cultural Affiliation	IO Type
2	Native American	Flake scatter
3	Native American	Lithic scatter
4	Native American	Pressure flaked biface
5	Native American	Flaked stone tool
6	Native American	Biface
7	Native American	Flake scatter
8	Euro-American	Benchmark
9	Euro-American	Rock alignment
10	Euro-American	Historic refuse, food, hardware
11	Euro-American	Can, food
12	Archaic	Unknown corner-notched dart point
13	Native American	Pressure flaked biface
14	Native American	Lithic scatter
15	Native American	Flake scatter
16	Euro-American	Can scatter, food
17	Euro-American	Can scatter, nonfood
18	Euro-American	Can scatter, food
19	Euro-American	Can, nonfood
21	Euro-American	Hardware
22	Native American and Euro-American	Lithic scatter and Historic refuse, food
23	Native American	Pressure flaked biface
24	Native American	Flaked stone tool
25	Archaic and Euro-American	Lithic scatter, includes 1 Elko Corner-notched point; and Cairn
26	Native American	Lithic scatter
27	Native American	Biface
28	Late Prehistoric	Desert side-notched point
29	Native American	Pressure flaked biface
30	Euro-American	Trail
31	Euro-American	Road
32	Euro-American	Benchmark
33	Euro-American	Wood pile
34	Native American	Flake

IO No.	Cultural Affiliation	IO Type
35	Native American	Flake
36	Euro-American	Bottle
37	Euro-American	Telephone/powerline locus
38	Euro-American	Can scatter, nonfood
39	Late Archaic	Gypsum point
40	Native American	Pressure flaked biface
41	Euro-American	Can, nonfood
42	Euro-American	Can, nonfood
61	Archaic	Unknown dart point
62	Native American	Pressure flaked biface
63	Native American	Pressure flaked biface
64	Native American	Flaked stone tool
65	Euro-American	Dendroglyph; Can, food
66	Late Archaic	Gypsum point
67	Native American and Euro-American	Flake and Can, food
68	Native American	Flake
69	Native American	Pressure flaked biface
70	Euro-American	Can scatter
71	Euro-American	Pipeline; Can, food
72	Native American	Flake scatter
73	Euro-American	Dendroglyph
74	Euro-American	Can, tobacco
75	Native American	Flake
76	Euro-American	Campfire; Historic refuse, food
77	Native American	Pressure flaked biface
78	Euro-American	Cairn cluster
79	Native American	Pressure flaked biface
80	Euro-American	Can, food
90	Euro-American	Can, food
165	Late Prehistoric	Unknown arrow point
229	Euro-American	Can scatter, food
253	Euro-American	Can, food
254	Euro-American	Historic refuse, nonfood, hardware

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
255	Euro-American	Can scatter, food
256	Euro-American	Can, food
257	Euro-American	Wood pile; Can, nonfood
258	Euro-American	Sign
259	Euro-American	Can, nonfood
260	Euro-American	Wood pile
261	Euro-American	Historic refuse, food, nonfood, hardware
262	Euro-American	Can scatter, food
263	Euro-American	Wood pile
264	Euro-American	Hardware
265	Euro-American	Historic refuse, food
266	Euro-American	Historic refuse, food
267	Euro-American	Historic refuse, food
268	Euro-American	Can, food
269	Euro-American	Can scatter, food
337	Euro-American	Pipe line
338	Euro-American	Can scatter, food
445	Euro-American	Can, food
480	Euro-American	Can, nonfood
481	Euro-American	Can scatter, food
773	Euro-American	Hardware
777	Euro-American	Can, food
1108	Late Archaic	Gypsum point
1232	Euro-American	Can scatter, food
1233	Euro-American	Can, tobacco
1271	Native American and Euro-American	Flake scatter and Historic refuse, food
1272	Euro-American	Can scatter, food
1282	Euro-American	Can scatter, food, nonfood
1322	Native American	Pressure flaked biface
1323	Euro-American	Rock piles
1324	Euro-American	Rock pile
1406	Euro-American	Can, food
1407	Euro-American	Can scatter, food

IO No.	Cultural Affiliation	IO Type
1431	Euro-American	Can, food
1449	Euro-American	Can scatter, food
1482	Euro-American	Rock piles
1483	Native American	Pressure flaked biface
1484	Archaic	Elko Corner-notched point
1485	Native American	Flaked stone tool
1486	Archaic	Elko Corner-notched point
1487	Euro-American	Can, food
1488	Native American	Flake
1489	Native American	Lithic scatter
1490	Euro-American	Wood pile; Can, food
1491	Native American	Sandstone scatter
1492	Native American	Sandstone scatter
1493	Native American	Pressure flaked biface
1494	Native American	Sandstone scatter
1495	Native American	Pressure flaked biface
1496	Native American and Euro-American	Pressure flaked biface and Can scatter, nonfood
1497	Native American	Pressure flaked biface
1498	Archaic	Elko Corner-notched point
1499	Native American	Flake
1515	Euro-American	Hardware
1525	Euro-American	Can, food
1533	Euro-American	Historic refuse, food
1534	Native American	Flake
1540	Euro-American	Historic refuse, food, hardware
1559	Unknown affiliation	Cairn
1561	Euro-American	Historic refuse, food
1597	Native American	Pressure flaked biface
1598	Native American	Flake
1599	Euro-American	Can scatter, food
1625	Native American	Pressure flaked biface
1626	Native American	Flake
1627	Native American	Flake scatter

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
1628	Euro-American	Can, food
1629	Euro-American	Can scatter, food
1630	Archaic	Elko Eared point
1631	Euro-American	Can scatter, food, tobacco
1632	Native American	Flake
1633	Euro-American	Can scatter, food
1634	Euro-American	Can, food
1635	Euro-American	Can scatter, food
1638	Euro-American	Can, food
1686	Euro-American	Can scatter, food, nonfood
1687	Native American	Flake scatter
1688	Euro-American	Historic refuse, food
1689	Euro-American	Can scatter, food
1690	Euro-American	Bottle scatter
1691	Native American	Flake
1692	Native American	Flake
1693	Euro-American	Can scatter, food
1694	Native American	Lithic scatter
1695	Euro-American	Can scatter, food
1696	Native American	Flake
1697	Native American and Euro-American	Flake and Historic refuse, food
1698	Euro-American	Hardware
1740	Euro-American	Can scatter, food, tobacco
1749	Euro-American	Can, nonfood
1772	Euro-American	Historic refuse, food, nonfood, hardware
1854	Euro-American	Can scatter, food
1868	Euro-American	Can, tobacco
1869	Euro-American	Can, food
1870	Native American	Flake scatter
1871	Euro-American	Can, food
1872	Native American	Flake
1873	Native American and Euro-American	Flake scatter and Historic refuse, food
1874	Native American	Flake scatter
1875	Native American	Flake
1876	Native American and Euro-American	Lithic scatter and Bottle
1877	Native American	Flake
1885	Native American	Flake
1886	Native American	Pressure flaked biface
1887	Euro-American	Historic refuse, nonfood
1888	Euro-American	Can scatter, tobacco, nonfood
1889	Archaic	Elko Corner notched point
1890	Archaic	Elko Corner notched point
1891	Euro-American	Bottle
1892	Late Archaic	Gypsum point
1893	Native American	Flake
1894	Native American	Flake
1895	Euro-American	Can, food
1896	Native American	Flake
1897	Euro-American	Can, food
1898	Euro-American	Historic refuse, food
1899	Native American	Flake scatter
1924	Native American and Euro-American	Flake and Benchmark
1925	Euro-American	Historic refuse, food
1926	Euro-American	Can, food
1927	Euro-American	Hardware
1928	Euro-American	Can, food
1929	Euro-American	Historic refuse, food, nonfood, tobacco, hardware
1951	Euro-American	Can scatter, food
2000	Native American	Unknown point
2001	Native American	Pressure flaked biface
2002	Native American	Pressure flaked biface
2003	Late Prehistoric	Unknown arrow point
2004	Native American	Flaked stone tool

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
2005	Late Prehistoric	Unknown side-notched arrow point
2006	Native American	Pressure flaked biface
2007	Archaic	Lithic scatter, includes 1 Elko Eared and 1 unknown corner-notched dart point
2008	Native American	Lithic scatter
2009	Euro-American	Hardware
2010	Native American	Pressure flaked biface
2011	Native American	Lithic scatter
2012	Euro-American	Wood pile
2013	Native American	Pressure flaked biface
2014	Euro-American	Can scatter, food, nonfood
2015	Euro-American	Structure foundation
2016	Euro-American	Campfire
2017	Euro-American	Historic refuse
2018	Euro-American	Bottle
2019	Euro-American	Campfire; Historic refuse, food, nonfood
2020	Euro-American	Sign
2021	Euro-American	Depression
2022	Native American	Pressure flaked biface
2023	Euro-American	Can, tobacco
2024	Euro-American	Can, food
2025	Euro-American	Campfire; Wood pile
2026	Native American	Pressure flaked biface
2027	Native American	Pressure flaked biface
2028	Late Archaic	Gypsum point
2029	Native American and Euro-American	Flake and Can scatter, food
2030	Native American	Flake
2031	Native American	Flake
2032	Late Prehistoric	Desert side-notched point
2033	Native American	Flake
2034	Euro-American	Can, food
2035	Native American	Flake
2036	Native American	Flake scatter
2037	Native American	Pressure flaked biface
2038	Native American	Pressure flaked biface
2039	Native American	Lithic scatter
2040	Native American	Lithic scatter
2041	Euro-American	Flake scatter
2042	Euro-American	Can, tobacco
2043	Native American	Biface
2044	Native American	Unknown point
2045	Euro-American	Fence
2046	Native American	Flake scatter
2047	Native American	Pressure flaked biface
2048	Native American	Pressure flaked biface
2049	Late Prehistoric	Unknown corner-notched arrow point
2050	Archaic	Unknown dart point
2053	Native American	Flake
2054	Euro-American	Dendroglyphs
2055	Euro-American	Cairn
2056	Native American	Pressure flaked biface
2059	Native American	Pressure flaked biface
2060	Euro-American	Rock piles
2061	Euro-American	Wood pile
2062	Euro-American	Historic refuse, nonfood, hardware
2063	Native American	Flaked stone tool
2064	Euro-American	Can, food
2065	Native American	Pressure flaked biface
2066	Euro-American	Wood pile
2067	Euro-American	Can, tobacco
2068	Euro-American and Unknown affiliation	Dendroglyph and Rock pile
2069	Euro-American	Blazed tree
2070	Euro-American	Dendroglyphs

