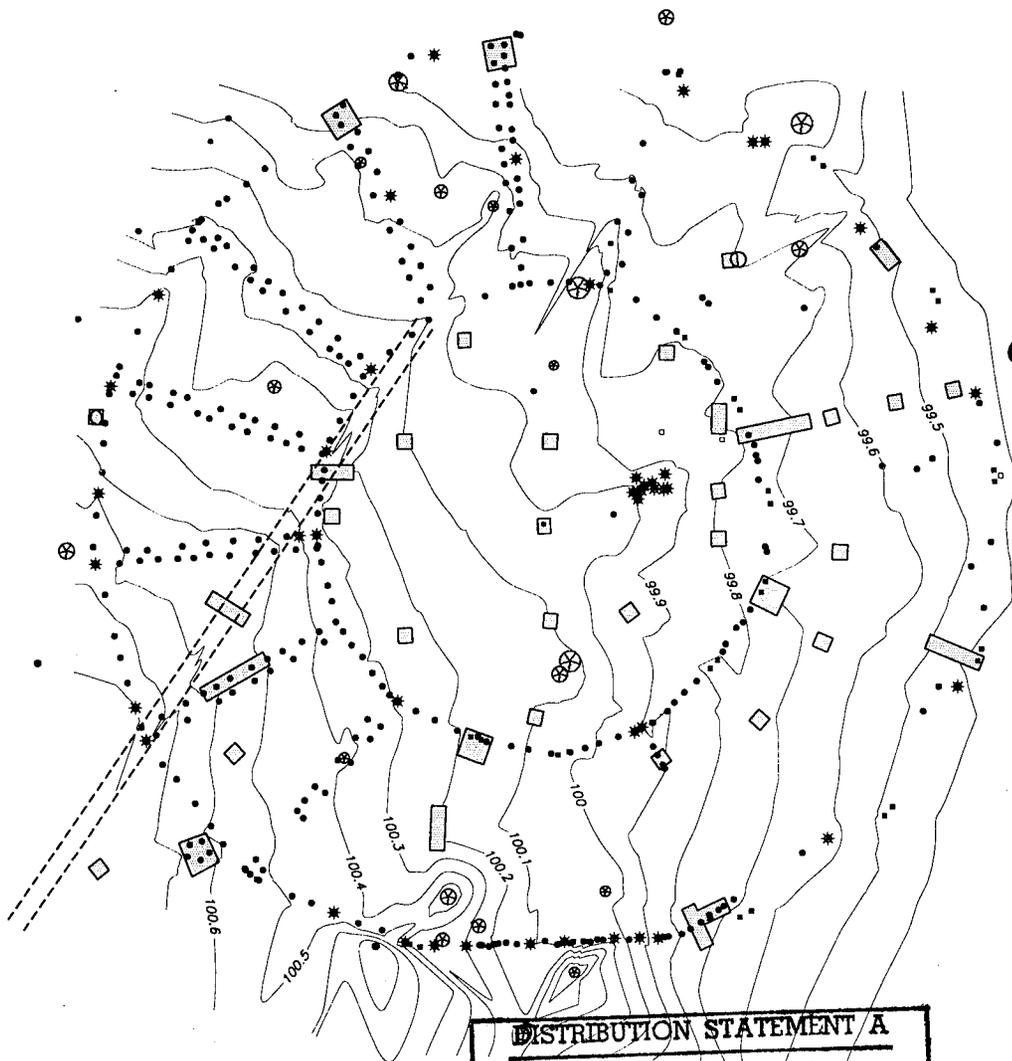


ARCHEOLOGY AND NATIVE AMERICAN RELIGION AT THE LEON RIVER MEDICINE WHEEL



by
Michael J. Quigg
Charles D. Frederick
Dorothy Lippert

with a Foreword by
Jack M. Jackson

and Epilogues by
Christopher R. Lintz
Steve Russell

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UNITED STATES ARMY FORT HOOD
ARCHEOLOGICAL RESOURCE MANAGEMENT SERIES
RESEARCH REPORT NO. 33

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**ARCHEOLOGY AND NATIVE AMERICAN RELIGION
AT THE LEON RIVER MEDICINE WHEEL**

Prepared for

**Directorate of Public Works
Environmental Management Office
Fort Hood, Texas**

by

**TRC MARIAH ASSOCIATES, INC.
Austin, Texas**

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19. ABSTRACT (Continued)

The Native American renewal ceremony was held on 18 May 1994, and was led by the Medicine Wheel Alliance from the Northern Plains, headed by Mr. William Tallbull with assistance by Elders Mr. Haman Wise, Mr. Floyd Youngman, and Mr. Lee Lonebear. The all-day event, hosted by the American Indian Resource and Education Coalition of Texas, featured an address by Mr. Tallbull which focused on the significance of the event at the Wheel, followed by a spiritual cleansing prior to the actual reconstruction/rededication of the Medicine Wheel. After the rebuilding event, a feast and give-away was held, followed by a sweat ceremony. The four prominent Traditional Elders were interviewed to obtain information on various topics concerning the Medicine Wheel. Their statements unanimously support the conviction that this is a very significant spiritual feature which will help strengthen the Native American community in Texas and provide a place for individual spiritual growth and harmony.

Mariah's 1994 evaluation included a multi-disciplinary set of archeological and geoarcheological investigations. The Native Americans permitted scientific study of the Medicine Wheel feature prior to its rededication in order to obtain information about the poorly defined portions. This was necessary for the accurate rebuilding of the structure. The scientific studies involved various physical and chemical assessments, aerial photograph interpretation, historic literature review, and ethnographic interviews. This diverse information is used to assess the research potential and cultural significance of the lithic scatter and the remaining part of the Leon River Medicine Wheel at 41CV1505.

The exposed western part of the Medicine Wheel and relevant adjunct features were mapped by a total station mapping system and probed by geophysical investigations (ground penetrating radar and electromagnetic induction) to explore the possibility that the eastern part of the structure was buried. Some 236 selected Medicine Wheel rocks were mapped and had specific formal attributes recorded and analyzed. Overhead air photos documented the Wheel's condition prior to the rebuilding ceremony, and 70 m² were hand excavated.

The geophysical results failed to detect the suspected burial of the east part of the Medicine Wheel and this absence was verified by archeological excavations. Excavations discovered Native stone tools and other stone debris mixed with recent non-Native historic metal and glass in the very shallow, upland soils. Three radiocarbon assays from charcoal indicate a potential occupation span from modern times back some 550 years, although the projectile point types recovered from the surface of 41CV1505 in 1990 suggest periodic occupations of the knoll dating back into the Paleoindian period. The Medicine Wheel is projected to be nearly 60 m in diameter and formed by two concentric polygons, the inner polygon is about 30 m in diameter and is connected to the outer polygon by 16 paired rock lines or pathways with no apparent central rock feature. The in situ Medicine Wheel rocks are buried 3 and 8 centimeters below surface with lichen covering about 68% of the rocks recorded.

The geoarcheological investigations documented a strong calcarious soil between 5 and 35 cm thick with the eastern side of the Medicine Wheel being the shallowest. This minimally weathered soil was disturbed by earth worms, ants, and tree roots. The fine sediments estimated to have been moved by the worms over a 40 to 50 year period could have accounted for the present depth of rock burial. Feature 9, a non-natural, narrow, low relief fossil oyster shell ridge crosses the western side of the Medicine Wheel. This feature exhibited the only detected stratigraphy, since the area immediately outside the Medicine Wheel had been cultivated. Excavations perpendicular to this low ridge documented a buried soil anomaly which consisted of roughly parallel linear depressions which had been filled in with a variety of matrix. These narrow (4 to 6 cm wide) depressions, spaced about 126 to 140 cm apart, are problematic, but are interpreted to represent ruts of a road. The ridge of fossil oysters (Feature 9) between the ruts represents borrow spillage; the rocks forming the Medicine Wheel overlie the fossil shell ridge. This interpretation is supported by the observations of a road feature on the 1941 aerial photographs in this location.

Even though the Leon River Medicine Wheel appears recent, the Traditional Elders affirm it as a significant spiritual feature that will restore harmony. Since archeological information has no relevance to religious belief systems, the excavation results can not invalidate that belief or the spiritual power associated with the Medicine Wheel.

Site 41CV1505 is currently protected under the Memorandum of Understanding between the U.S. Army, the American Indian Resource and Education Coalition of Texas, and the Comanche tribe. Continuing on-ground protection is recommended for this unique sacred site.

EXECUTIVE SUMMARY

Cultural resource site 41CV1505, the Leon River Medicine Wheel at Fort Hood, is a unique sacred site and should be protected. It was discovered in February 1990, and as part of the ongoing base-wide evaluation of cultural resources by the United States Army, was scheduled for National Register evaluation in May 1994. The archeological assessment was conducted by Mariah Associates, Inc. (a subsidiary of TRC Environmental Company) immediately prior to a Native American ceremony which rededicated and renewed the spiritual harmony of the Leon River Medicine Wheel.

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ACKNOWLEDGEMENTS

Any multidisciplinary project such as this involving financing, scheduling, logistical planning and coordination of the numerous groups participating in the ceremony, and the field personnel and subcontractors used in archeology, requires the complete cooperation of many individuals and companies to be successful. In fact, the large number of diverse people and the numerous subcontractors who were involved during a very tightly scheduled series of events demanded more communication and cooperation than usual. The principal author expresses his deepest thanks to all the individuals involved and their cooperative efforts to complete the short field investigation before the successful production of the religious ceremony in a timely and professional manner. We also wish to thank the Native Americans for their interest and understanding in allowing us to intrude on their sacred places and in their ceremonies.

Dr. Jack Jackson, Fort Hood staff archeologist, and his colleague, Mr. Kimball Smith, were especially helpful in providing direction and advice throughout the field and reporting process. These two individuals performed the initial mapping of the Leon River Medicine Wheel which initiated and stimulated this overall program. Dr. Jackson was responsible for identifying the need for this site assessment and obtaining the financial support for its implementation and the undertaking of the renewal ceremony. Dr. Jackson provided Mariah staff with the original field map of the Medicine Wheel, a series of color slides taken in 1990 of the structure, a second generation 1937 aerial photograph of the site, notes of phone calls, and other information which aided in the analyses and report preparation.

The officers and members of the American Indian Resource and Education Coalition (AIREC) were responsible for the successful completion of the rebuilding and renewal ceremony and the associated events over the three days. This program was coordinated and facilitated by the leadership of their President, Ms. Annette Arkeketa from Corpus Christi, Vice President, Mr. John Waukeshon, Board members Mr. Ron Howard, Ms. Judi Melot, Mr. Al Moose, Dr. Richard Shott, and Ms. Ardena Rodriguez, and Repatriation Chairman Mr. Shiloh Perkins. AIREC members, along with the Four Winds Intertribal Society of Killeen, Texas, also accomplished the difficult task of clearing the brush and trees from the Medicine Wheel, without which the archeological and technical investigations would not have been possible. AIREC members were also responsible for identifying and facilitating all the events surrounding the rebuilding ceremony including arrangement for the food, lodging, facilities, ceremonial needs, and invitations for the Medicine Wheel Alliance members and other visitors.

I would like to thank Ms. Dorothy Lippert, co-author and AIREC member, for her willingness to undertake the critically important interviews with the Traditional Elders of the Medicine Wheel Alliance and accumulating the sensitive information into a very informative chapter of this report. Her direct insights into the Native American culture have greatly benefited this effort.

The rebuilding and renewal ceremony would not have been possible without the members of the Medicine Wheel Alliance from the Northern Plains headed by Mr. William Tallbull (Northern Cheyenne), and assisted by Mr. Haman Wise (Shoshone), Mr. Floyd Youngman (Sioux), and Mr. Lee Lonebear (Northern Cheyenne). Also present was Mr. Luke Brady (Northern Cheyenne) of the Medicine Wheel Coalition. Although not part of the official ceremony, Ms. Nicol Price, Coordinator of the Medicine Wheel Alliance, provided a very insightful talk on Native American involvement in the cultural resource process and how to be active in the various undertakings. This presentation was very beneficial for the

many Native Americans who attended. Staff at Mariah would like to thank the individuals of the Medicine Wheel Alliance for allowing us to participate in the Medicine Wheel rebuilding ceremony and including us in the sweat ceremony. The sharing of ideas and beliefs has helped educate many of us to better understand and have greater sensitivity to the Native American point of view.

The numerous individuals who contributed to this project are all thanked for their expertise, open communication, and willingness to participate on this project within the tight deadlines. Mr. David Severinson of S. A. Hicks and Company in Austin provided his time to identify a number of plants collected from the Medicine Wheel. Dr. Morris Foster of the Department of Anthropology at the University of Oklahoma, Norman, is thanked for his direction and guidance of Ms. Lippert in developing oral interviews, and providing brief tribal backgrounds concerning Medicine Wheels and religious beliefs. Mr. Gary Lockhard of Blimp Photo Company of Austin, worked closely with Mariah staff to obtain the clear and beautiful overhead photographs of the Medicine Wheel. Mr. Tim Deignan and Mr. William Brennam of Denver, Colorado, are thanked for their cooperation in working closely with the Mariah staff in the field during their geophysical investigations. Mrs. Terry Lee Hunt of Gatesville, Texas, the previous land owner, was kind enough to provide her recollections concerning their property. Dr. Thomas Nash at the Department of Botany, Arizona State University, Tempe, Arizona, performed the lichen examination, identification, and the interpretation of growth rates. Mr. Rod Vickers, Archeologist with Alberta Cultural and Multiculturalism in Alberta, supplied an important publication concerning medicine wheels and is thanked for his help and cooperation. Mr. David Jurney supplied Mariah with a copy of his unpublished manuscript.

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Dr. Lynne Sebastian, the New Mexico State Historic Preservation Officer, provided advice and information relating to Traditional Cultural Properties in New Mexico; she was helpful in clarifying a number of points. Dr. Patricia Parker of the National Park Service in Washington, D.C., provided information and advice concerning how one might proceed with the protection of this feature. Dr. William Butler of the National Park Service in Denver also provided his advice concerning Traditional Cultural Properties. Ms. Carol Gleichman of the Advisory Council on Historic Preservation, Denver, offered her comments concerning the eligibility of the Leon River Medicine Wheel and its potential for the National Historic Landmark status. Dr. Ruth Ann Knudson, National Legacy Program Coordinator, Washington, D.C., provided useful advice concerning a number of legal aspects. The draft of this report was reviewed by Dr. Donna Roper of Kansas State University.

The staff at Mariah are thanked for their contributions to the data acquisition, material analyses, and report production. The field crew consisted of Roman Clem, Karl Kleinbach, Gemma Mehalchick, Jay Peck, and geomorphologist Charles Frederick who all worked enthusiastically through rainy weather and a tight field schedule to successfully complete the investigations. I thank Mr. Kleinbach for supplying

his personal power tools and his expertise is using them. Dr. Chris Lintz facilitated the coordination with AIREC necessary to prepare for the rebuilding and rededication ceremony and associated events and also completed the transcription of Mr. Tallbull's speech. Dr. Nicholas Trierweiler conducted a peer review of this document, and provided useful editorial comments. Mr. Frederick continually offered advice and suggestions for improving this report and I thank him for his insights and contributions in the field. Jim Abbott help with the aerial photograph interpretation and photographic enhancement. Dale Lynch provided the lithic identification of the raw materials recovered. Pat O'Neill, through the help of Mr. "Bus" Becker of Okeene, Oklahoma, supplied vehicle width measurements on Model A and T trucks; comparable information on wagons was provided by Mr. Bill Hunt, Midwest Regional Center of the National Park Service, Lincoln, Nebraska. Mike Hilton produced the Medicine Wheel maps with the use of AutoCAD, and Carol Mills produced the beautiful artifact drawings. Debora White handled report production with the assistance of Tammy Jenkins and Jocelyn Vinograd.

Mike Quigg
Austin, Texas
May 1995

FOREWORD

Jack M. Jackson

The project reported here was supported by a grant from the Department of Defense Legacy Resource Management Program (94-0759). It was accomplished in partnership and cooperation with two Native American organizations. The North American Medicine Wheel Tribal Alliance took the lead in directing the renewal of the site as a ceremonial center. Mr. William Tallbull, a leader of the alliance and a newly appointed member of the Advisory Council on Historic Preservation, deserves credit for the initial idea of restoration of the wheel. He made the suggestion when he visited the site in connection with the reburial of some repatriated human remains in an area near the wheel in November 1993. The American Indian Resource and Education Coalition, Inc. of Texas furnished most of the volunteer labor that carefully hand cleared the site of trees and brush before the archeologists began their work. Mr. Tim "Shiloh" Perkins led those volunteers and put in many hours of hard labor with grave reverence for the task.

The original objective of the archeological project was to recover from the site material that would date its original construction. The working hypothesis was that the structure had been laid out by members of the Comanche nation between 1700 and 1850. A tree ring date from an oak tree on the outer ring of the wheel seemed to indicate that the wheel was constructed before 1872 when that tree germinated. If we could find some better material to establish a good date of construction it was our intention to nominate the Leon River Medicine Wheel as a National Historic Landmark. Science and the soil failed to meet our expectations. The charred wood obtained and dated from the excavations was poorly associated with the construction event and either too early or much too late to support the hypothesis. The result was ambiguity with the best context indicating that the structure was less than 50 years old. The following report details the effort and is exemplary in its carefully reasoned use of the evidence and respect for other cultures and their ways of knowing.

The view from the Native American spiritual side is quite different, but varies. Some would assert that the spirits who protect the wheel did not wish it to become a National Historic Landmark and used their powers to confuse the archeologists. Others might suggest that the spirits or the "little people" assembled the stones to make a sacred place and that when that event occurred is of no importance. Others contend that men are inspired by the spirits to build such monuments. Elders and spiritual leaders of a number of plains tribes visited the wheel and were all convinced of its power and significance. After the renewal ceremony the wheel was made a sacred place, regardless of its construction history. These are matters of religious belief. Such matters are not subject to question by scientific archeology. Under the American Indian Religious Freedom Act the Government is obligated to provide access and freedom of worship at the site, regardless of lingering scientific questions about the date of construction.

The reader will note at several points in the following text indications of the conflict between these two idea systems. It can be most easily noted in the section by Ms. Lippert where she reports the reluctance of spiritual leaders to speak about certain matters to an anthropologist. Spiritual leaders of the Comanche have been particularly reticent. As the designated Cultural Resource Manager for Fort Hood, I have had to weigh all of the evidence presented in this report with great care. On the whole, I find it difficult to visualize a scenario where persons for some unknown reason would go to the trouble of constructing a rock alignment of some precision in and among trees and brush on an Army installation. Yet this is

what the strongest archeological evidence suggests. I find the argument that the wheel is less than 50 years old unconvincing because of that improbable scenario. On the other hand, under federal law I am obligated to consult with Native Americans about the significance of sites covered under National Register Bulletin 38, as a *traditional cultural property*. Indeed, current regulations covering the section 106 process of the National Historic Preservation Act requires federal agencies to "be sensitive to the special concerns of Indian tribes in historic preservation issues, which often extend beyond Indian lands to other historic properties" (36CFR800.1(c)(2)(iii)). Traditional cultural leaders are specifically mentioned as interested parties in this process. The point here is that given the spiritual significance of the Leon River Medicine Wheel, it is quite unlikely that any undertaking that would have any adverse effect on the site would be acceptable to most Native Americans.

When the initial draft of this publication was reviewed by interested Native Americans there was a storm of objections to the conclusions. The peer review by an outside archeologist was highly critical of the undertaking as well, but for different reasons. In an attempt to resolve some of these objections we mounted additional studies. The post script was added as a part of this effort. We also launched an ethnographic study among the Comanche seeking to trace remnants of traditions about holy places. This study will be published at a later date, if it produces useful data. We also wanted to open a test trench through the root system of one of the live oak trees growing on the inner ring to show that stones in the structure had been captured by the roots. Toward that end, we wrote letters to each of the elders of the wheel who had participated in the rebuilding ceremony seeking their permission. Some of the elders replied favorably. A few replied, but opposed further excavation. The majority did not reply. Without their assent it was considered unwise to risk offending anyone by opening a test pit inside the wheel.

The matter is also complicated by the fact that in 1991, a Memorandum of Understanding (MOU) among the Army, the Comanche Nation, and the American Indian Resource and Education Coalition, Inc. was established to allow for reburial of repatriated human remains near the area and for use of the wheel in traditional worship. This MOU also specifically authorized the Army to continue scientific investigation of the structure and assumed that it would be nominated to the National Register of Historic Places (NRHP). Research Report 19 in this series published in 1993 stated that the site was eligible and the State Historic Preservation Officer (SHPO) concurred. It was only after the investigations reported here produced ambiguity as to the age of the structure that the SHPO withdrew concurrence.

It seems clear that failure to treat such a property as eligible for inclusion in the NRHP because investigation failed to prove it to be over 50 years old, beyond any doubt, would concern Native Americans. An epilogue to this report by Steven Russell, a Native-American lawyer and former judge, indicates how strong these concerns could become. I would also assure Native American readers that the Army intends to exercise the discretion granted in Section 304 of the National Historic Preservation Act to "withhold from disclosure to the public, information related to the location" of the Leon River Medicine Wheel. The primary reason for the project was, and remains, to afford protected status to the Leon River Medicine Wheel while allowing free access to it for Native Americans who wish to worship there.

Readers whose primary interest is in Cultural Resource Management may be more interested in the dilemmas created by trying to do all that is required by the various statutes. An attempt to promptly comply with the Native American Graves Protection and Repatriation Act led us into an MOU which very well may have had the effect of creating a place of worship from an otherwise enigmatic archeological site. The archeologists have been as sensitive to the delicate ethnographic issues as possible, without

suppressing any scientific findings. Let me assure all readers that when I asked for the Legacy grant to do the investigation and sponsor the renewal ceremony, I thought the answers would be different.

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1.0 INTRODUCTION

J. Michael Quigg

Mariah Associates, Inc. (Mariah) of Austin, under contract to United States Army at Fort Hood, Texas and at the direction of Fort Hood Staff Archeologist Dr. Jack Jackson, received a delivery order to assess prehistoric site 41CV1505, a diffuse lithic scatter and associated surface stone alignment known as the Leon River Medicine Wheel. This site investigation, assessment, and National Historic Landmark study of the Leon River Medicine Wheel was part of an ongoing evaluation of cultural resource properties at Fort Hood under the broad terms of the Programmatic Agreement (PA) signed in 1990 and more specifically as outlined in terms of the Historic Preservation Plan (HPP; Jackson 1992).