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
2071	Native American	Pressure flaked biface
2072	Euro-American	Can, nonfood
2073	Euro-American	Benchmark
2074	Native American	Flake
2075	Native American	Pressure flaked biface
2076	Native American	Pressure flaked biface
2077	Euro-American	Road
2078	Euro-American	Hardware
2079	Euro-American	Benchmark
2080	Euro-American	Dendroglyphs
2081	Euro-American	Benchmark
2082	Euro-American	Benchmark
2083	Archaic	Unknown corner-notched dart point
2084	Euro-American	Bottle
2085	Euro-American	Can, nonfood
2086	Archaic	Unknown side-notched dart point
2087	Euro-American	Benchmark
2088	Euro-American	Benchmark
2089	Late Prehistoric	Lithic scatter, incl. 1 unknown corner-notched arrow point
2090	Native American	Pressure flaked biface
2091	Native American	Pressure flaked biface
2092	Native American	Flake scatter
2093	Euro-American	Sign
2094	Native American	Unknown point
2095	Archaic	Elko Eared point
2096	Native American	Flake
2097	Euro-American	Dendroglyph
2098	Euro-American	Pipeline
2099	Native American	Flake scatter
2145	Euro-American	Historic refuse, food, nonfood, tobacco, hardware
2163	Euro-American	Historic refuse, food

IO No.	Cultural Affiliation	IO Type
2180	Euro-American	Can, food
2249	Euro-American	Can, nonfood
2256	Native American	Pressure flaked biface
2292	Euro-American	Hardware
2420	Euro-American	Can, tobacco
2426	Native American and Euro-American	Pressure flaked biface and Historic refuse, food
2467	Euro-American	Hardware
2468	Middle Archaic	Humboldt point
2469	Euro-American	Hardware
2470	Euro-American	Wood pile; Historic refuse, food, hardware
2471	Euro-American	Bottle
2472	Native American	Flake
2473	Euro-American	Bottle scatter
2474	Euro-American	Historic refuse
2551	Native American	Flake
2570	Euro-American	Can, food
2823	Euro-American	Can, tobacco
2824	Euro-American	Bottle
2825	Native American	Flake
2826	Euro-American	Can, tobacco
2827	Euro-American	Can, food
2830	Euro-American	Historic refuse
2889	Native American	Flake
2890	Native American	Flake scatter
2891	Native American	Pressure flaked biface
2892	Euro-American	Can, nonfood
2893	Native American	Pressure flaked biface
2896	Euro-American	Bottle
2897	Euro-American	Historic refuse, food
2898	Euro-American	Cairn
2899	Native American	Biface
3059	Euro-American	Can, food
3060	Euro-American	Can, nonfood

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
3065	Euro-American	Bottle
3093	Native American	Flake
3094	Euro-American	Road
3095	Native American	Lithic scatter
3096	Archaic	Lithic scatter, includes 1 Elko Corner notched point
3097	Euro-American	Dendroglyph
3098	Native American	Flake
3099	Euro-American	Can, nonfood
3193	Euro-American	Cairn
3197	Euro-American	Wood pile
3198	Euro-American	Can scatter, nonfood
3199	Native American	Pressure flaked biface
3225	Euro-American	Can, tobacco
3242	Native American	Flake
3243	Euro-American	Can, food
3244	Euro-American	Hardware
3245	Euro-American	Bottle
3246	Native American	Flake
3247	Euro-American	Hardware
3248	Native American and Euro-American	Flake scatter and Historic refuse, food
3249	Euro-American	Bottle
3250	Euro-American	Can scatter, food
3251	Euro-American	Can scatter, food
3252	Euro-American	Sign
3253	Euro-American	Fence
3254	Euro-American	Fence
3255	Euro-American	Boundary segment
3256	Euro-American	Can, food
3257	Native American	Pressure flaked biface
3258	Euro-American	Can, food
3259	Euro-American	Boundary segment
3260	Euro-American	Boundary segment
3261	Native American	Lithic scatter

IO No.	Cultural Affiliation	IO Type
3262	Native American	Flake
3263	Euro-American	Historic refuse, food, nonfood, tobacco
3264	Late Prehistoric	Unknown corner notched arrow point
3265	Euro-American	Can, food
3266	Native American	Pressure flaked biface
3267	Native American	Flake scatter
3268	Native American	Flake scatter
3269	Native American	Pressure flaked biface
3270	Late Archaic	Gypsum point
3271	Late Prehistoric	Unknown corner-notched arrow point
3272	Euro-American	Bottle
3273	Euro-American	Campfire; Can scatter, food
3274	Euro-American	Can scatter, food, tobacco
3275	Euro-American	Road
3276	Euro-American	Can scatter, food
3277	Euro-American	Telephone/powerline locus
3278	Euro-American	Rock alignment
3279	Euro-American	Dendroglyphs
3280	Euro-American	Bottle
3281	Euro-American	Benchmark
3282	Euro-American	Hardware
3283	Euro-American	Dendroglyphs
3284	Euro-American	Campfire; Can, food
3285	Euro-American	Hardware
3286	Euro-American	Bottle
3287	Euro-American	Dendroglyph
3288	Euro-American	Road
3289	Euro-American	Road
3354	Euro-American	Historic refuse, food
3382	Euro-American	Cairn
3383	Native American	Flake scatter
3384	Euro-American	Hardware

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
3385	Late Archaic	Gypsum point
3386	Euro-American	Dendroglyphs
3387	Euro-American	Dendroglyphs
3388	Archaic	Unknown corner-notched dart point
3389	Native American	Pressure flaked biface
3390	Native American	Unknown point
3391	Native American	Lithic scatter
3432	Euro-American	Can, food
3458	Euro-American	Campfire; Can scatter, food, nonfood
3459	Euro-American	Can, food
3460	Euro-American	Campfire
3461	Late Archaic	Gypsum point
3462	Native American	Pressure flaked biface
3463	Euro-American	Dendroglyph
3464	Euro-American	Dendroglyph
3465	Euro-American	Can, tobacco
3466	Euro-American	Can, food
3467	Euro-American	Rock pile
3468	Euro-American	Rock pile; Can, food
3469	Native American	Flake scatter
3470	Native American	Pressure flaked biface
3471	Euro-American	Dendroglyph
3472	Native American	Pressure flaked biface
3473	Native American	Lithic scatter
3474	Euro-American	Dendroglyph
3475	Euro-American	Can scatter, food
3476	Euro-American	Dendroglyph
3477	Native American	Lithic scatter
3478	Native American	Flake
3479	Native American and Euro-American	Pressure flaked biface; Historic refuse, food, nonfood, hardware
3480	Native American and Euro-American	Lithic scatter and Can scatter, food
3481	Native American	Pressure flaked biface
3482	Euro-American	Fence
3500	Euro-American	Campfire
3501	Euro-American	Dendroglyph
3502	Native American and Euro-American	Pressure flaked biface and Rock piles
3503	Euro-American	Can scatter, nonfood
3504	Euro-American	Historic refuse, food
3505	Euro-American	Can, food
3506	Euro-American	Can, nonfood
3507	Euro-American	Rock pile
3508	Native American	Flaked stone tool
3509	Euro-American	Hardware
3510	Euro-American	Can, nonfood
3511	Euro-American	Rock pile; Historic refuse, food, nonfood
3512	Euro-American	Can, food
3513	Native American and Unknown	Flake and Bottle and Cairn
3514	Native American	Flake scatter
3515	Euro-American	Cairn
3516	Euro-American	Rock pile
3517	Native American	Flake scatter
3518	Euro-American	Dendroglyph; Rock pile
3519	Native American	Lithic scatter
3520	Archaic	Elko Corner-notched point
3521	Native American	Flake
3522	Euro-American	Can, nonfood
3523	Native American	Flake
3524	Native American	Flaked stone tool
3525	Euro-American	Can, tobacco
3526	Euro-American	Road
3527	Native American	Flake
3528	Late Prehistoric	Unknown corner-notched arrow point

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
3529	Euro-American	Dendroglyph
3530	Euro-American	Bottle
3531	Euro-American	Can, food
3532	Native American	Flake
3533	Euro-American	Cairn
3534	Archaic	Unknown corner-notched dart point
3535	Euro-American	Dendroglyphs
3536	Euro-American	Bottle
3537	Euro-American	Dendroglyphs
3538	Native American	Pressure flaked biface
3539	Native American	Pressure flaked biface
3540	Archaic	Unknown corner-notched dart point
3541	Euro-American	Can, food
3542	Euro-American	Telephone/powerline locus
3543	Euro-American	Dendroglyph; Historic Refuse, food, nonfood
3544	Euro-American	Can scatter, food
3545	Native American	Flake
3557	Euro-American	Can scatter, food
3558	Native American	Pressure flaked biface
3559	Euro-American	Historic refuse, food
3560	Euro-American	Dendroglyphs
3561	Euro-American	Can, tobacco
3562	Archaic	Elko Corner-notched point
3563	Native American	Flake
3564	Euro-American	Road
3629	Euro-American	Cairn
3640	Euro-American	Blazed tree
3641	Late Prehistoric	Lithic scatter, includes 1 Rosegate Stemmed point
3642	Euro-American	Earthen dam
3643	Euro-American	Benchmark
3655	Euro-American	Can scatter, food

IO No.	Cultural Affiliation	IO Type
3658	Euro-American	Hardware
3659	Euro-American	Can, food
3660	Late Prehistoric	Desert side-notched point
3661	Euro-American	Telephone/powerline locus
3662	Euro-American	Historic refuse
3663	Euro-American	Historic refuse
3664	Euro-American	Bottle
3665	Native American	Lithic scatter
3666	Euro-American	Benchmark
3667	Euro-American	Can, nonfood
3668	Euro-American	Rockpile; Historic refuse
3669	Euro-American	Campfire; wood pile
3670	Euro-American	Hardware
3671	Euro-American	Bottle
3672	Euro-American	Historic refuse
3673	Euro-American	Can scatter
3674	Euro-American	Bottle scatter
3675	Euro-American	Historic refuse
3676	Euro-American	Boundary segment
3677	Euro-American	Campfire; Historic refuse
3678	Euro-American	Blazed tree
3679	Euro-American	Can scatter
3680	Euro-American	Road
3681	Euro-American	Road
3682	Euro-American	Pipeline
3684	Euro-American	Depression
3788	Native American	Flake scatter
3800	Native American	Pressure flaked biface
3801	Euro-American	Campfire
3802	Native American	Pressure flaked biface
3803	Native American	Flake scatter
3804	Native American	Flake scatter
3805	Euro-American	Historic refuse
3806	Euro-American	Cairn

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
3807	Euro-American	Cairn
3808	Euro-American	Cairn
3809	Euro-American	Cairn
3810	Euro-American	Cairn
3811	Euro-American	Cairn
3812	Euro-American	Cairn
3813	Euro-American	Can scatter
3814	Native American	Flaked stone tool
3838	Native American	Pressure flaked biface
3839	Euro-American	Rock pile
3840	Euro-American	Dendroglyph
3841	Euro-American	Dendroglyph
3842	Euro-American	Rock pile
3843	Euro-American	Road
3844	Late Archaic	Gypsum point
3845	Euro-American	Dendroglyph
3846	Euro-American	Dendroglyph
3847	Euro-American	Dendroglyph
3848	Native American	Lithic scatter
3849	Euro-American	Dendroglyph
3850	Native American	Flake scatter
3851	Euro-American	Dendroglyph
3852	Euro-American	Benchmark
3853	Euro-American	Dendroglyph
3854	Euro-American	Dendroglyph
3855	Native American	Pressure flaked biface
3856	Native American	Biface
3857	Native American	Flake
3858	Native American	Lithic scatter
3859	Euro-American	Dendroglyph
3860	Euro-American	Dendroglyph
3861	Euro-American	Dendroglyph
3862	Euro-American	Inscription
3863	Euro-American	Dendroglyph

IO No.	Cultural Affiliation	IO Type
3864	Euro-American	Benchmark
3865	Euro-American	Road
3866	Native American	Lithic scatter
3867	Euro-American	Cairn
3868	Euro-American	Dendroglyph
3869	Euro-American	Rock pile
3870	Native American	Pressure flaked biface
3871	Native American	Flake scatter
3872	Euro-American	Cairn
3873	Euro-American	Cairn
3874	Euro-American	Boundary segment
3875	Euro-American	Can, food
3876	Late Prehistoric	Rosegate Stemmed point
3877	Euro-American	Cairn
3878	Euro-American	Cairn
3879	Euro-American	Cairn
3880	Euro-American	Cairn
3881	Archaic	Unknown corner-notched dart point
3882	Euro-American	Can, food
3883	Euro-American	Dendroglyph
3884	Euro-American	Cairn
3885	Euro-American	Cairn
3886	Euro-American	Rock alignment
3887	Euro-American	Dendroglyphs
3888	Native American	Lithic scatter
3889	Native American	Flake scatter
3890	Native American	Flake scatter
3891	Native American	Flake
3892	Native American and Euro-American	Flake scatter and Hardware
3893	Euro-American	Boundary segment
3894	Late Prehistoric	Parowan Basal-notched point
3895	Euro-American	Benchmark
3896	Native American	Pressure flaked biface

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
3897	Late Archaic	Lithic scatter, includes 1 Gypsum point
3898	Native American	Pressure flaked biface
3899	Euro-American	Bottle
3900	Native American	Lithic scatter
3901	Euro-American	Can scatter
3902	Euro-American	Can, food
3903	Euro-American	Can, food
3904	Euro-American	Dendroglyphs
3905	Euro-American	Dendroglyph
3906	Euro-American	Dendroglyph
3907	Native American	Manuport
3908	Euro-American	Bottle
3909	Native American	Lithic scatter
3910	Euro-American	Dendroglyph
3911	Euro-American	Boundary segment
3912	Euro-American	Dendroglyph
3913	Euro-American	Benchmark
3914	Euro-American	Dendroglyph
3915	Euro-American	Can, food
3916	Euro-American	Can, nonfood
3917	Euro-American	Hardware
3918	Euro-American	Benchmark
3919	Euro-American	Road
3920	Euro-American	Boundary segment
3921	Native American	Biface
3922	Late Prehistoric	Lithic scatter, includes 1 Desert Side-notched point
3923	Euro-American	Dendroglyph
3924	Euro-American	Road
3925	Euro-American	Log pile
3926	Euro-American	Road
3927	Euro-American	Historic Refuse
3928	Native American	Lithic scatter
3929	Native American	Flake
3930	Euro-American	Road
3931	Euro-American	Bottle
3932	Euro-American	Road
3933	Euro-American	Dendroglyph
3934	Euro-American	Dendroglyph
3935	Euro-American	Dendroglyphs
3936	Euro-American	Dendroglyph
3937	Euro-American	Dendroglyph
3938	Euro-American	Road
3939	Euro-American	Rock quarry
3940	Euro-American	Rock quarry
3941	Euro-American	Road
3942	Euro-American	Road
3943	Euro-American	Historic refuse
3944	Euro-American	Telephone/powerline locus
3945	Euro-American	Telephone/powerline locus
3946	Euro-American	Telephone/powerline locus
3947	Euro-American	Telephone/powerline locus
3948	Euro-American	Telephone/powerline locus
3949	Euro-American	Telephone/powerline locus
3950	Native American	Flake scatter
3951	Native American	Flake
3952	Native American	Flake
3953	Native American	Flake
3954	Euro-American	Telephone/powerline locus
3955	Euro-American	Telephone/powerline locus
3956	Euro-American	Telephone/powerline locus
3957	Euro-American	Telephone/powerline locus
3958	Euro-American	Telephone/powerline locus
3959	Euro-American	Telephone/powerline locus
3960	Euro-American	Telephone/powerline locus
3961	Euro-American	Telephone/powerline locus
3962	Euro-American	Telephone/powerline locus
3963	Euro-American	Telephone/powerline locus

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
3964	Euro-American	Telephone/powerline locus
3965	Euro-American	Telephone/powerline locus
3966	Euro-American	Telephone/powerline locus
3967	Euro-American	Telephone/powerline locus
3968	Euro-American	Telephone/powerline locus
3969	Euro-American	Telephone/powerline locus
3970	Euro-American	Telephone/powerline locus
3980	Euro-American	Road
3983	Euro-American	Trail
3984	Euro-American	Trail
3985	Euro-American	Blazed tree
3986	Euro-American	Benchmark
3987	Euro-American	Benchmark/Blaze
3988	Euro-American	Benchmark
3989	Euro-American	Boundary Segment
3990	Euro-American	Road
3991	Euro-American	Road
3992	Euro-American	Road
3993	Euro-American	Borrow pit
3994	Euro-American	Boundary segment
3995	Euro-American	Boundary segment
3996	Euro-American	Boundary segment
3997	Euro-American	Boundary segment
3998	Euro-American	Boundary segment
3999	Euro-American	Boundary segment
4000	Euro-American	Hardware
4001	Euro-American	Road
4002	Euro-American	Road
4003	Euro-American	Road
4004	Euro-American	Telephone/powerline locus
4005	Euro-American	Benchmark
4006	Euro-American	Road
4007	Euro-American	Foundation
4008	Euro-American	Storage box

IO No.	Cultural Affiliation	IO Type
4009	Euro-American	Can scatter
4010	Unknown affiliation	Cairn
4011	Archaic	Elko Eared point
4012	Native American	Pressure flaked biface
4013	Archaic	Elko Corner-notched point
4014	Unknown affiliation	Cairn
4015	Native American	Ground stone tool
4016	Euro-American	Bottle
4017	Euro-American	Dendroglyph
4018	Euro-American	Dendroglyph
4019	Euro-American	Historic refuse
4020	Euro-American	Hardware
4021	Euro-American	Can scatter
4022	Euro-American	Road
4023	Euro-American	Road
4024	Euro-American	Road
4025	Euro-American	Boundary segment
4026	Euro-American	Boundary segment
4027	Euro-American	Boundary segment
4028	Euro-American	Benchmark
4029	Euro-American	Boundary segment
4030	Euro-American	Boundary segment
4031	Euro-American	Road
4032	Euro-American	Road
4033	Euro-American	Road
4034	Euro-American	Road
4035	Euro-American	Road
4036	Euro-American	Road
4037	Euro-American	Benchmark
4038	Euro-American	Boundary segment
4039	Euro-American	Boundary segment
4040	Euro-American	Boundary segment
4041	Euro-American	Boundary segment

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
4042	Euro-American	Road
4043	Euro-American	Road
4044	Euro-American	Road
4045	Euro-American	Road
4046	Euro-American	Road
4047	Euro-American	Road
4048	Euro-American	Road
4049	Euro-American	Road
4050	Euro-American	Road
4051	Euro-American	Road
4052	Euro-American	Road
4053	Euro-American	Road
4054	Euro-American	Pipeline
4055	Euro-American	Road
4056	Euro-American	Road
4057	Euro-American	Road
4058	Euro-American	Depression
4059	Euro-American	Depression
4060	Euro-American	Road
4061	Euro-American	Pipeline
4062	Euro-American	Road
4063	Euro-American	Road
4064	Euro-American	Road
4065	Euro-American	Road
4066	Euro-American	Road
4067	Euro-American	Road
4068	Euro-American	Road
4069	Euro-American	Depression
4070	Euro-American	Road
4071	Euro-American	Road
4072	Euro-American	Road
4073	Euro-American	Road
4074	Euro-American	Road
4075	Euro-American	Road