This work was conducted in accordance with the U.S. Army's obligation under the National Historic Preservation Act of 1969 as amended; the American Indian Religious Freedom Act of 1978; the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990; the Memorandum of Understanding (MOU) between the Comanche Tribe of Oklahoma, the American Indian Resource and Education Coalition, Inc. (AIREC), of Austin, and the U.S. Army, signed in 1990; the Legacy Resource Management Program (LRMP) passed by Congress in 1990; and specific recommendations of the Advisory Council on Historic Preservation and Texas Historical

Commission (THC) concerning the scientific, religious, and cultural importance of site 41CV1505, and the associated Leon River Medicine Wheel. This study was supported by a partnership grant by the U.S. Army Legacy Program and will strengthen the goodwill and close ties between the U.S. Army, Fort Hood and Native American peoples.

The three principal goals presented in the Scope of Work for the 1994 investigations at 41CV1505 were: (1) to evaluate the significance of the lithic scatter and its potential to contribute to the research questions outlined in the Fort Hood Research Design (Ellis et al. 1994); (2) to establish the extent, construction sequence, and age of the Native American religious structure associated with 41CV1505 and evaluate its potential for designation as a National Historic Landmark under requirements of 36CFR65; and (3) in association with the above archeological field evaluation process and in conjunction with the subsequent Native American renewal ceremony to be held at the Leon River Medicine Wheel, conduct informant interviews with appropriate Native American Traditional Elders¹ and religious leaders attending the renewal ceremonies, to establish a comprehensive understanding of the possible uses of the stone alignment, and establish its significance to modern Native American religious beliefs and practices.

¹ Due to concerns expressed by several Native Americans about the use of the term "Elder" in a draft of this report (Quigg et al. 1994), we offer the following clarification as explained by Mr. Haman Wise. Those men involved with the placement of the prayer stones and the ceremonies surrounding the renewal and rededication of the Leon River Medicine Wheel are regarded as *Elders of the Leon River Medicine Wheel* by virtue of having experienced something that no other individual has experienced. The designation of these individuals was specifically stated by Mr. Wise during the 1994 rededication ceremony and carries with it a life-long commitment and obligation to protect the Medicine Wheel and to pass down the lessons of how to properly use the sacred site. Thus, the term *Elder of the Leon River Medicine Wheel* does not denote persons of a specific age-grade, or even persons possessing a substantial cultural knowledge, as may be implied by the term "Elder" used in some Tribal contexts. Similarly, those individuals from the Medicine Wheel Alliance, including Mr. William Tallbull, Mr. Haman Wise, Mr. Lee Lonebear, and Mr. Floyd Youngman, with the knowledge to instruct the Leon River Medicine Wheel Elders in the renewal ceremonies, are properly called *Traditional Elders* or *Traditional People* by virtue of their experiences in, and knowledge of, traditional cultural matters.

In response to the latter goal, Ms. Dorothy Lippert, a Native American Ph.D. candidate in anthropology at The University of Texas at Austin, was employed by Mariah to conduct the oral interviews with the Traditional Elders. The intent of having a Native American conduct the interviews was to reduce potential cultural barriers and bias and provide the Traditional Elders with a conducive atmosphere during discussions on religious beliefs. Each interview was planned to be tape recorded with the Traditional Elders' permission. Video taping of the interviews, the renewal ceremony, and other events was also planned with the Traditional Elders' permission.

1.1 HISTORY OF INVESTIGATIONS AT 41CV1505

Site 41CV1505 was discovered on 2 February 1990, by a crew from the Archeological Research Laboratory, Texas A&M University, during a systematic survey of this region under a work order from Fort Hood. A Fort Hood Prehistoric Archeological Site Survey Form completed at that time (Texas A&M University, 1990) indicated that the site was in the intermediate upland, at an elevation of nearly 225.5 m (740 ft), with nearly 70% of the site covered with grasses, and 30% tree covered, divided equally between oaks and junipers. The site lay about 400 m above the Leon River. The prehistoric cultural material consisted of a broad scatter of chert flakes, few chert stone tools, burned rock, and a patterned alignment of cobbles believed to represent a medicine wheel, all covering an area estimated at nearly 66,000 m². Two concentrations of large scrapers, two scattered hearths, and several concentrations of debitage were observed during surface inventory. Burned rock and artifact density was referred to as medium. Diagnostic projectiles collected from the surface included one Angostura point base (estimated age is ca. 8000 BP), one nondiagnostic dart point base (age unknown, possibly predating 1,250 years ago), and one complete Scallorn arrow point (estimated age 1,250 to 750 years ago). Other prehistoric material included a pestle, a large uniface scraper,

a gouge, a biface mid-section, cores, choppers, and hammerstones. A thin historic scatter of whiteware and other ceramics, metal fragments, and bottle fragments was present at the site's southeastern side, but no structural foundations or other historic features were documented. At that time, 41CV1505 was considered in good condition and a recommendation was presented for careful mapping and possible fencing to preserve the stone alignment.

On 28 February 1990, Dr. Jackson conducted a telephone interview with Mrs. Troy Lee Hunt, the wife of the property owner before acquisition by the U.S. Army in 1940. Dr. Jackson learned that she had no knowledge of the rock alignment on the Hunt's property and that no one had mentioned seeing such a feature. She indicated that her husband had only plowed the bottom lands along the Leon River. At that time, Dr. Jackson rejected the hypothesis that the stones had been arranged as a part of some ornamental garden feature created by the Hunts.

During the first months of 1990, Dr. Jackson and Mr. Kimball Smith (Assistant Archeologist at Fort Hood) mapped the exposed part of the Leon River Medicine Wheel by alidade and plane table (Figure 1.1). That map documented the limits of the brush/tree clearing, the projected surface contours, and the position of the embedded stones that formed the three completely exposed spokes, the three partial spokes, the interior circle arc, the fragmented outer circle arc, and two small rock clusters on the western side of the feature. This initial map depicted the inner and outer stone rings as parts of circles with no openings into the inner circle at the junction of the spokes.

In July 1990, the Texas A&M University Anthropology Department conducted limited brush clearing and subsequent plane table and alidade mapping of the exposed part of the Medicine Wheel (Carlson 1993:29-34). No excavation or other investigations were conducted at that time.

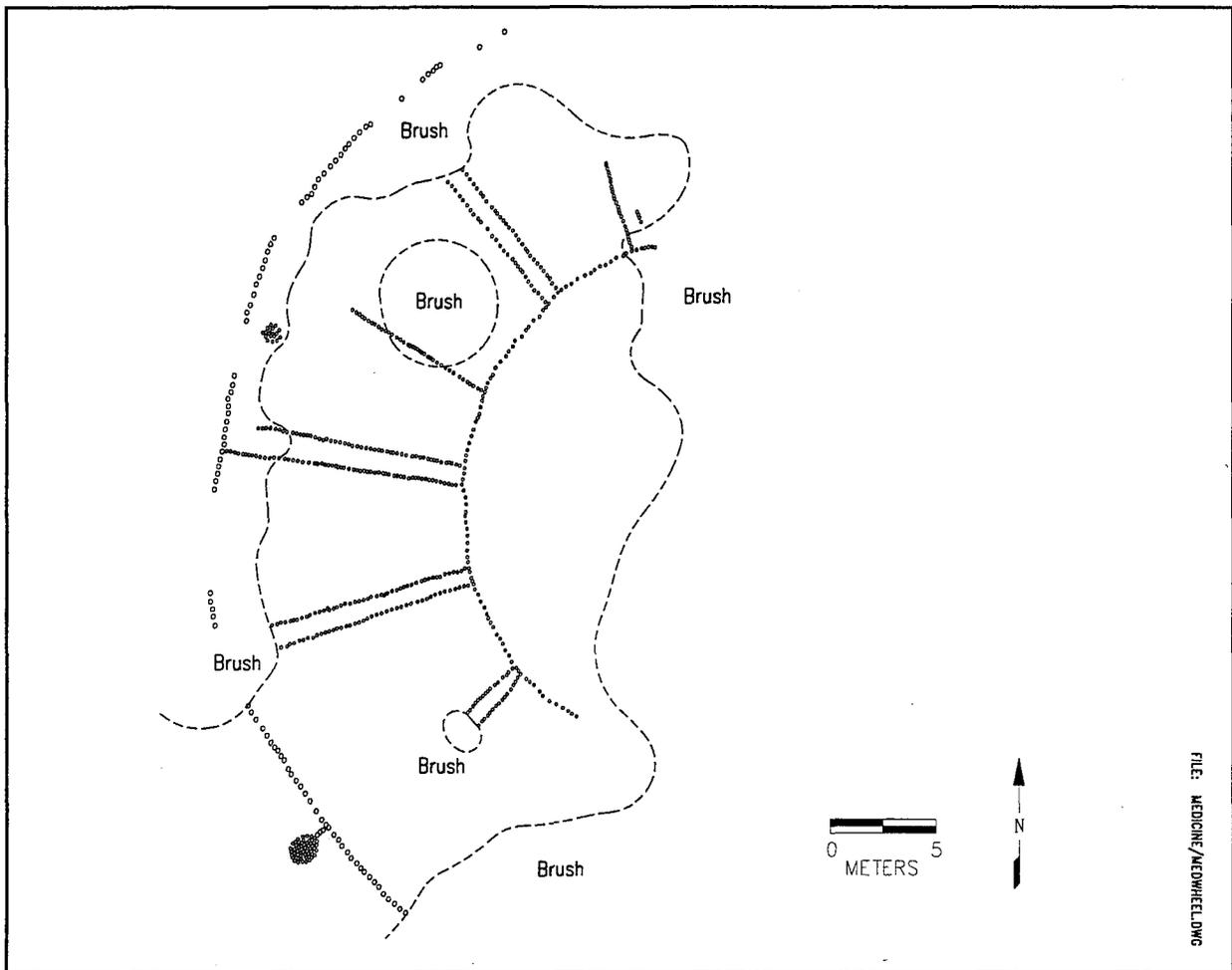


Figure 1.1 The February 1990 Plan Map of the Leon River Medicine Wheel at 41CV1505, by Jackson and Smith (rock positions are estimates).

The stones in the western third of the alignment and those that marked the entire inner ring were visible, but no part of the eastern alignment was exposed. Following some brush removal, 1,200 visible stones were mapped with an alidade (Figure 1.2). The 1990 map depicted the embedded and loose stones. The Medicine Wheel appeared to be circular in construction with the entire inner circle nearly present (only a few rocks were present on the very eastern side); most of six sets of paired spokes, the displaced outer circle, and one cluster of rocks on the southwestern corner of the outer circle were also mapped. Many individual rocks had been moved from their original position, since there were few continuous lines or embedded rocks.

The first description of site 41CV1505 in print discussed the mapping and feature configuration based on the visible western third and the physical characteristics of the stone alignment (Carlson 1993:29-34). Referring to the stone alignment as a "Medicine Wheel" Dr. David Carlson stated it: "consists of two concentric circles with rays connecting them. The inside circle is about 30 m (90 ft) in diameter and the outer circle is about 60 m (180 ft) in diameter." Six partial rays connect the inner and outer circles with each ray consisting of two parallel lines of stones spaced about 70 to 90 cm (2.25 to 3 ft) apart. The rays appeared spaced at 22.5° increments around the circle. The inside ring appeared to have been laid out by laying stones along a straight line from ray to ray.