IO No.	Cultural Affiliation	IO Type
4076	Euro-American	Road; Pipeline
4077	Euro-American	Road
4078	Euro-American	Road
4079	Euro-American	Road
4080	Euro-American	Road
4081	Euro-American	Blazed tree
4082	Euro-American	Benchmark
4083	Euro-American	Blazed tree
4084	Euro-American	Boundary segment
4085	Euro-American	Road
4089	Euro-American	Road
4090	Euro-American	Boundary segment
4091	Euro-American	Benchmark
4092	Euro-American	Boundary segment
4093	Euro-American	Boundary segment
4094	Euro-American	Boundary segment
4095	Native American	Flake scatter
4096	Native American	Pressure flaked biface
4097	Euro-American	Benchmark
4098	Euro-American	Benchmark
4099	Euro-American	Benchmark
4124	Native American	Flake
4125	Euro-American	Benchmark/Blazed tree
4126	Native American	Flake scatter
4127	Euro-American	Fence; Historic refuse
4128	Euro-American	Flake scatter, modern
4129	Euro-American	Lithic scatter, modern
4130	Euro-American	Can scatter
4158	Native American	Pressure flaked biface
4159	Euro-American	Historic refuse
4160	Euro-American	Historic refuse
4161	Euro-American	Historic refuse
4162	Euro-American	Historic refuse
4164	Euro-American	Historic refuse

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
4165	Euro-American	Historic refuse
4166	Euro-American	Dendroglyphs
4167	Euro-American	Historic refuse
4168	Euro-American	Historic refuse
4169	Euro-American	Telephone/powerline locus
4170	Euro-American	Historic refuse
4173	Native American	Flake
4174	Euro-American	Can scatter
4175	Euro-American	Historic refuse
4176	Euro-American	Historic refuse
4180	Euro-American	Road
4181	Euro-American	Historic refuse
4182	Euro-American	Blazed tree
4183	Euro-American	Benchmark
4184	Euro-American	Bottle
4185	Euro-American	Can, food
4186	Euro-American	Can scatter
4187	Euro-American	Hardware
4188	Euro-American	Historic refuser
4189	Euro-American	Can, nonfood
4190	Euro-American	Can, food
4191	Euro-American	Can, nonfood
4192	Euro-American	Historic refuse
4193	Euro-American	Hardware
4194	Euro-American	Historic refuse
4195	Euro-American	Hardware
4196	Euro-American	Historic refuse
4197	Late Prehistoric and Euro-American	Lithic scatter, includes 1 unknown arrow point; and Bottle
4198	Euro-American	Can, nonfood
4199	Euro-American	Benchmark
4200	Euro-American	Fence
4201	Euro-American	Historic refuse
4210	Euro-American	Can, food
4225	Euro-American	Can, nonfood
4226	Euro-American	Benchmark
4227	Euro-American	Wood pile
4228	Euro-American	Bottle scatter
4229	Euro-American	Campfire; Historic refuse
4230	Unknown affiliation	Manuport
4231	Euro-American	Bottle
4232	Euro-American	Benchmark
4233	Euro-American	Lithic scatter
4234	Euro-American	Historic refuse
4235	Euro-American	Rock alignment
4236	Euro-American	Historic refuse
4237	Euro-American	Historic refuse
4242	Euro-American	Historic Refuse
4243	Euro-American	Historic refuse
4244	Native American	Pressure flaked biface
4245	Euro-American	Sign
4246	Native American	Ground stone tool
4247	Euro-American	Blazed tree
4248	Unknown affiliation	Manuport
4249	Euro-American	Historic refuse
4250	Euro-American	Foundation; Historic refuse
4251	Native American	Flaked stone tool
4252	Euro-American	Fence
4253	Euro-American	Hardware
4254	Euro-American	Fence
4255	Euro-American	Historic Refuse
4256	Euro-American	Historic Refuse
4257	Euro-American	Pipeline
4258	Euro-American	Pipeline
4259	Euro-American	Can scatter
4260	Euro-American	Can, nonfood
4261	Euro-American	Bottle scatter

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
4262	Euro-American	Can, nonfood
4263	Euro-American	Historic Refuse
4264	Euro-American	Bottle
4265	Euro-American	Rock pile
4266	Euro-American	Can, nonfood
4267	Euro-American	Fence
4268	Euro-American	Can, food
4269	Native American	Flake
4270	Euro-American	Bottle scatter
4271	Euro-American	Historic refuse
4272	Euro-American	Borrow Pit
4273	Euro-American	Can, food
4274	Euro-American	Bottle scatter
4275	Euro-American	Can, food
4276	Native American	Flake
4277	Euro-American	Can scatter
4279	Euro-American	Bottle scatter
4280	Euro-American	Hardware
4281	Euro-American	Road
4282	Euro-American	Leveled area
4299	Euro-American	Road
4300	Euro-American	Road
4301	Native American	Pressure flaked biface
4302	Euro-American	Bottle
4303	Euro-American	Bottle
4304	Euro-American	Benchmark; Historic refuse
4305	Euro-American	Historic refuse
4306	Euro-American	Wood pile
4307	Euro-American	Historic refuse
4308	Euro-American	Historic refuse
4309	Euro-American	Historic refuse
4328	Native American	Pressure flaked biface
4329	Euro-American	Historic refuse
4330	Euro-American	Telephone/powerline locus

IO No.	Cultural Affiliation	IO Type
4331	Euro-American	Road
4332	Euro-American	Blazed tree; Historic refuse
4333	Euro-American	Bottle
4334	Euro-American	Bottle scatter
4335	Euro-American	Historic refuse
4336	Euro-American	Hardware
4337	Euro-American	Concrete structure
4338	Euro-American	Historic refuse
4339	Euro-American	Bottle
4340	Euro-American	Bottle
4341	Euro-American	Bottle scatter
4342	Euro-American	Can, tobacco
4343	Euro-American	Pipeline feature
4344	Native American	Flake scatter
4345	Euro-American	Historic refuse
4346	Euro-American	Historic refuse
4347	Euro-American	Historic refuse
4348	Euro-American	Historic refuse
4349	Euro-American	Campfire
4350	Euro-American	Bottle
4351	Euro-American	Campfire; Historic refuse
4352	Euro-American	Hardware
4353	Euro-American	Historic refuse
4355	Euro-American	Road
4356	Euro-American	Road
4357	Euro-American	Road
4358	Euro-American	Road
4359	Euro-American	Can, food
4360	Euro-American	Wood pile; Can, food
4361	Euro-American	Historic refuse
4362	Euro-American	Historic refuse, hardware
4363	Euro-American	Historic refuse
4364	Euro-American	Bottle scatter
4365	Euro-American	Historic refuse

Appendix 6.2. (continued)

IO No.	Cultural Affiliation	IO Type
4366	Euro-American	Pipeline feature
4367	Euro-American	Historic refuse
4438	Euro-American	Bottle
4526	Euro-American	Historic refuse
4527	Euro-American	Historic refuse
4528	Euro-American	Can scatter
4529	Euro-American	Road
4530	Euro-American	Campfire
4531	Euro-American	Modified tree
4532	Euro-American	Historic refuse
4533	Euro-American	Historic refuse
4534	Euro-American	Historic refuse
4539	Euro-American	Can scatter
4540	Euro-American	Blazed tree
4541	Euro-American	Historic refuse
4542	Euro-American	Historic refuse
4543	Euro-American	Can, food
4544	Euro-American	Blazed tree
4545	Euro-American	Bottle scatter
4632	Unknown affiliation and Euro-American	Flake scatter and Historic refuse
4633	Euro-American	Historic refuse
4644	Euro-American	Historic refuse, hardware
4845	Euro-American	Can scatter
4846	Late Prehistoric	Unknown arrow point
4847	Euro-American	Road
4848	Euro-American	Fence
4849	Euro-American	Fence
4850	Euro-American	Fence
4851	Euro-American	Fence
4863	Euro-American	Road
4864	Euro-American	Road
4865	Euro-American	Can scatter
4866	Euro-American	Historic refuse
4868	Euro-American	Benchmark
4869	Euro-American	Dendroglyph
4870	Native American	Lithic scatter

Checkdam Numbers (n=3909) : 1, 20, 43-60, 81-89, 91-164, 166-228, 230-252, 270-336, 339-444, 446-479, 482-772, 774-776, 778-1107,1109-1231, 1234-1270, 1273-1281, 1283-1321, 1325-1405, 1408-1430, 1432-1448, 1450-1481, 1500-1514, 1516-1524,1526-1532, 1535-1539, 1541-1558, 1560, 1562-1596, 1600-1624, 1636-1637, 1639-1685, 1699-1739, 1741-1748, 1750-1771, 1773-1853, 1855-1867, 1878-1884, 1900-1923, 1930-1950, 1952-1999, 2051-2052, 2057-2058, 2100-2144, 2146-2162, 2164-2179, 2181-2248, 2250-2255, 2257-2291, 2293-2419, 2421-2425, 2427-2466, 2475-2550, 2552-2569, 2571-2822, 2828-2829, 2831-2888, 2894-2895, 2900-3058, 3061-3064, 3066-3092, 3100-3192, 3194-3196, 3200-3224, 3226-3241, 3290-3353, 3355-3381, 3392-3431, 3433-3457, 3483-3499, 3546-3556, 3565-3628, 3630-3639, 3644-3657, 3683, 3685-3787, 3789-3799, 3815-3837, 3981-3982, 4086-4088, 4100-4123, 4131-4157, 4163, 4171-4172, 4177-4179, 4202-4209, 4211-4224, 4238-4241, 4278, 4283-4298, 4310-4327, 4368-4437, 4439-4525, 4535-4538, 4546-4631, 4634-4643, 4645-4844, 4852-4862, 4867