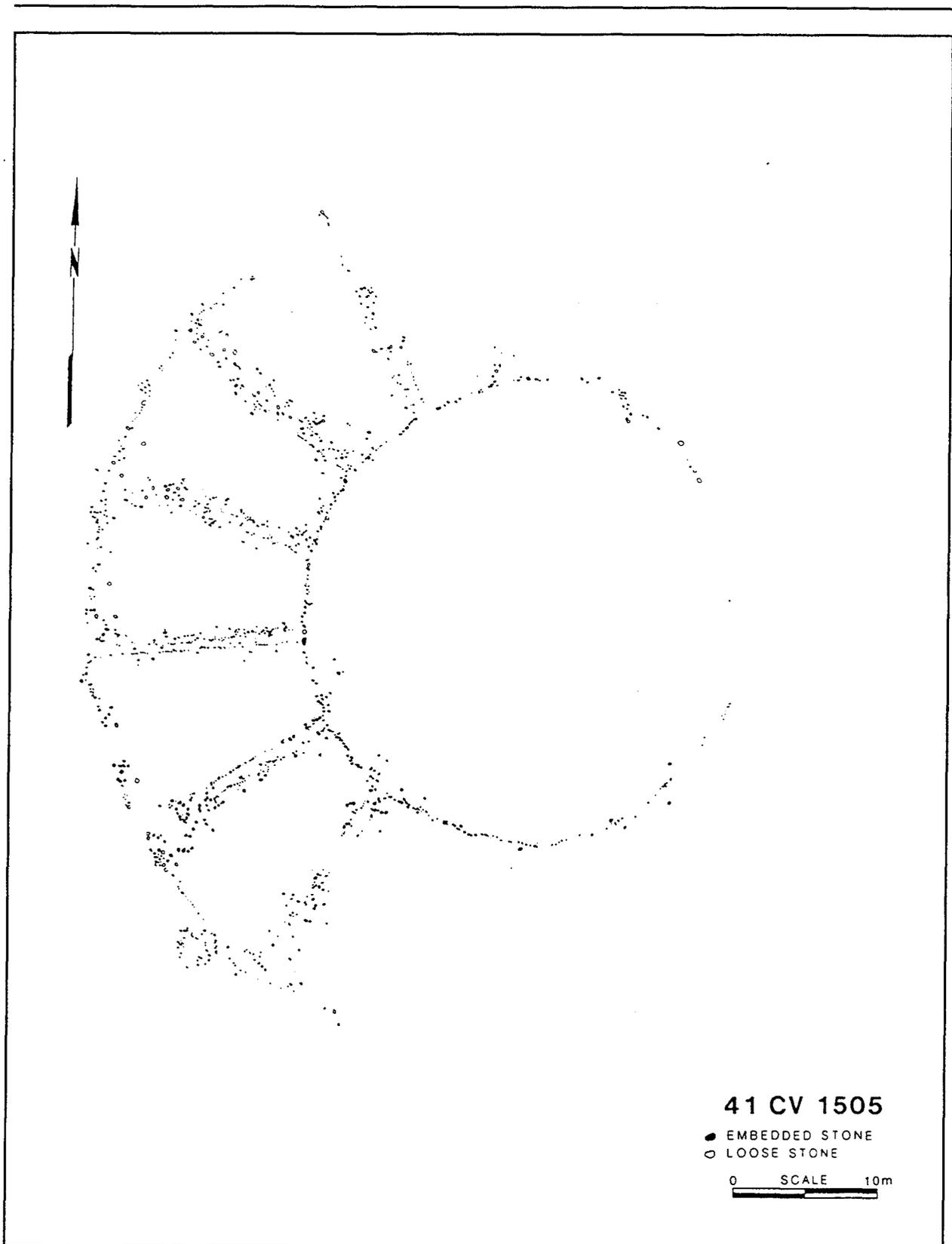


Figure 1.2 1990 Plan View of Observed Rocks Forming the Leon River Medicine Wheel at 41CV1505 (by Texas A&M University, Carlson 1993:31).

Using the present pattern, a reconstructed wheel would have included 16 rays made from over 3,000 stones. Dr. Carlson (1993) postulated that this feature could have been laid out using two 30-m-long ropes. Brief mention is made that the Leon River Medicine Wheel is a unique construction in comparison to known medicine wheels on the Northern Plains.

In 1991, Mr. David Journey, working as an independent subcontractor to Archeological Research Laboratory at Texas A&M University conducted a pilot study in the Fort Hood area to determine the feasibility of long-term reconstruction of climate variations using dendrochronology. As part of that study, three live oak trees from the Leon River Medicine Wheel were cored (Journey 1992). Specimen 1 was a 45.7 cm (18 in) diameter tree at chest height with 96 rings dating to A.D. 1895 to 1991. Specimen 2 from the projected outer ring of the Medicine Wheel was a 48.3 cm (19 in) diameter tree at chest height, with 92 rings dating to A.D. 1899 to 1991. Specimen 3, adjacent to loose and imbedded stones of the outer ring of the wheel, had 119 rings and dated to A.D. 1872 to 1991. Unfortunately the trees did not cross-date each other (Journey 1992:20). It has not been demonstrated that live oak trees add a single ring per year which is necessary to establish cross-dating and absolute dating (Journey 1992:24). Mr. Journey assumed that these live oak trees germinated and grew following the original construction of this rock alignment, since the trees would have otherwise interfered with laying out and building the feature using the rope technique as advocated by Carlson (1993). Consequently, Journey assumed the feature must have been older than the oldest tree on site (before A.D. 1872) and suggested that the live oak forest community was established before extensive land disturbances.

In a subsequent report, Carlson and others (1994:82) provided a basic site description for 41CV1505 in an Appendix. Of note, some minor changes and additions had been made to the previously published data. For instance, the

overall site size was reduced from 66,000 m² to 52,000 m² without explanation. The inner circle was given as nearly 27 m in diameter and an outer stone circle was about 49 m in diameter which conflicts with the previously reported sizes of 30 and 60 m diameters. The sides of the spokes are reported to be delineated by two parallel rows of limestone rocks with the area between the sides filled with smaller limestone pebbles. The temporal affiliations of Late Paleoindian/Early Archaic through the Austin phase is also stated.

In March 1994, members of AIREC, a pan-Indian group from across Texas, under the direction of Repatriation Chairman Shiloh Perkins, began the difficult task of clearing the brush and trees from the Medicine Wheel in order to prepare the feature for the archeological investigations and the renewal ceremony. The 1990 plan map of the Medicine Wheel by Jackson and Smith documented trees covering the entire eastern half of the feature and extending near the center of the structure as well as all along the west margin of the outer ring. Trees were dominated by live oak and juniper (locally called cedar). Only the western one-third of the medicine wheel was exposed without tree cover. This area was vegetated with short grasses. Trees were cut down at about 50 cm above ground using chain saws, then stripped of their limbs which were manually hauled and piled to the sides of the Medicine Wheel. Trunks were cut into about 1 m lengths and removed and stacked for later use. The brush was so plentiful that the brush piles eventually filled up the open areas immediately adjacent to the feature. The entire project area of the Wheel was cleared of all but two large live oak trees and one juniper tree. One large oak on the north side of the inner ring was left because it contained a bee hive. A second large oak was left inside the inner ring on the south side. The smaller juniper between the inner and outer rings, on the western side, was not cut because it held numerous prayer bundles (small cloth bundles or leather bags containing offerings). The trees and brush were initially cleared to about 50 to 100 cm beyond the outer ring. The eastern and southwestern sides

had open spaces of 8 to 10 m. During the clearing activities, the bees in the oak tree became so agitated that a small, smoky grass fire was set to calm them. The fire burned approximately 65 m² immediately east of, and partially scorched the oak tree containing the hive.

Between 2 and 13 May 1994, Mariah conducted a general site assessment of the lithic scatter and detailed investigations of the Medicine Wheel. The field archeology had to be completed before the renewal ceremony scheduled for 18 May 1994. The lithic scatter was walked over by an archeologist and geomorphologist before completing several site-specific forms used to assess the site's archeological and geomorphic potential. Data forms used for the site assessments were identical to those used by Mariah to assess other prehistoric sites across Fort Hood during the 1992 and 1993 seasons (Trierweiler 1994).

Mariah's archeological investigations at the stone alignment included: ground penetrating radar (GPR); conductivity investigations to search for buried stones and features; total station mapping of the alignment structure; overhead blimp photography to document the feature attributes; excavations at specific areas in the center of the feature, along spokes, at spoke-wheel intercepts, and in "cairn" features which involved the archeological excavation of 70 m²; detailed geoarcheological investigations; detail rock recording; and tree ring sampling. The investigations also staked out the potential locations of missing spokes to aid in the rebuilding of the structure. Figure 1.3 shows the Medicine Wheel in oblique aerial view after rebuilding.

The Medicine Wheel rebuilding and renewal ceremony and other associated preliminary events occurred within three days following the archeological field investigations. Since that time, sweat baths and various other Native American events continue to be held at the Medicine Wheel Site.

1.2 REPORT STRUCTURE

The body of this report is divided into 11 Chapters. Chapter 2.0 presents the background and history of the 67 known medicine wheel sites from the Northern Plains. Chapter 3.0 documents the Medicine Wheel renewal ceremony and associated events. In Chapter 4.0, oral interviews with the four principal Traditional Elders of the renewal ceremony discuss the cultural and religious significance of the Leon River Medicine Wheel and the renewal ceremony to the modern Native American. Chapter 5.0 provides an overview of the regional and local environmental setting for site 41CV1505, the lithic scatter, and physical description of the Medicine Wheel are presented in Chapter 6.0. These descriptions are followed in Chapter 7.0 by a discussion of the 1994 scientific methods. The results of the investigations are presented in Chapter 8.0. Chapter 9.0 presents National Register and National Historic Landmark evaluations followed by management recommendations in Chapter 10.0. References cited are presented in Chapter 11.0.

Four appendices are presented at the end of the report: Appendix A is the complete consultants report on the geophysical investigations. Appendix B is the radiocarbon details used to interpret the age of the Medicine Wheel. Appendix C presents summary metric data on sizes of the wheel spokes and rings. Appendix D presents surface worm cast data.

Following completion of the draft report, and because of its unanticipated scientific conclusions, Fort Hood authorized two responses to be included in the final published document. A Post Script by archeologist and AIREC member Christopher Lintz presents some alternative perspectives from the Western way of knowing, and an Epilogue by AIREC member Steve Russell presents a Native American view.



Figure 1.3 Aerial View of the Leon River Medicine Wheel During Excavation.

2.0 HISTORY AND BACKGROUND OF MEDICINE WHEELS

J. Michael Quigg

Medicine wheel sites are one of the rarest categories of archeological sites across the Plains and nearly nonexistent outside the Northern Plains region that includes southern Alberta, southern Saskatchewan, and Montana (Quigg 1984; Brumley 1988). Recent syntheses by Jack Hofman and others (1989) for the Southern Great Plains, and Steven L. Black (1989:17-38) for the Central Texas Plateau Prairie, do not even mention this particular site type. Their uniqueness coupled with their visually intricate configuration has generated considerable interest from anthropologists, other professionals, and the general public, all of whom have speculated upon how these stone features functioned. Their unique forms have caused most researchers to interpret that the features served ceremonial/religious functions.

Since Native Americans did not employ written records, their most important events, ceremonies, and knowledge of specific group matters were passed along by verbal communication in the form of stories or instructions. Most history for any one group was then stored in the minds of a few selected individuals in charge of group history, ceremonies, or record keeping, such as tribal elders, priests, or tribal historians. Special ceremonies were selectively passed down by oral tradition to another individual who showed interest, asked for information, or was chosen when the keeper of knowledge was getting old.