Numbers not assigned (n=10): 3971-3979, 4354

Appendix 7.1

Coding Format and Key for Projectile Point Analysis

Projectile Point Type

Code	Type
1	Elko Corner-notched
2	Elko Eared
3	Elko Side-notched
4	Gypsum
5	Pinto
6	Sudden Side-notched
7	San Rafael Side-notched
9	Unknown Corner-notched, Dart
10	Unknown Side-notched, Dart
11	Unknown Stemmed, Dart
12	Unknown, Dart
13	Northern Side-notched
16	Desert Side-notched
17	Rosegate Corner-notched
19	Rosegate Stemmed
20	Parowan Basal-notched
21	Unknown Corner-notched, Arrow
22	Unknown Side-notched, Arrow
23	Unknown, Arrow
24	Bull Creek
31	Great Basin Stemmed
32	Humboldt

Raw Material Type

Material Code	Material Type	Grouped Material Code	Grouped Material Type
100	chert, unknown	2	Other chert
101	chert, white	1	Brian Head chert
102	chert, "strawberry cheesecake" (white/pink)	1	Brian Head chert
103	chert, jasper	3	Jasper
104	chert, gray	2	Other chert
105	chert, white-orange-pink	1	Brian Head chert
106	chert, orange and white, peach	1	Brian Head chert
107	chert, orange	1	Brian Head chert
108	chert, pink and white	1	Brian Head chert
109	chert, tan	2	Other chert
110	chert, white, orange, and gray banded	2	Other chert
200	chalcedony, clear	20	Brian Head chalcedony
201	chalcedony, clear and gray	20	Brian Head chalcedony
202	chalcedony, clear and orange	20	Brian Head chalcedony
203	chalcedony, clear, red, and white	20	Brian Head chalcedony
204	chalcedony, clear, gray, and red	20	Brian Head chalcedony
301	quartzite, orange and white	30	Exogenous quartzite
400	obsidian, Wild Horse Canyon	40	Obsidian
401	obsidian, Panaca Summit	40	Obsidian
402	obsidian, unknown (ignimbrite)	40	Obsidian
500	siltstone, gray	50	Siltstone
600	petrified wood, translucent brown	60	Petrified wood

Thermal Alteration
0 absent
1 present

Thermal Alteration Type (used alone or in combination)
0 none
1 crazing
2 color change
3 luster
4 pot-lid fracture

Patination
0 none
1 minimal
2 moderate
3 heavy

Portion (used alone or in combination)
0 unknown
1 complete
2 base
3 midsection
4 tip
5 nearly complete, missing tip
6 base break
7 shoulder break
8 lateral portion (shoulder)
9 nearly complete, shoulder break
10 nearly complete, base break

Blank form
0 unknown
1 triangular
2 lanceolate
3 leaf shaped

Base Shape
0 unknown
1 straight
2 concave
3 convex
4 notched

Serration
0 absent
1 serrated, fine
2 serrated, large
3 unknown

Measured Variables (see Chapter 6 text)
Proximal shoulder angle
Distal shoulder angle
Notch opening index
Notch width
Notch depth
Stem/base height
Shoulder width
Base/stem width
Length
Width
Thickness
Weight

Appendix 7.2

Coded Projectile Point Analysis Data

Appendix 7.2. Coded Projectile Point Analysis Data.

FS No.	Site No.	IO No.	Type	Material	Grouped Material	Therm. alt.	Therm. type	Patination	Portion	Weight	Length	Incomplete Length	Width	Incomplete Width.	Thickness	PSA	DSA	Notch depth	Notch width	NOI	Stem/Base Height	Base Width	Shoulder Width	Blank form	Base shape	Serration
1	42GA1903	–	31	101	1	–	–	2	1	6.0	46.11	–	26.21	–	5.61	88	152	1.55	4.19	70	20.25	16.71	26.21	1	3	–
2	42GA1903	–	4	100	2	–	–	–	1	4.5	38.69	–	18.49	–	5.99	69	157	1.16	4.21	82	3.73	7.03	15.08	2	3	–
3	42GA1903	–	12	106	1	–	–	3	34	6.1	–	35.66	24.70	–	6.38	–	195	–	–	–	–	–	24.70	2	–	2
4	42GA1903	–	23	204	20	–	–	–	1	1.2	25.51	–	12.29	–	3.73	122	217	2.09	5.95	77	7.97	11.58	12.29	1	2	–
5	42GA1903	–	13	102	1	–	–	–	2	1.5	–	12.34	23.13	–	4.01	156	185	3.96	4.19	27	8.55	23.13	19.73	–	2	3
6	42GA1903	–	3	101	1	–	–	3	237	3.9	–	27.63	–	20.11	4.76	164	186	2.15	3.50	23	10.08	18.84	–	1	3	–
7	42GA1903	–	9	105	1	–	–	–	23	3.1	–	26.50	–	21.84	4.26	109	138	–	–	–	9.32	16.02	–	–	1	–
8	–	25	1	105	1	–	–	–	23	3.2	–	24.58	23.69	–	5.04	135	152	4.74	5.43	45	9.91	17.66	23.19	1	3	–
9	–	28	16	200	20	–	–	–	236	0.4	–	13.13	–	12.20	2.05	175	190	1.27	1.29	28	6.52	–	10.67	1	4	–
10	42KA5756	–	22	202	20	–	–	–	10	0.5	–	17.90	–	9.95	2.84	166	180	2.20	1.47	19	–	–	–	1	–	–
11	–	39	4	105	1	–	–	–	23	2.9	–	31.35	19.56	–	3.60	70	157	1.40	4.68	98	5.58	9.21	18.50	2	3	1
12	42GA5177	–	5	105	1	–	–	3	23	5.0	–	33.57	–	23.82	5.86	92	210	1.07	6.89	136	13.63	20.04	–	–	2	–
13	42GA1896	–	9	202	20	–	–	–	23	2.8	–	21.51	–	21.32	4.74	107	177	3.41	6.99	86	8.22	15.49	20.57	–	1	–
14	42GA5182	–	5	105	1	–	–	3	2	4.2	–	30.70	–	20.91	6.09	108	210	2.94	14.35	105	13.63	15.59	–	–	1	2
15	42GA5186	–	12	104	2	–	–	–	3	3.3	–	21.22	–	21.83	4.76	–	180	–	–	–	–	–	–	–	–	2
16	42GA5190	–	1	101	1	–	–	–	26	1.6	–	23.44	–	22.19	3.81	116	157	5.81	5.05	45	11.76	–	–	–	1	–
17	42GA5190	–	5	500	50	–	–	3	5	5.3	–	40.38	21.22	–	5.82	95	200	1.57	4.59	115	14.59	20.71	21.22	1	2	–
18	–	165	23	105	1	–	–	1	3	2.4	–	23.01	17.01	–	4.72	–	165	–	–	–	–	–	17.01	1	–	2
19	–	1108	4	103	3	–	–	–	23	2.2	–	22.76	–	19.65	4.57	78	171	2.00	4.69	49	7.34	8.34	–	–	3	–
20	–	66	4	104	2	1	4	–	5	4.2	43.73	–	22.54	–	5.13	62	151	2.56	8.80	111	5.30	6.55	22.54	1	3	1
21	–	1630	2	101	1	–	–	–	2367	4.9	–	38.36	–	22.58	4.59	130	–	–	–	–	6.56	–	–	1	2	1

Appendix 7.2. (continued)

FS No.	Site No.	IO No.	Type	Material	Grouped Material	Therm. alt.	Therm. type	Patination	Portion	Weight	Length	Incomplete Length	Width	Incomplete Width.	Thickness	PSA	DSA	Notch depth	Notch width	NOI	Stem/Base Height	Base Width	Shoulder Width	Blank form	Base shape	Serration
23	42GA5192	–	16	101	1	–	–	–	236	0.6	–	15.97	–	16.84	2.29	158	188	2.48	2.12	23	10.26	–	12.36	1	4	–
24	42KA3288	–	2	101	1	1	3	–	23	2.9	–	26.92	–	21.93	4.94	135	163	5.06	4.38	36	8.97	17.76	–	1	2	–
25	42KA3288	–	1	200	20	–	–	–	95	2.7	–	28.43	–	25.55	3.86	128	–	–	–	–	8.48	14.37	–	1	1	–
26	42KA3288	–	2	109	2	–	–	–	1	4.9	37.51	–	23.20	–	5.74	124	199	1.60	2.97	49	6.93	22.52	23.20	1	2	–
28	–	2050	12	103	3	1	4	–	3	2.9	–	22.19	–	24.18	5.01	–	186	–	–	–	–	–	–	1	–	–
29	–	1889	1	105	1	1	3	–	1	3.6	35.20	–	24.11	–	4.54	129	154	2.80	3.09	26	6.70	16.78	24.11	1	1	–
30	–	1890	1	104	2	1	3	–	23	1.9	–	21.08	16.56	–	4.29	119	163	1.47	2.83	51	6.73	12.02	16.15	1	3	–
31	–	1892	4	101	1	–	–	1	5	3.6	–	42.51	–	17.06	4.99	78	205	1.68	5.53	120	5.96	8.12	14.63	1	3	–
32	–	2000	12	400	40	–	–	–	3	5.2	–	29.81	–	25.42	5.84	–	–	–	–	–	–	–	25.42	1	–	–
33	–	2003	23	400	40	–	–	–	23	1.1	–	17.44	–	14.94	3.60	–	–	–	–	–	–	–	–	3	–	–
34	42GA3383	–	4	101	1	–	–	–	2	1.3	–	14.38	22.40	–	4.19	63	204	1.76	9.42	131	9.22	11.70	22.40	–	3	3
35	–	2005	22	107	1	–	–	–	236	0.8	–	27.07	–	9.75	2.54	144	200	1.01	2.07	30	–	–	9.75	1	–	1
36	–	2007	9	101	1	–	–	–	3	2.7	–	23.49	21.13	–	4.34	–	158	–	–	–	–	–	19.98	–	–	1
37	–	2007	2	106	2	–	–	–	23	2.4	–	19.83	–	20.80	4.92	145	–	–	–	–	9.79	17.25	–	–	2	–
38	–	2028	4	101	1	1	4	–	56	3.5	45.33	–	16.53	–	4.49	63	176	2.08	6.95	115	5.81	5.93	16.53	1	3	1
39	–	2032	16	400	40	–	–	–	236	0.8	–	24.99	–	23.43	2.54	158	190	2.76	2.33	23	8.83	–	–	1	4	–
40	–	2468	32	101	1	–	–	–	1	7.3	48.74	–	21.94	–	6.74	–	–	–	–	–	–	16.48	–	2	2	–
41	42GA5193	–	9	202	20	1	13	1	3	2.3	–	28.09	15.31	–	4.67	–	151	–	–	–	–	–	15.31	1	–	1
42	42GA5202	–	22	106	2	–	–	–	3	1.3	–	16.57	13.85	–	3.78	156	197	1.82	2.87	33	–	–	13.58	–	–	–
43	42GA5203	–	1	400	40	–	–	–	1	1.9	27.36	–	15.53	–	4.26	144	168	3.37	3.69	34	6.78	15.04	15.53	2	1	–
44	42GA5205	–	20	202	20	1	3	–	23	1.2	–	19.73	–	15.64	3.34	83	139	2.13	3.07	59	2.64	5.94	15.64	1	1	–
45	–	2044	12	108	1	–	–	2	34	6.2	–	54.31	19.88	–	4.90	–	–	–	–	–	–	–	–	2	–	–