Our existing understanding about medicine wheels comes from three principal sources; (1) ethnographic/oral information; (2) archeological field investigations; and (3) astronomical measurements of alignments and orientations.

The medicine wheel site type includes some 67 stone features recorded as of 1984 (Quigg 1984). These display a wide range of structural configurations and no single specific stone trait

such as a central cairn, spokes, or rings is common to all features. John Brumley (1988) has provided a summary and appraisal of the 67 known medicine wheels which constitutes the most up-to-date archeological interpretation of medicine wheel sites.

To provide a general understanding of this unique site type, a brief overview of the background and existing knowledge concerning medicine wheels in the Northern Plains is presented. First, a general working definition of a medicine wheel is presented followed by a general locational statement. Next, highlights of previous medicine wheel investigations are discussed. The postulated age estimates for medicine wheels are summarized in the following section. The subsequent section provides a discussion on the form and function of these various stone configurations. The last section examines potential cultural affiliations for the known structures.

2.1 DEFINITION

The term "medicine wheel" first appeared in print when an anthropologist/archeologist, S. C. Simms (1903), of the Field Columbia Museum, discussed the Big Horn Medicine Wheel in northern Wyoming. Sporadic use of the term medicine wheel occurs in obscure scientific literature from the early 1900s through the mid-1950s. No definition was applied to the earliest uses of the term, but the name became popular through continued use and is generally accepted by the anthropological community. The term was apparently first defined in the literature by Thomas Kehoe (1954:133) who described medicine wheels as a surface stone alignment that consists of a circle of stones or stone cairn from which a number of stone lines radiate outward. An underlying assumption was that medicine wheel features were associated with ceremonies and/or religion and therefore places of power or medicine; thus they are regarded as extremely significant sites.

As additional archeological surveys were undertaken across the unplowed parts of the northern Plains in Canada and the United States during the 1950s through the 1970s, various stone alignment features which are far more complex than the simple and familiar tipi rings and faintly resemble the Big Horn Medicine Wheel, were recorded. During those 20 years the various surface stone features which could not be classified as tipi rings were lumped into the medicine wheel site category, which soon became a "catch-all" category. It soon included many stone alignment features with many different shapes, sizes, forms, and configurations other than that expressed at the Big Horn Medicine Wheel. Many unique features classified as medicine wheels do not exhibit even the basic radiating lines of stones as expressed in Thomas F. Kehoe's 1954 definition.

The limited and sporadic anthropological investigations into the different medicine wheel forms over the years stimulated researchers to establish various new definitions to account for the expanding variability observed in the category of medicine wheels (for examples of definitions of medicine wheels see Kehoe 1954; Dempsey 1956; Grey 1963:30; Calder 1977:200; and Brumley 1988). John Brumley (1988) utilized the previously accumulated medicine wheel database (Quigg 1984) and established eight subgroups in the medicine wheel category to account for the visible variation in structural form. These subgroups may be sufficiently broad to accommodate for slight variations in new forms as they become known.

2.2 REGIONAL LOCATION AND TOPOGRAPHIC SETTING

The 67 medicine wheels known in 1984 are restricted to the Northern Plains, specifically in two Canadian provinces (Alberta and Saskatchewan) and three states in the U.S. (Montana, Wyoming, and South Dakota). These medicine wheel sites are concentrated in Alberta which has 65.7% (n=44), while Saskatchewan has 19.4% (n=13). Wyoming and South Dakota each

have 1.5% (n=1) of the known features. Although a few accounts have indicated medicine wheels in other states, including Colorado and North Dakota, no formal documentation of those sites has occurred. A medicine wheel recently reported atop Burnt Mountain in the high country of central Colorado was later determined to have been constructed in 1992 by a city councilman (Burns 1994).

Medicine wheels are topographically situated in five general settings (Table 2.1). Nearly 48% are situated along valley margins, while another 36% are on prominent knolls or hills, and the majority of the latter are near valleys. Most medicine wheel features were constructed in locations with considerable vistas overlooking present or past water courses. Certainly, these religious features are not built in isolated locations or meant to be out of sight in nonconspicuous places. All are in the plains, except the Big Horn Wheel which is high on Medicine Mountain in Wyoming. Vegetation at medicine wheel settings is dominated by various types of grasses with few trees or brush; occasionally, a bush has grown up in the central cairn if the feature has been disturbed. Most medicine wheel features are in the glaciated areas of the northern Plains, where abundant surface rocks are readily available for the construction of such stone features.

2.3 INVESTIGATIONS

Diverse scientific investigations have been conducted at many medicine wheel features ranging from completing a simple sketch map and recording detailed observations, to making detailed topographic maps, and undertaking partial or complete excavation of the central cairn. Table 2.2 shows the kinds of investigations conducted at the various medicine wheel subgroups (see descriptions below). Nearly 69% of the known medicine wheels have been mapped in detail, but unfortunately, few in Montana have been documented, and 17.9% have no maps whatsoever. For the remaining nine, only the original field sketch map is available.

Table 2.1 Topographic Setting of the 67 Known Medicine Wheels.

Medicine Wheel Subgroups ¹	Prominent Hill/ Mountain Tops	Open Prairie	Valley Margin	Valley Terrace	Unknown/ Other	Total
1	13	-	9	-	-	22
2	3	1	2	-	-	6
3	2	-	9	-	1	12
4	2	-	10	1	5	18
5	1	-	-	1	-	2
6	2	1	-	-	-	3
7	-	-	2	-	-	2
8	1	-	-	1	-	2
Totals	24	2	32	3	6	67

¹ Described in Section 2.5.

Table 2.2 Kinds of Investigations and Research¹ at 67 Known Medicine Wheels.

Sub-Groups ²	No Map	Sketch Map	Detail Map	Unexcavated	Excavated Unpublished	Excavated Published
1	8	3	11	17	5	-
2	-	-	6	4	2	-
3	-	4	8	6	6	-
4	3	2	13	17	-	1
5	1	-	1	2	-	-
6	-	-	3	1	-	2
7	-	-	2	1	1	-
8	-	-	2	1	-	1
Totals	12	9	46	49	14	4
Percentages	17.9%	13.4%	68.7%	73.1%	20.9%	6%

¹ Diverse research activities at any single Medicine Wheel counted more than once.

² Described in Section 2.5.

In 1976, a concerted effort by the Archaeological Survey of Alberta was made to prepare detailed topographic maps of known medicine wheel sites in Alberta before any further destruction occurred to these unique features. Some 60 selected archeological sites were visited by a professional mapping team, and 25 selected medicine wheel features had detailed site and feature maps prepared (Walde 1977:93-99). Included with each feature map was the precise astronomical orientation. These detailed maps have formed an important body of data from which other researchers have investigated astronomical alignments and compared various forms.

Nearly 75% of the medicine wheels have not been scientifically excavated, while four sites (6%) have undergone "extensive" excavations and have been fully published. The four most intensively investigated and reported sites include the Big Horn Medicine Wheel (Wyoming Archeological Society 1959; Grey 1963, Wilson 1981), Majorville (Calder 1977), Moose Mountain (Kehoe and Kehoe 1979), and Ellis Medicine Wheel (Brumley 1985). Unfortunately, 14 excavated features/sites have not been fully reported. Many of the earliest investigations were undertaken as salvage projects during the 1950s and 1960s before vandalism destroyed parts or all of the stone configurations (Forbis 1958, 1960; King 1961; Freiberg 1974; Watson 1972). Other medicine wheel sites, such as Twin Peaks Medicine Wheel tested in 1975 by John Brumley (Brumley and Willis 1976), have never been fully reported. Below is a brief summary of the archeological investigations at the four most thoroughly published medicine wheel sites to provide a general discussion of the types of investigations conducted and the results generated from these studies.

2.3.1 The Big Horn Medicine Wheel

The best known medicine wheel, the Big Horn feature in northern Wyoming, has a long and involved history of scientific investigations with many individuals seeking answers about the age,

function, cultural affiliations, and construction methods used for this feature. The Big Horn Wheel was first observed in the late 1880s and first documented by an anthropologist in 1902 (Simms 1903). In 1915, Mr. H. H. Thompson, a local amateur historian, conducted some investigations and wrote several articles about the Medicine Wheel, postulating various interpretations (Grey 1963). The United States Forest Service, the property owner, mapped the site in 1917. George Bird Grinnell visited the site in 1922 and published a descriptive report together with ethnological accounts for its functional interpretation (Grinnell 1922). Over the years the site has suffered from vandalism. A tall, metal protective fence was built around the feature in 1935 by the United States Forest Service. In 1958, the Wyoming Archeological Society conducted the first major scientific excavations and mapping program (Wyoming Archeological Society 1959). Their work provided a detail map of the feature and topography of the surrounding area. Their map revealed that the Wheel was oval, not circular, and that the radiating lines and horseshoe shaped cairns were not evenly spaced around the outer margin of the Wheel. Don Grey (1963:28) states the 1958 map was "markedly different" from the 1915 Forest Service map, but he later he dismissed the discrepancies by insisting that the original 1915 mapper assured him the feature was not noticeably different from the 1958 depiction (Grey 1963:34).

The Wyoming Archeological group dug two 30.5 m (100 ft) long trenches outside the wheel, then excavated the soil between parts of nine spokes concentrated around the central cairn and all the soil from between four spokes, as well as the soil inside all seven horseshoe cairns (Wilson 1981:365). Artifacts recovered were mostly from the upper few centimeters. The inner wheel surface yielded colored (blue-green and reddish-brown) bone objects and plain black ceramic sherds east of the central cairn (Grey 1963). The central cairn, which displayed a central oval pit penetrating about 60 cm (2 ft) into the limestone bedrock, yielded ceramic beads, a perforated shell

bead, a pot sherd, a bird tibiotarsal, and wood fragments.

Further excavations conducted in 1973 by Michael Wilson (1981) concentrated on one spoke (#10) between the central cairn and an outer cairn on the southeast side to clarify stratigraphic relationships. Wilson discovered that the rocks forming the radiating stone lines were constructed over the rocks which formed the central cairn. A small side notched arrow point of the Late Prehistoric period and a Middle Prehistoric period corner notched point was recovered from beneath a stone of the outer rim along the northwest periphery of the excavations (Wilson 1981).

2.3.2 The Majorville Cairn and Medicine Wheel

The Majorville cairn in southern Alberta was mapped and excavated in 1971 by University of Calgary students under the direction of Dr. Richard Forbis with the resultant data issued as a Masters thesis from the University of Calgary (Calder 1977). The southern half of the 9 m (29.5 ft) diameter by 1.6 m (5.2 ft) tall central cairn was excavated in a series of layers to obtain stratigraphic information and obtain data concerning age and function. Nearly 3,000 stone, bone, and ceramic artifacts plus 13,000 pieces of stone debitage were recovered and analyzed. The majority of artifacts represent utilitarian objects which would be found in most prehistoric camp sites in the region. However, the 16 stone and ceramic pipe fragments, the 29 buffalo stones - "*inisk'im*" (a Blackfoot word, see Reeves 1993 or Kehoe 1965 for discussions of this sacred object), 24 other fossil bacculite and ammonite sections, and four pieces of hematite, all indicate possible non-utilitarian or ceremonially related events. The cairn was initially constructed ca. 3200 B.C. and rocks and artifacts were added to the central cairn over the years into historic times. James M. Calder (1977) suggests that the cairn functioned as a ceremonial site.

2.3.3 Moose Mountain Medicine Wheel

The Moose Mountain Medicine Wheel in southeastern Saskatchewan was first recorded in 1961, and test excavated in July 1976 (Kehoe and Kehoe 1979). A 10 m² area was excavated along one stone line extending from a small cairn outside the ring, through the ring, and connecting with the large central cairn (Kehoe and Kehoe 1979). This excavation exposed the stones which were utilized to assess the association of the rock line with the outer and inner cairns and the ring around the central cairn. A total of 555 cultural artifacts were recovered which were overwhelmingly dominated (73%) by end scrapers. All items appeared to be utilitarian in function. The construction of the rock cairns, rock lines, and rock ring appear to be contemporaneous, since there is no apparent stratigraphic difference in their depths. A single charcoal sample from the ground surface immediately below the central cairn yielded a date of 2650 ± 245 BP (S-1241; NMC-877-880) or ca. 440 B.C. This feature was interpreted as a nonceremonial site because of the recovered artifacts (Kehoe and Kehoe 1979:60).

2.3.4 The Ellis Medicine Wheel

The Ellis Site, in southeastern Alberta, was discovered in 1971; test excavations of a 28 m² area in 1974 focussed on the central stone circle and another stone circle southeast of the central circle (Brumley 1985). This medicine wheel was first mapped in 1976 during the Archaeological Survey of Alberta mapping program and again in 1980 by the Medicine Hat, Alberta, amateur archeological society. The latter map showed the precise location of every rock in the site. The 1974 excavation yielded at least 900 artifacts; human bone fragments and a wooden stake were recovered from the central stone circle. The 5 cm in diameter by 13 cm long wooden stake, of non-native "white oak," was driven into the ground at a pronounced angle. The bottom part had been sharpened with an axe or axe-like implement. The stake's outer surface was covered with a light turquoise-blue pigment composed of an organic

substance bound to a base of borium sulfate. A standard radiocarbon date of 450 ± 160 BP (Beta-8948) was obtained from the wooden stake. This age was consistent with the Late Prehistoric period small side notched arrow points recovered. Brumley (1985) relied on ethnographic data to help identify the function of the Ellis Site as a burial lodge of probable Blackfoot origin.

Besides archeological excavations at 18 medicine wheel sites (Table 2.2), at least 13 features have been investigated for astronomical alignments with summer solstice and bright stars rising about the time of summer solstice (Table 2.3). In 1974, John Eddy, an astronomer from the High Altitude Observatory, National Center for Atmospheric Research in Boulder, Colorado, accepted previous functions of the Big Horn Medicine Wheel, but revealed a potential astronomical alignment with the stone cairns used for sightings of the heliacal rising of summer solstice sunrise and bright stars including Aldebaran, Rigel, and Sirius visible at that time (Eddy 1974). Only cairn D, on the south side, could not be associated with a bright star. Later reports indicated that the Big Horn and Moose Mountain Medicine Wheels are aligned to points on the horizon that mark sunrise and bright stars at summer solstice (Eddy 1977a).

The Fort Smith Medicine Wheel in southeastern Montana was also found to be aligned to summer solstice sunrise through its longest stone line, although the other five spokes or rays do not align with any known stars. Dr. Eddy calculated that there was about a 5% chance that the sunrise line was accidental. Eddy (1977a) postulated that these medicine wheels served as crude observation posts or used as time markers, but many of the medicine wheels observed in southern Alberta did not show any possible astronomical alignment.

At both the Big Horn and Moose Mountain Medicine Wheels, one cairn located to the south-southeast was not determined to be associated with a particular star rising (Eddy 1974). Later, Dr. Robinson (1981:15-23) discovered that each of the unaccounted for cairns at these two sites and one

line of stones at the Fort Smith Medicine Wheel aligned with the rising point of the bright star, Fomalhaut. The cairns were believed to have been used as foresight for the heliacally rising of Fomalhaut in the southern sky in advance of summer solstice. This discovery of a possible connection with Fomalhaut along with the coincidental rising of the sun at summer solstice and the same four bright stars at the Moose Mountain and Big Horn Medicine Wheels provide strong evidence to indicate that these two and possible other features had astronomical uses. Dr. Robinson's accumulated astronomical evidence implies minimally a May to June use of these features, as this is the period when these bright stars can be observed rising in the eastern sky.

Many of the Medicine Wheel surface rock cairns and rock alignments are no longer intact, since all have suffered some physical alterations over the years. Consequently, one of the problems with working with astronomical alignments involves the precision of measuring the heliacal rising of the sun and bright stars using these stone alignment structures. Deviations detected in sightings of these celestial bodies require explanations. It is unclear if deviations are a result of natural or human alterations to the cairns and spokes over time, or if the difference observed can be accounted for by potential wobbles in the earth's axis since the date of construction.

Astronomers working for the H. R. MacMillian Planetarium in Vancouver, British Columbia also conducted a detail examination of the Moose Mountain Medicine Wheel for astronomical purposes (Ovenden and Rodger (1981:371-386). They indicate that some imprecision exists in Dr. Eddy's alignments (sightings and directions are off as much as 3°) at Big Horn, but these discrepancies were not more than might be expected considering the basic assumptions and disturbances to the stone features over the years. After careful study of the Moose Mountain Medicine Wheel, they believe that little direct evidence exists to support claims for any solstitial orientation.

Table 2.3 Medicine Wheel Alignments Investigated for Astronomical Associations.

Sites	Astronomical Associations		Reference
	Summer Solstice	Stars	
Moose Mountain	yes	yes	Kehoe and Kehoe 1979; Eddy 1977a
Minton Turtle	yes	yes	Kehoe and Kehoe 1979
Roy Rivers	no	no	Kehoe and Kehoe 1979
Doug Wade	no	no	Kehoe and Kehoe 1979
Plenty	no	no	Kehoe and Kehoe 1979
Hughton	no	no	Kehoe and Kehoe 1979
Halbrite	no	no	Kehoe and Kehoe 1979
Greenlay Cross	no	no	Kehoe and Kehoe 1979
Tipperary Creek Circle	no	no	Kehoe and Kehoe 1979
Glen Ewen Burial Mound	no	no	Kehoe and Kehoe 1979
Big Horn Medicine Wheel	yes	yes	Eddy 1977a
Fort Smith Medicine Wheel	yes	yes	Eddy 1977a, 1978; Robinson 1981
Grassy Lake Medicine Wheel	possible	possible	Archeological Society of Alberta, Lethbridge 1976

Based on the feature maps from the 67 medicine wheels documented by Quigg (1984) for the Northern Plains, Haack (1987a) provided a critical evaluation of the proposed medicine wheel astronomy interpretation. He states that some 54 features, or 81%, of the Northern Plains medicine wheels are simple circles or cairns and have no astronomical alignment. He concludes "that medicine wheels generally lack the precision necessary to be used as calendric devices" and suggests that "there is no indication that the Plains Indians were ever interested in keeping track of time with any precision" (Haack 1987a:82). In rebuttal, Kehoe and Kehoe (1987:323-324) refer to specific data presented in their earlier studies to refute Haack's interpretation. However, Haack (1987b:324-326) responded by justifying his statements and reiterating that "The stellar alignments proposed at Moose Mountain are inexact, arbitrary, unnecessary and statistically insignificant." Nevertheless, Haack's (1987a) statement concerning the lack of Plains Indians' interest in keeping track of time can be countered

with the fact that many of the northern Plains groups, including the Blackfoot, Sioux, Kiowa, and others had winter counts to record years and often used events in the sky such as meteor showers, fireballs, and eclipses, to document specific years (Chamberlain 1984:S1-S17).

In conjunction with Drs. Ovenden and Rodgers' (1981:371-386) study of the astronomical possibilities of Moose Mountain Medicine Wheel, they advocate that the cairn positions and the construction of the stone ring at both Moose Mountain and the Big Horn Medicine Wheel were geometrically derived. Ovenden and Rodger documented how the existing configuration of the cairns and the shape of the stone ring at each feature could be positioned in the overall structure using angles, distances, and simple geometry. Identical configurations were also found in British megalithic stone rings of Europe. Although this does not negate the possibility of an astronomical orientation, it potentially explains how two odd

shaped features, hundreds of kilometers apart, could appear so much alike.

Fries (1980:20-24) examined the Big Horn Medicine Wheel from the ethnographic view previously proposed by George Grinnell (1922), Robert Lowie (1935) and others: namely, that the feature was used for vision quests. He supports that interpretation.

In 1985, Robert L. Hall (1985:181-193) compared and contrasted the Northern Plains medicine wheels, with specific emphasis on the Big Horn Medicine Wheel, with the boulder outline on Chicoma Mountain in New Mexico. He saw consistency in the function and symbolic association similar to other world centers and emphasizes that medicine wheel features had an active, rather than solely passive role in providing a group's religious orientation. The medicine wheel functioned to obtain power from nature; and this view was consistent with interpretations that they were representations of Sun Dance lodges or vision quests. All these sacred places were considered to be linkages with higher powers to help the individual through life. Hall believed that multiple functional interpretations are possible. Hall also focussed more on a "religious" or belief system interpretation rather than the physical/functional view advocated by most archeologists.

2.4 AGE

Table 2.4 lists the 16 (24%) medicine wheel sites with some known or extrapolated age estimate. Only four sites, Majorville, Ellis, Moose Mountain, and Big Horn, yielded absolute radiocarbon dates; the other sites relied on recovered artifact assemblages, astronomical alignments, or oral histories to provide a relative indication to the features' age. The Majorville cairn appears to be the oldest structure so far documented with one radiocarbon date of 1895 B.C. (S-856), and obsidian hydration dates ca. 3200 B.C. Both dates are supported by recovered Oxbow projectile points (ca. 3000 to 1500 B.C.)

assigned to the Middle Prehistoric period from the central excavated cairn (Calder 1977:42). The recovered artifact assemblage and two other radiocarbon dates (Table 2.4) indicate continued use of the cairn right into the recent historic period.

The radiocarbon age of A.D. 1430 obtained for the Ellis Site was from an in situ, painted wooden stake recovered from near the middle of the central ring which apparently was in good context (Brumley 1985). This radiocarbon age appears to extend the age of buried functions of medicine wheels and possibly the Blackfoot group back some 500 years in time.

Eddy (1974) used astronomical data to postulate an age for the construction of the Big Horn Medicine Wheel. He suggested that it may be as late as A.D. 1700, and might possibly date to between 200 and 700 years ago. Moose Mountain was estimated to have been constructed between 1500 to 2000 BP (A.D. 100 to 300 most likely) based on the astronomical alignments of the stone features to various stars (Eddy 1978).

The Big Horn Medicine Wheel was estimated to be younger than A.D. 1760, an age established from dendrochronological evaluation on a wood specimen retrieved from the west cairn (number 6) (Wyoming Archaeological Society 1959; Grey 1963:36). The Medicine Wheel is definitely older than its first reported discovery in the 1880s (Wyoming Archaeological Society 1959). However, this age may indicate the timing for only one of the more recent use episodes, since the Big Horn Medicine Wheel has been demonstrated to be a composite structure which was constructed and used over an unknown period of time (Wilson 1981:333-370).

At least four medicine wheels in southern Alberta (Eagle Child, Steel, Wolf Child, and Many Spotted Horses) and the Fort Smith Site in southeastern Montana have been attributed to recent historical times based on direct oral history linked to specific individuals of the Blackfoot and

Table 2.4 Medicine Wheel Ages.