Appendix 7.2. ***(continued)***

FS No.	Site No.	IO No.	Type	Material	Grouped Material	Therm. alt.	Therm. type	Patination	Portion	Weight	Length	Incomplete Length	Width	Incomplete Width.	Thickness	PSA	DSA	Notch depth	Notch width	NOI	Stem/Base Height	Base Width	Shoulder Width	Blank form	Base shape	Serration
46	–	2049	21	102	1	–	–	–	36	1.1	–	26.83	16.28	–	1.96	–	196	4.06	–	–	–	–	16.28	1	–	–
47	42GA5200	–	1	101	1	–	–	3	236	6.0	–	30.65	27.66	–	5.48	141	150	3.96	4.20	27	8.12	–	27.66	2	3	–
48	42GA5201	–	16	203	20	–	–	–	236	0.5	–	16.71	–	12.57	2.29	161	186	1.67	2.23	29	6.75	–	11.01	1	4	1
49	42GA5201	–	2	103	3	–	–	–	2	1.1	–	12.77	–	19.73	4.34	119	–	–	–	–	10.00	19.73	–	–	2	3
50	42GA5210	–	4	103	3	1	14	–	2	1.8	–	22.05	–	16.89	3.68	75	–	–	–	–	4.74	7.62	–	–	1	–
51	42GA5210	–	4	105	1	1	34	–	237	2.8	–	28.79	–	19.87	5.08	65	150	2.42	5.18	70	6.50	6.04	–	1	3	–
52	42GA5209	–	9	400	40	–	–	–	3	2.6	–	24.10	25.50	–	4.12	–	134	–	–	–	–	–	–	1	–	1
53	42GA3388	–	4	103	3	1	4	3	3	3.3	–	30.16	–	21.88	5.58	75	202	–	–	–	–	–	–	2	–	–
54	42GA5213	–	9	101	1	–	–	–	3	2.0	–	23.72	–	20.14	4.08	–	159	–	–	–	–	–	–	1	–	1
55	42GA5213	–	4	101	1	1	1	2	236	2.6	–	21.48	–	20.30	4.59	61	201	.88	5.99	–	–	–	–	1	–	1
56	42GA5215	–	23	200	20	–	–	1	2	1.2	–	15.48	12.23	–	5.08	78	240	–	–	–	8.61	9.29	12.36	0	3	–
57	42GA5215	–	2	101	1	1	1	–	236	2.0	–	21.36	18.49	–	4.11	136	157	3.81	2.97	22	7.51	–	18.49	1	2	1
58	42GA5218	–	1	106	2	–	4	–	236	2.8	–	26.08	20.44	–	4.71	121	159	2.04	3.12	39	6.04	–	20.44	1	3	1
59	42GA5218	–	11	400	40	–	–	1	2	4.1	–	27.27	–	21.20	6.04	72	–	–	–	–	–	12.01	–	2	3	–
60	42GA5220	–	12	400	40	–	–	–	5	1.7	30.64	–	10.71	–	4.25	–	–	–	–	–	–	–	–	2	2	1
61	42GA5223	–	1	101	1	1	4	–	510	2.1	–	24.76	21.46	–	3.68	117	162	2.87	4.87	61	–	–	21.46	1	–	–
62	42GA1902	–	10	101	1	1	1	–	236	1.5	–	20.33	16.81	–	3.42	162	204	3.22	3.47	25	–	–	16.81	–	–	–
63	–	3264	21	101	1	–	–	–	8	0.2	–	7.16	–	11.60	1.87	–	159	–	–	–	–	–	–	–	–	–
64	–	3270	4	108	1	–	–	–	9	3.7	33.15	–	–	23.21	5.20	80	156	2.64	4.57	56	4.57	8.35	–	2	1	–
65	–	3271	21	201	20	–	–	1	34	1.1	–	25.78	–	15.90	2.47	–	131	5.38	–	–	–	–	–	1	–	–
66	–	3520	1	106	2	1	4	–	2367	5.0	–	28.32	–	27.05	5.51	123	142	4.52	4.01	27	8.59	–	–	1	–	1
67	–	3528	21	103	3	1	2	–	3	1.7	–	19.20	–	18.23	4.14	–	149	–	–	–	–	–	–	1	–	–

Appendix 7.2. (continued)

FS No.	Site No.	IO No.	Type	Material	Grouped Material	Therm. alt.	Therm. type	Patination	Portion	Weight	Length	Incomplete Length	Width	Incomplete Width.	Thickness	PSA	DSA	Notch depth	Notch width	NOI	Stem/Base Height	Base Width	Shoulder Width	Blank form	Base shape	Serration
68	–	3534	9	101	1	–	–	–	3	4.2	–	29.56	–	22.69	4.64	–	155	–	–	–	–	–	–	1	–	1
69	–	3540	9	108	1	–	–	2	3	4.1	–	39.44	–	25.53	4.52	–	155	–	–	–	–	–	–	1	–	–
70	–	3562	1	202	20	–	–	–	9	6.1	37.60	–	–	27.11	5.81	111	149	5.35	4.61	34	9.37	21.86	–	1	1	–
71	–	3641	19	105	1	–	–	–	3	0.8		19.53	–	11.83	3.32	87	198	.93	2.89	62	–	–	–	1	–	1
72	42GA5235	–	1	101	1	–	–	–	9	5.5	46.27	–	22.45	–	5.28	116	148	2.47	4.69	56	8.69	12.82	–	1	1	–
73	42GA5235	–	2	102	1			–	5	2.7	33.61	–	17.65	–	4.87	121	148	3.04	3.72	28	5.51	13.81	17.65	1	2	1
74	–	12	9	400	40	–	–	1	3	2.7	–	20.47	–	22.37	4.72	–	160	–	–	–	–	–	–	1	–	2
75	42GA5237	–	10	105	1	–	–	–	10	3.2	27.40	–	23.74	–	5.76	165	202	2.18	3.70	68	12.19	23.54	23.74	1	3	–
76	42GA5237	–	5	203	20	–	–	–	26	1.7	–	15.70	–	18.97	5.35	108	210	2.81	–	120	13.76	–	–	–	2	3
77	42GA5240	–	19	401	40	–	–	–	236	0.5	–	16.56	–	10.43	2.69	88	190	–	–	–	4.87	–	–	1	1	–
78	42GA5240	–	22	101	1	–	–	–	236	1.3	–	23.82	–	11.89	4.80	139	216	1.05	2.15	102	6.45	–	9.67	1	2	–
79	–	1484	1	101	1	1	4	1	23	6.1	–	38.40	–	21.03	6.31	119	173	2.84	3.42	72	9.93	16.61	–	1	1	
80	–	1486	1	107	1	1	1	3	236	2.9	–	24.44	18.69	–	4.69	110	169	2.36	3.41	53	6.68	12.42	18.58	1	1	1
81	–	2083	9	108	1	–	–	3	3	4.9	–	31.03	–	33.62	4.08	–	130	–	–	–	–	–	–	1	–	–
82	–	2086	10	402	40	–	–	–	1	3.4	39.14	–	15.92	–	5.96	161	196	2.03	4.26	37	8.86	11.44	15.24	2	1	–
83	–	2089	21	106	2	–	–	–	3	1.2	–	19.10	–	17.37	3.64	–	151	–	–	–	–	–	–	1	–	–
84	–	2094	12	101	1	–	–	–	3	2.7	–	32.71	14.40	–	5.25	–	–	–	–	–	–	–	–	3	–	–
85	–	2095	2	101	1	–	–	–	56	2.0	–	28.87	18.84	–	3.88	123	161	1.68	2.87	45	5.84	–	18.84	1	2	1
86	42GA5242	–	2	101	1	1	1	2	23	2.9	–	28.54	18.87	–	4.39	137	158	3.02	2.72	22	5.39	15.97	18.16	1	2	1
88	–	3096	1	400	40	–	–	–	236	2.6	–	29.74	–	22.50	4.14	128	146	4.44	2.74	32	5.00	–	22.58	1	–	1
89	–	1498	1	108	1	1	4	–	23	7.0	–	44.52	24.40	–	4.85	132	149	2.76	3.47	26	6.24	16.51	21.83	2	3	–
90	42KA5773	–	12	101	1	–	–	–	3	3.2	–	26.41	–	25.20	4.11	–	–	–	–	–	–	–	–	1	–	1