Site / Feature	C-14 Date	Astronomical	Ethnographical	Other	Projectiles
Alberta					
Eagle Child	-	-	1931	-	-
Steel	-	-	1940	-	-
Manyberries	-	-	-	A.D. 215-1260 ¹	Middle Prehistoric
Wolf Child	-	-	Historic	-	-
Many Spotted Horses	-	-	Historic	A.D. 1700 - 1750 ²	-
Grassey Lake	-	-	-	-	-
Many Island Lake	-	-	-	-	1000 B.C. to A.D. 250
Ellis	A.D. 1430 ± 160	-	-	-	-
Twin Peaks Cairn	-	-	-	-	1000 B.C. to Historic
British Block Cairn	-	-	-	-	5000 BP to Historic
Majorville Cairn	140 B.C., 705 B.C., 1895 B.C.	-	-	3200 B.C. on ¹	5000 BP to Historic
Rumsey Cairn	-	-	-	-	Late Prehistoric- Historic
Saskatchewan					
Moose Mountain	A.D. 800 ± 360	A.D. 100-300	-	-	A.D. 700 to 1300
Hughton	-	-	-	-	Late Prehistoric- Historic
Wyoming					
Big Horn	-	A.D. 200 - 700	-	Historic ² A.D. 1760 ³	300 B.C. to A.D. 1700
Montana					
Fort Smith	-	A.D. 1750 ± 250 ⁴	A.D. 1850 ⁵	-	-

¹ = Obsidian Hydration

² = Historic Artifacts

³ = Dendrochronology

⁴ = Robinson 1981

⁵ = Conner 1965

Crow Tribes. Demsey (1956) provides details of the events surrounding the construction of the Eagle Child (A.D. 1931) and Steel (A.D. 1940) Medicine Wheels. He also states;

The earliest reference to a Blackfoot "medicine wheel" known to informants is credited to Bull Back Fat, a Blood chief who died in 1842. But according to Jack Low Horn, a reliable Blood informant who supplied this data, the marker did not

originate with this chief but "was started in the days when our people used dogs instead of horses" (Demsey 1956:177).

Conner (1965) makes a strong case for the Fort Smith Medicine Wheel to have been constructed by a Crow, called Burnt Face or Scar Face, around A.D. 1850 according to a Crow Indian legend. Robinson (1981) advocates that the age of the Fort Smith Medicine Wheel is about A.D. 1750 ± 250 years, based on the astronomical

alignments he discovered. This age agrees with the general construction age projected by the Crow Indian legends which place it around A.D. 1850 (Conner 1965).

2.5 FORM/FUNCTION

The function of Medicine Wheels has been a matter of considerable debate since the first discovery of these features. Archeological evidence has provided little information to formulate functional interpretations. Wilson (1981:336) makes several pertinent statements worth repeating concerning function. He states: "we can not dig up ideas, and the symbolism contained in these structures is of a multilevel nature." Furthermore, "any single site could have been used in several different ways; and the historical documentation of one such use does not exclude others, nor does it prove that the site was constructed originally for the documented purpose" (Wilson 1981:336). This view is similar to Hall's (1985:181-193) association of medicine wheels with multifunctional events including their use to obtain power, blessings of nature, roads to the after world, channels for communication with the dead, or supernatural powers of the spirit world.

The increase in variability of form in features assigned in this category over the years has contributed confusion to interpreting their function, since so much has been made of their form. Since plan maps have been the most widely used form of feature documentation, these maps have been the focus of the different investigations. The scarcity of archeological investigations at medicine wheel sites and the lack of morphological consistency has frustrated attempts to ascertain the feature's function.

Several hypotheses have been postulated to explain these unique structures. Most of these ideas have originated from studying a particular feature. The range of postulated ideas to account for medicine wheel functions include burial or commemorative markers to important individuals (Kehoe 1954:133-137; Dempsey 1956:177-182; Kehoe 1972:183-

189; Brumley 1985:180-232); astronomical alignments (Eddy 1974:1035-1043; Eddy 1977b:140-146; Eddy 1977a:18-29; Kehoe and Kehoe 1979; Ovenden and Rodger 1981:371-386; Robinson 1981:15-23); vision quest sites (Lowie 1922; Fries 1980:20-24); sun dance/thirst dance site associations (Grinnell 1922; Wilson 1981:333-370); directional markers (Wilson 1981:338-340); and places to connect with the spirit world or higher powers (Hall 1985:181-193).

Consequently, any of the many existing interpretations may account for patterns observed at one particular site or configuration, but it does not apply to all features in the medicine wheel category. Brumley (1988) has provided the most up-to-date syntheses of the 67 known medicine wheels in the northern Plains. He identified eight subgroups based on their surface configurations and associated elements. Each is briefly reviewed and discussed in relation to specific postulated functions.

Subgroup 1 consists of features characterized by a prominent central stone cairn surrounded by a stone ring (Figure 2.1). Twenty-two (33%) features fall in this subgroup. No direct ethnographic references account for these structures but the North Blackfoot, Dakota, Mandan and Crow constructed monuments to memorable events using simple outline effigy figures and/or cairns (Kehoe 1959:123). A few features in this subgroup have been excavated or reported in detail. Several partially excavated central cairns at Rumsey (King 1961), Twin Peaks (Brumley 1988:17), and Manyberries (Carter 1967; Freiberg 1974), have yielded questionable burial pits or secondary human burial fragments. At least two sites, Roy Rivers and British Block, are possible human effigies constructed of stones inside the large outer wheel which may be a link to a specific individual. At British Block, a partial camp circle of some 24 tipi rings lie 10 m east of the Medicine Wheel.

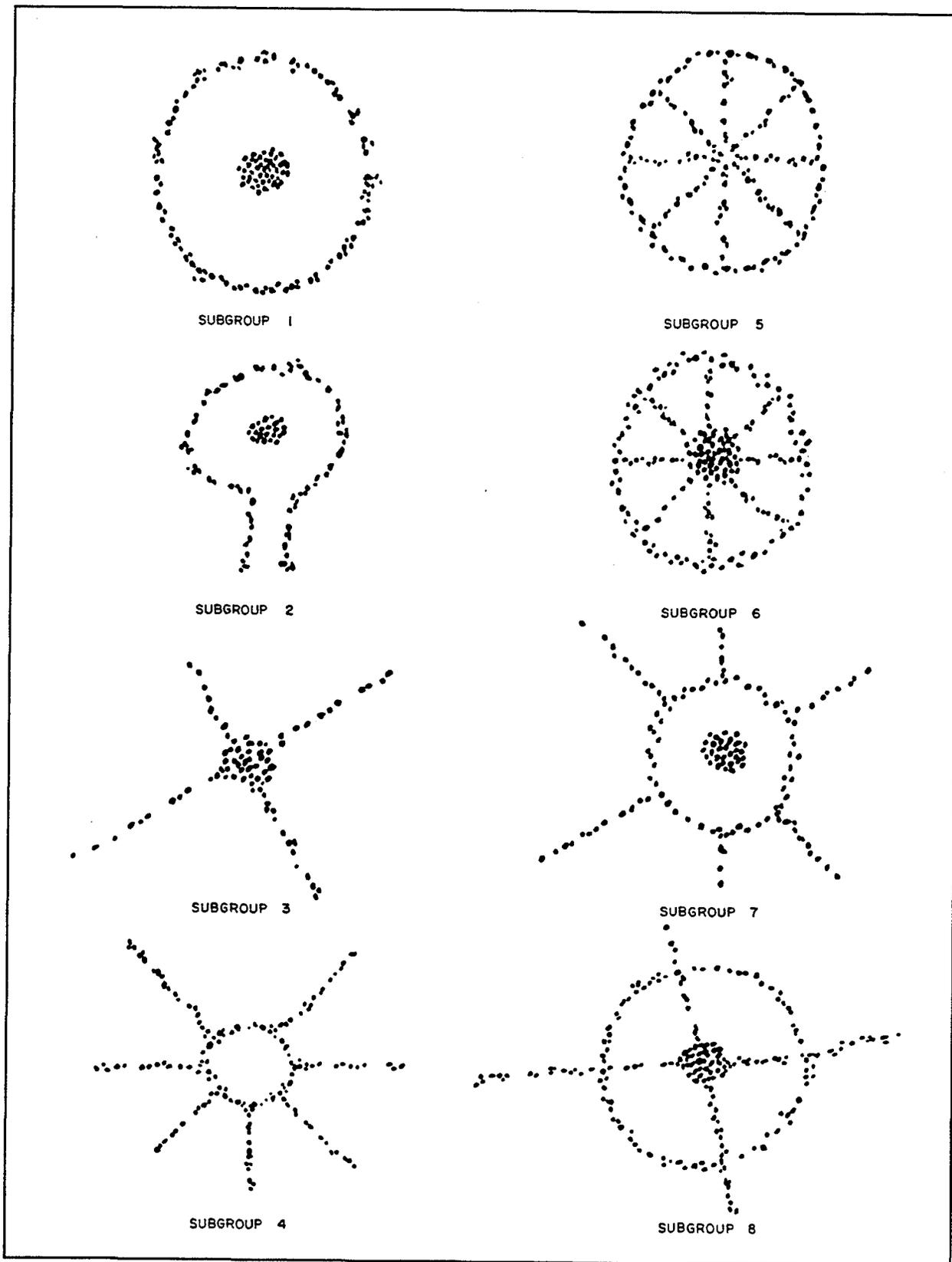


Figure 2.1 Medicine Wheel Subgroups (from Brumley 1985:6, Figure 2).

Medicine wheels in Subgroup 1 are concentrated in southern Alberta (82%), with single examples in eastern Saskatchewan, and south-central Saskatchewan, and two more cases in northern Montana.

Subgroup 2 is characterized by a central stone cairn surrounded by a stone ring with two roughly parallel or converging stone lines extending outward from the ring, creating a single "pathway" to the central cairn (Figure 2.1). This type includes six (9%) medicine wheel examples. Minimal published information exists on the partial excavations conducted at the Barry Site, which Forbis (1970) indicated yielded no artifacts from the central cairn, or the Hughton Wheel, which reportedly had Late Prehistoric artifacts (Kehoe and Kehoe 1979; Watson 1974). No historical or ethnographical data are known to account for these alignments. Four features are in southern Alberta and one each occurs in southeastern Saskatchewan and northern Montana.

Subgroup 3 is characterized by a prominent central cairn from which two or more stone lines extend in various directions (Figure 2.1). Twelve (18%) examples are classified to Subgroup 3. Brief historical accounts indicate that large commemorative cairns were sometimes built over a location where a great chief had been killed or died (Kehoe 1954). John McLean, an early traveler through the Blackfoot territory in southern Alberta who encountered "medicine wheels" near Fort McLeod, in 1880 commented:

"Several great battles were fought, and these cairns were placed there to commemorate these events, and probably to mark the spot where some of their greatest warriors died. When a great chief or warrior died a lodge was placed over him, and when this was blown down by the wind, the body of the deceased was laid upon the ground and a cairn of stones erected over it. There is a cairn called by the Indians the Gamblers Cairn, near the store of I. G. Baker, in the town

of Macleod. Several years ago a Piegan camp of Indians located on this spot was attacked by small-pox, and the disease proved so fatal that fifty dead lodges were left standing. Among those who died was Aikutee; i.e., the Gambler, head chief of the Piegan tribe. His people placed a lodge over him, and when that had blown down by the western winds, he was reverently laid upon the ground, and the cairn of stones erected. The original cairn was three or four feet in diameter, with rows of stones between forty and fifty feet each in length, leading to the cairn. Only one row of stones remains, and the cairn is worn nearly level with the street. This simple monument is of little interest to the passing stranger; but the Indians riding past will turn to this comrade and say "Aikutee." (McLean 1896:579 cited in Kehoe 1954:134).