Appendix 7.2. ***(continued)***

FS No.	Site No.	IO No.	Type	Material	Grouped Material	Therm. alt.	Therm. type	Patination	Portion	Weight	Length	Incomplete Length	Width	Incomplete Width.	Thickness	PSA	DSA	Notch depth	Notch width	NOI	Stem/Base Height	Base Width	Shoulder Width	Blank form	Base shape	Serration
91	42KA5773	–	1	103	3	–	–	–	236	3.2	–	31.06	18.59	–	5.05	112	154	1.85	2.85	64	7.16	8.43	18.59	1	3	–
92	–	3385	4	101	1	–	–	–	23	4.2	–	32.09	–	20.44	4.74	64	163	1.56	4.76	95	6.33	9.98	–	1	3	1
93	–	3388	9	102	1	–	–	1	2367	3.2	–	23.46	–	17.86	5.95	127	–	–	–	–	7.41	–	–	–	2	–
94	–	3390	12	201	20	–	–	–	3	3.1	–	28.49	–	22.19	4.01	–	–	–	–	–	–	–	–	1	–	2
97	42GA5239	–	12	400	40	–	–	–	34	2.2	–	29.92	14.26	–	5.08	–	–	–	–	–	–	–	–	2	–	1
100	–	3461	4	204	20	1	3	–	23	3.8	–	33.14	19.40	–	5.11	67	211	1.57	9.72	147	7.89	10.03	19.40	2	3	1
101	42GA1904	–	23	109	2	–	–	–	34	1.5	–	25.46	18.05	–	3.20	154	208	1.24	3.22	80	–	–	18.05	2	–	–
102	42GA1904	–	16	101	1	–	–	–	26	0.6	–	14.42	–	16.89	3.45	159	178	2.38	1.60	20	9.16	–	–	–	4	–
103	–	3922	16	400	40	–	–	–	2	0.5	–	12.36	14.58	–	2.43	161	189	2.54	2.33	22	7.31	14.58	13.91	1	3	–
104	–	4846	23	400	40	–	–	–	3	1.7	–	19.15	–	17.42	3.97	–	–	–	–	–	–	–	–	1	–	–
105	42GA3558	–	10	400	40	–	–	1	23	2.6	–	30.11	13.00	–	5.33	115	200	1.29	2.81	66	9.29	10.94	13.00	1	1	–
106	–	3876	19	101	1	–	–	–	510	0.8	20.71	–	11.98	–	3.14	80	154	1.67	3.42	50	–	5.92	11.98	1	–	–
107	–	3844	4	202	20	–	–	1	23	2.4	–	21.28	17.48	–	4.85	84	203	2.24	8.15	122	7.46	8.10	17.48	1	3	1
108	–	4011	2	101	1	–	–	2	57	2.9	41.88	–	–	18.33	4.24	132	–	–	–	–	6.00	10.96	–	2	2	–
109	–	3660	16	101	1	–	–	–	2367	0.7	–	21.47	–	9.77	2.71	160	180	1.82	1.44	20	7.32	–	–	1	4	–
110	–	3897	4	110	2	–	–	–	23	2.7	–	26.06	22.50	–	4.77	77	152	1.68	4.38	69	5.82	7.50	22.50	1	1	1
111	–	3894	20	202	20	–	–	–	1	1.6	23.95	–	16.33	–	4.24	79	128	3.44	4.64	49	4.67	4.54	16.33	1	3	1
112	–	4013	1	101	1	–	–	–	3	4.9	–	33.52	27.72	–	4.52	143	198	2.20	4.11	64	–	–	27.22	1	–	–
113	–	4197	23	101	1	–	–	1	3	0.9	–	22.25	13.14	–	2.38	–	168	–	–	–	–	–	13.14	1	–	–
114	–	3881	9	101	1	–	–	2	2367	2.1	–	23.67	–	15.95	4.92	139	–	–	–	–	–	–	–	1	2	–
115	42KA3288	–	1	103	3	–	–	–	23	4.6	–	34.51	23.03	–	4.24	110	167	2.27	5.27	56	8.62	17.00	23.03	2	1	1
116	42KA3288	–	21	202	20	–	–	–	34	0.7	–	21.59	14.60	–	2.48	–	145	2.18	–	–	–	–	14.60	1	–	1

Appendix 7.2. (continued)

FS No.	Site No.	IO No.	Type	Material	Grouped Material	Therm. alt.	Therm. type	Patination	Portion	Weight	Length	Incomplete Length	Width	Incomplete Width.	Thickness	PSA	DSA	Notch depth	Notch width	NOI	Stem/Base Height	Base Width	Shoulder Width	Blank form	Base shape	Serration
119	42GA1904	–	24	105	1	–	–	–	10	2.1	41.88	–	–	15.11	4.21	–	–	–	–	–	–	–	–	1	2	–
120	42GA1904	–	2	101	1	1	1	–	2367	1.3	–	19.24	–	16.07	4.08	112	142	–	–	27	7.63	–	–	1	2	1
121	42GA1904	–	7	101	1	–	–	–	236	2.3	–	22.30	–	21.31	4.80	158	178	2.48	3.28	24	14.88	–	–	–	2	–
122	42GA5267	–	12	105	1	1	1	3	3	2.4	–	20.29	17.90	–	4.74	–	210	–	–	–	–	–	16.71	–	–	1
123	42GA1899	–	2	106	2	–	–	–	2	1.9	–	18.21	20.18	–	4.29	134	156	4.15	4.33	31	9.55	18.69	20.18	1	2	1
124	42GA1899	–	17	600	60	–	–	–	23	1.6	–	21.36	12.04	–	4.57	128	210	1.73	3.14	72	6.68	11.55	12.01	1	3	–
125	42GA1899	–	21	102	1	–	–	–	3	1.0	–	16.33	–	16.68	3.26	–	151	–	–	–	–	–	–	1	–	–
129	42KA5798	–	6	104	2	1	2	–	2	2.8	–	23.71	22.07	–	4.64	162	204	2.19	4.54	50	15.34	21.99	20.11	–	1	–
130	42KA5798	–	6	104	2	–	–	–	23	5.8	–	32.15	21.79	–	5.99	153	200	2.27	4.57	29	15.08	18.28	20.47	1	1	–
131	42KA5813	–	12	101	1	–	–	–	3	3.0	–	20.71	21.48	–	5.43	–	193	–	–	–	–	–	–	–	–	–
134	42GA5240	–	5	202	20	–	–	3	510	4.0	–	31.16	20.62	–	6.14	76	178	1.86	7.28	106	11.86	–	20.62	2	2	–
135	42KA3284	–	11	301	30	–	–	–	23	4.4	–	29.51	19.03	–	5.99	80	–	–	–	–	–	9.95	–	2	1	–
136	42GA2634	–	19	101	1	–	–	–	510	1.0	–	28.60	11.98	–	2.69	85	174	1.22	2.12	63	2.99	–	12.03	1	1	1
137	42GA5284	–	2	102	1	–	–	3	5910	3.3	–	28.57	–	19.34	4.77	127	158	2.71	4.78	53	–	–	1.00	2	–	–

Appendix 7.3

X-ray Fluorescence Analysis of Obsidian Artifacts

Geochemical Research Laboratory Letter Report 2001-83

October 9, 2001

Mr. Chris Wenker, Archeologist
National Park Service
Intermountain Support Office
P.O. Box 728
Santa Fe, New Mexico 87504-0728

Dear Mr. Wenker:

Enclosed with this letter you will find a table presenting x-ray fluorescence (xrf) data generated from the analysis of 15 obsidian artifacts from various archaeological sites and isolates within Bryce Canyon National Park, Utah. This research was conducted pursuant to your letter request of October 1, 2001 under terms of National Park Service purchase order P7485210038.

Analyses of obsidian are performed at my laboratory on a Spectrace™ 5000 (Tracor X-ray) energy dispersive x-ray fluorescence spectrometer equipped with a rhodium (Rh) x-ray tube, a 50 kV x-ray generator, with microprocessor controlled pulse processor (amplifier) and bias/protection module, a 100 mHz analog to digital converter (ADC) with automated energy calibration, and a Si (Li) solid state detector with 160 eV resolution (FWHM) at 5.9 keV in a 30 mm^2 area. The x-ray tube is operated at 34.0 kV, .26 mA, using a .127 mm Rh primary beam filter in an air path to generate x-ray intensity data for elements zinc (Zn Kα), gallium (Ga Kα), rubidium (Rb Kα), strontium (Sr Kα), yttrium (Y Kα), zirconium (Zr Kα), and niobium (Nb Kα). Barium (Ba Kα) intensities are generated by operating the x-ray tube at 50.0 kV, .35 mA, with a .63 mm copper (Cu) filter, while those for titanium (Ti Kα), manganese (Mn Kα) and total iron ($Fe_2O_3^T$) are generated by operating the x-ray tube at 15.0 kV, .30 mA with a .127 mm aluminum (Al) filter. Iron vs. manganese (Fe Kα/Mn Kα) ratios are computed from data generated by operating the x-ray tube at 15.0 kV, .30 mA, with a .127 mm aluminum (Al) filter. Deadtime-corrected analysis time for each sample appears in the data table.

X-ray spectra are acquired and elemental intensities extracted for each peak region of interest, then matrix correction algorithms are applied to specific regions of the x-ray energy spectrum to compensate for inter-element absorption and enhancement effects. After these corrections are made, intensities are converted to concentration estimates by employing a least-squares calibration line established for each element from analysis of up to 30 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology, the Geological Survey of Japan, the Centre de Recherches Petrographiques et Geochimiques (France), and the South African Bureau of Standards. Further details pertaining to x-ray tube operating conditions and calibration appear in Hughes (1988, 1994). Extremely small/thin specimens are analyzed using a .25 mm^2 primary beam collimator, and resulting data normalized using a sample mass correction algorithm. Deadtime-corrected analysis time is greatly extended in all instances when primary beam collimation is employed.

Trace element measurements on the xrf data tables (except Fe/Mn ratios) are expressed in quantitative units (i.e. parts per million [ppm] and weight percent composition), and matches between unknowns and known obsidian chemical groups were made on the basis of correspondences (at the 2-sigma level) in diagnostic trace element concentration values (in this case, ppm values for Rb, Sr, Y, Zr, Nb and, when necessary, Ba, Ti, Mn and $Fe_2O_3^T$) that appear in Hughes (1983, 1984, 1985, 1986, 1990, 2001a, n.d.a-b), Macdonald et al. (1992), Nelson (1984), and Nelson and Holmes (1979). Artifact-to-obsidian source (geochemical type, *sensu* Hughes 1998) correspondences were considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source standards. I use the term "diagnostic" to specify those trace elements that are well-measured by x-ray fluorescence, and whose concentrations show low intra-source variability and marked variability across sources. In short, diagnostic elements are those concentration values allowing one to draw the clearest geochemical distinctions between sources (Hughes 1990, 1993). Although Zn, Ga and Nb ppm concentrations also were measured and reported for each specimen, they are not considered "diagnostic" because they don't usually vary significantly across obsidian sources (see Hughes 1982, 1984). This is particularly true of Ga, which occurs in concentrations between 10-30 ppm in nearly all parent obsidians in the study area. Zn ppm values are infrequently diagnostic; they are always high in Zr-rich, Sr-poor peralkaline volcanic glasses, but otherwise they do not vary significantly between sources in the study area.

Composition measurements are reported to the nearest ppm (or, for $Fe_2O_3^T$, to nearest hundredth wt. %) to reflect calibration-imposed resolution capabilities of non-destructive energy dispersive x-ray fluorescence spectrometry. The resolution limits of the present x-ray fluorescence instrument for the determination of Zn is about 3 ppm; Ga about 2 ppm; for Rb about 4 ppm; for Sr about 3 ppm; Y about 3 ppm; Zr about 4 ppm; and Nb about 3 ppm (see Hughes [1988, 1994] for other elements). When counting and fitting error uncertainty estimates (the "±" value in the table) for a sample are greater than element-specific resolution limits given above, the larger number is a more conservative indicator of composition variation and measurement error arising from differences in sample size, surface and x-ray reflection geometry.

The artifact-to-source attribution for each specimen appears in the data table, and the location of the source type identified appears in Nelson and Holmes (1979:Figure 5) and Nelson (1984:Figure 1). As was the case at nearby Cedar Breaks National Monument (Hughes 2001b), the majority of artifacts in this Bryce Canyon sample (13 of 15; 87% of the sample total) were fashioned from obsidian from the Wild Horse Canyon chemical type (cf. Nelson 1984:Table 4, source # 2; Hughes n.d.b:Table 2) in the Mineral Mountain Range, while one artifact (7% of the sample total) matches the chemical profile of obsidian of the Panaca Summit chemical type, nodules of which occur over 160 km to the west of Bryce Canyon. I use the term Panaca Summit in concert with Nelson's (1984) 'Modena area' because my own reference collections made from geologic occurrences in the Panaca Summit area (east of Panaca, Nevada) document that glass of this chemical type occurs in geologic contexts beyond the immediate vicinity of Modena.

Finally, one specimen (FS # 82) has a trace element composition profile unlike any of the geologic obsidian standards currently in my regional comparative database.

I hope this information will help in your analysis of these site materials. Please contact me at my laboratory ([650] 851-1410; e-mail: rehughes@silcon.com) if I can be of further assistance.

Sincerely,

[*Signed original*]

Richard E. Hughes, Ph.D.
Director, Geochemical Research Laboratory

encl.

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October 9, 2001Bryce Canyon, Utah, Xrf Data
R. E. Hughes, Analyst
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Cat. No.	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	Obsidian Source (Chemical Type)
	Trace and Selected Minor Element Concentrations											**Ratio**	
FS # 32	40 ±6	16 ±3	184 ±4	36 ±3	20 ±3	104 ±4	19 ±3	154 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 33	40 ±6	17 ±3	187 ±4	39 ±3	20 ±3	109 ±4	21 ±3	161 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 39	41 ±6	15 ±3	189 ±4	37 ±3	18 ±3	103 ±4	17 ±3	205 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 43	39 ±6	18 ±3	188 ±4	35 ±3	19 ±3	106 ±4	20 ±3	200 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 52	39 ±6	15 ±3	175 ±4	39 ±3	18 ±3	107 ±4	20 ±3	198 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 59	41 ±5	15 ±3	183 ±4	37 ±3	19 ±3	100 ±4	20 ±3	181 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 60	42 ±6	19 ±3	188 ±4	36 ±3	17 ±3	100 ±4	19 ±3	169 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 74	41 ±6	15 ±3	177 ±4	36 ±3	19 ±3	103 ±4	18 ±3	142 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 77	47 ±4	13 ±5	191 ±3	74 ±3	25 ±4	112 ±3	14 ±6	476 ±15	nm	nm	nm	nm	Panaca Summit
FS # 82	91 ±6	21 ±3	380 ±5	13 ±3	38 ±3	234 ±4	77 ±3	19 ±12	1108 ±24	748 ±12	1.25 ±.10	14	Unknown
FS # 88	38 ±6	19 ±3	194 ±4	37 ±3	19 ±3	105 ±4	20 ±3	164 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 97	44 ±6	15 ±3	182 ±4	37 ±3	19 ±3	104 ±4	18 ±3	187 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 103	49 ±6	16 ±3	190 ±4	37 ±3	22 ±3	108 ±4	20 ±3	189 ±14	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 104	36 ±6	19 ±3	192 ±4	38 ±3	17 ±3	105 ±4	22 ±3	193 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)
FS # 105	39 ±6	16 ±3	192 ±4	38 ±3	20 ±3	102 ±4	23 ±3	188 ±13	nm	nm	nm	nm	Wild Horse Canyon, UT (Mineral Mountains)

Values in parts per million (ppm) except total iron (expressed in weight percent) and Fe/Mn intensity ratios
± = estimate (in ppm) of x-ray counting uncertainty and regression fitting error at 300 and 600 (*) seconds livetime
nm = not measured.

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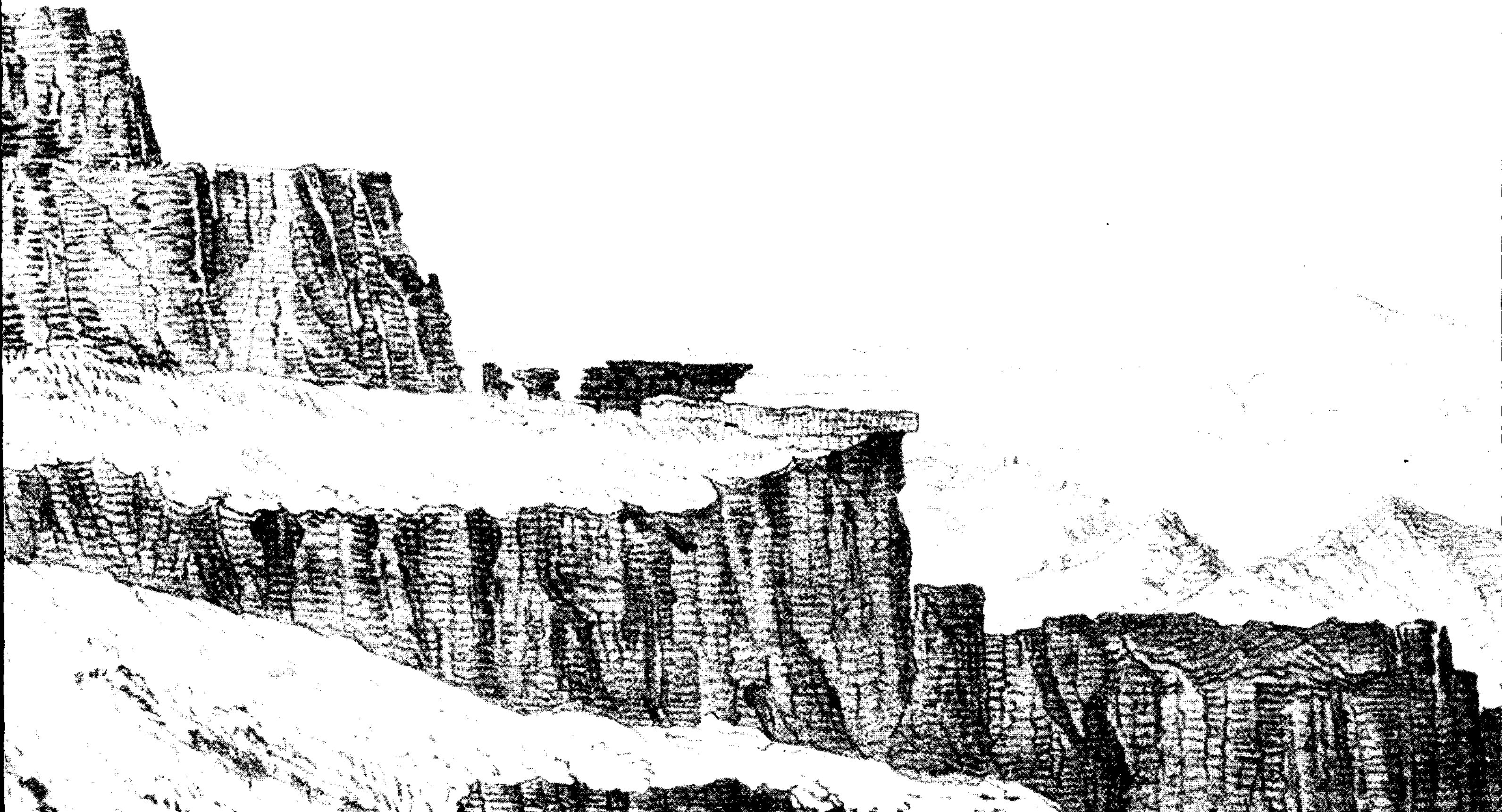

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