Kehoe (1972:186) speculates that the Jelly Ranch Medicine Wheel is the type of structure that contains the physical remains of the war chief in comparison to other types of medicine wheels that are monuments to individuals. He also states that human remains and a catlinite straight pipe and other Late Prehistoric artifacts were recovered from the central cairn at the Halbrite Site (Kehoe 1972:186; Kehoe and Kehoe 1977:85-95). Seven of these features are in southern Saskatchewan, four are in southern Alberta, and one is just south of the Alberta border in northern Montana.

Subgroup 4 is characterized by a stone ring which has two or more stone lines radiating from the outer margin (Figure 2.1). Eighteen (27%) of the known medicine wheels are assigned to this subgroup. This is the only subgroup for which there is reliable and detailed information regarding construction and function.

T. Kehoes' work in the 1950s on the Blackfoot Reservation in northern Montana enabled him to interview informant, Adam White Man, a South Piegan, who was familiar with medicine wheels

and reacted to a sketch of a medicine wheel by stating;

I heard that when they buried a real chief, one that the people loved, they would pile rocks around the edge of his lodge and then place rows of rocks out from his burial tipi. The rock lines show that everybody went there to get something to eat. He is inviting someone everyday. People went there to live off him. Not every chief is treated like this - just the one loved by everyone (Kehoe 1954:133).

Kehoe also related a second individual's interpretation from southern Alberta which was nearly identical to the first in that a circle of stones was used by the Bloods to mark the place where great chiefs or medicine men died.

Dempsey (1956:177-182) obtained direct accounts from Native Americans who had participated in or witnessed the construction of two existing stone alignments of this subgroup. Dempsey states "The Blackfoot 'medicine wheel' consists of a circle of stones or 'tipi ring,' with concentric lines of stones of varying lengths extending away from it in the four cardinal directions." The Steel and Eagle Child Medicine Wheels were inspected while at least two other named historic wheels, Wolf Child (a Blood Indian Chief) and Many Spotted Horses (a Blood war chief who died in 1884; Dempsey 1956:179) were known. The later four sites are on the existing Blood Indian Reserve in southwestern Alberta. Apparently, the number of rows of stones radiating away from the wheel is not functional or religious, but symbolic (Dempsey 1956:181). Jim Weasel Tail told Kehoe:

. . .the lines of rock show the different directions in which they go on the warpath - they were the dead chief's war deeds. If they kill someone, they pile rocks at the end of the rock line. If there is no rock pile present, then they just go to the enemy. Short lines are short trips (Kehoe 1972:184).

This somewhat contradicts what Kehoe (1954:133) was told earlier;

. . .the rock lines show that everybody went there to get something to eat. He is inviting someone everyday. People went to live off him.

According to Crow Indian legend, Burnt Face or Scar Face built the Fort Smith Medicine Wheel in southern Montana and he had previously spent many years on Medicine Mountain (the location of the Big Horn Wheel in northern Wyoming) where he possibly observed the Big Horn Wheel.

Archeological investigations at the Grassy Lake (Forbis 1960:158) and Ellis (Brumley 1985:180-232) Medicine Wheels in southern Alberta both document that individuals had been buried at Subgroup 4 structures. Most features in Subgroup 4 are in southern Alberta (78%), with three examples in Montana and one site in south-central Saskatchewan.

Subgroup 5 is characterized by a stone ring dissected into segments by four or more interior stone lines radiating outward from a central origin point and ending at the stone circle wall (Figure 2.1). Only two (3%) examples belong to this subgroup. The Belle Creek structure occurs atop a knoll in the open prairie in southeastern Montana and the Jamieson's Place Medicine Wheel is on a river terrace in south central Alberta. No archeological excavations have occurred at either feature and no ethnographic information has been identified to advance the interpretations.

Subgroup 6 is characterized by a prominent central cairn surrounded by a stone ring with two or more interior stone lines connecting the central cairn to the surrounding stone ring (Figure 2.1). Three (4%) medicine wheels occur in Subgroup 6. The Big Horn and Majorville Wheels are quite spectacular but the third, the Jennings feature (Abbott et al. 1982), is unlike these bigger and more complex medicine wheels. These three features are spread wide across the Northern

Plains; Majorville is in southern Alberta, Big Horn is in northern Wyoming, and Jennings is in central South Dakota. No excavations have been undertaken at the Jennings Site.

At the Majorville Site, the excavation of the southern half of the central cairn yielded roughly 3,000 artifacts that demonstrated the cairn was constructed over a 5,000-year-long period, in a series of distinguishable accretional domes. Apparently, this site functioned as some unspecified ceremonial site as evidenced by the presence of several smoking pipes and *inisk'ims*. These items have not been linked to any one specific ceremony. No ethnographic accounts have been obtained and no oral traditions are known to indicate the potential uses or tribal affiliations for these smoking pipes and *inisk'ims*.

Ethnographic information does exist for the Big Horn Medicine Wheel and several accounts attempt to explain that feature. These interpretations range from suggestions of a vision quest structure (Fries 1980:20-24; Wilson 1981:337), or an altar, or a Medicine House (Grey 1963:27) used by the Crow Indians. Robert Lowie (1922:436) presents a story about the Crow using the Big Horn Medicine Wheel as a vision quest site. But since the Wheel had already been constructed before the visions quests were undertaken, the vision quest was a subsequent function. George Grinnell (1922:307-309) observed the Wheel, then conducted interviews with the Indians.

I have discussed the Medicine Wheel with old Cheyennes, and (in) particular with Elk River, who was probably born about 1810-12. He was a man of good intelligence, of excellent memory, and of high character. He was extremely well informed as to all tribal customs and traditions. . .

Years ago, when I showed to Elk River, Mr. Simms's plan of the Medicine Wheel, he said at once that it was the plan of an

old time Cheyenne Medicine Lodge. The outer circle of stones he said represented the wall of the Medicine Lodge; the lines leading toward the center, the rafters - or, as he called them, the lodge poles - of the Medicine Lodge; and the small circle in the center of the large one, from the so-called spokes radiate, represented the center pole of the Medicine Lodge. He added that the building to the northwest of the entrance, and within the circle and touch it, was the place from which the thunder came; and by this I understood him to mean what I call the altar - the place in the Cheyenne Medicine Lodge which is especially sacred, and in which is the buffalo skull.

The position of the stones, the outside circle, the inner circle, and the radiating spokes and the inside construction which touches the wall on the northwest of the circle, suggest at once, to anyone who has ever attended and observed that ceremony, a ground plan of the Cheyenne Medicine Lodge. As Elk River said, the outside circle of the stones seems to represent the walls of the Medicine Lodge, the inner circle, the center pole, and the so-called spokes of the wheel, the rafters of the roof, which run from the fork in the center pole to the supporting cross-pieces of the wooden framework which forms the wall of the Medicine Lodge. The position of the altar confirms the other points. If we imagine the Medicine Wheel to be the ground plan of the Cheyenne Medicine Lodge, the oval construction to the west and connected with the large circle by line of stone occupies approximately the place of the "lonely" lodge where the instructions is given to the Medicine Lodge makers and from which the Cheyenne Medicine Lodge women carry the buffalo skull down to the Medicine Lodge which is in process of being built.

From this Native American account, Grinnell came to the conclusion that the structure was related to the Sun Dance ceremonial lodge because of its overall configuration with the outer circle and the spokes representing the rafters. Even though the stories told by different Native Americans varied, the ethnological data all seemed to regard the Medicine Wheel as a holy place (Grey 1963:28).

Literature research into the Big Horn feature has revealed two other possible interpretations for its function. Wilson (1981:354-362) postulated a thirst dance relationship based on its overall location, rainfall patterns in the area, and summer solstice orientation. An astronomical link has been proposed by Eddy (1974:1042) based on alignments of certain cairns pointing to summer solstice sunrise and with heliacal rising points of the stars Aldebaran, Rigel, and Sirius.

The archeological evidence from Big Horn Medicine Wheel does not negate any of these postulated functions, since the kinds of recovered artifacts (points, plain ceramic sherds, and small thinning/sharpening flakes) are usually associated with generalized camping and procurement tasks. However, the nine brass and ceramic beads, and rotted wood fragments from the central cairn support a possible function for a vision quest experience. Vision quests are religious experiences in which an individual seeks spiritual knowledge and inspiration during a solitary ceremony. The small horseshoe-shaped features on the margins of the Big Horn Wheel would permit a single person to occupy this space for this type of event. Blue-green and reddish brown stains on a couple of bone fragments outside the central cairn may be related to ceremonial or religious events at the Wheel. These colored bones do not represent any one particular ceremony.

Subgroup 7 is characterized by a prominent central stone cairn surrounded by a stone ring with two or more stone lines extending outward from the margins of the ring (Figure 2.1). Only two (3%)

medicine wheels, Many Islands Lake and Minor No. 1, fit this description and both are in southeastern Alberta. Presently, there is no ethnographical or archeological evidence to postulate any particular function. The Many Islands Lake structure is similar to the Subgroup 4 wheels but Minor No. 1's configuration is closer to an animal effigy, if it was constructed during a single event. Both of these features are mostly intact.

Subgroup 8 is characterized by a prominent central cairn surrounded by a stone ring with two or more stone lines extending outward from the central cairn and passing through the ring wall for some distance (Figure 2.1). Only two (3%) features represent this subgroup: the Moose Mountain and Oxbow West Wheels in the extreme southeastern corner of Saskatchewan. Extensive interviews with Plains Cree and Assiniboine informants concerning Moose Mountain consistently drew no information about this feature (Kehoe and Kehoe 1979:36). The archeological testing at the Moose Mountain Wheel in 1976 yielded considerable utilitarian artifacts and no evidence of human remains (Kehoe and Kehoe 1979:40-60). Dr. Eddy (1977b:144) and the Kehoes' carefully investigated various alignments of the cairns in 1975 and discovered four specific astronomical alignments which were linked to summer solstice and the stars Aldebaran, Rigel, and Sirius. The discovered alignments of cairns, rings, and lines are nearly identical to those discovered at Big Horn Wheel. Later, Fries (1980:23) recalculated a different age based on the astronomical alignments. Drs. Ovenden and Rodger (1981:371-386) point out that the Moose Mountain Medicine Wheel could have been constructed in its unique oval shape by using precise mathematical formulations, identical to that used in the construction of some British megalithic rings.

2.6 CULTURAL AFFILIATION

The Indians residing in the Canadian Plains region of southern Alberta and southern Saskatchewan at the time of Euro-American contact (ca. A.D.

1650-1700) include the Plains Cree (Nehathawa), the Plains Ojibwa (Bungi/Ochipwa), the Assiniboine (Assinnee Poetuc), the Gros Ventre (Astina/Fall Indians), the Sarsi (Susee), the confederated tribes of the Blackfoot (Sikaika), the Piegan (Pikuni), and the Blood (Kainah). The Shoshone (Snake) and Kutenai, occupied the western edges of the Plains in eastern Wyoming and into the foothills and mountains of Montana and Alberta (Table 2.5). The Cheyenne and Arapaho resided in western Wisconsin and northeast Montana, but shifted westward during the early historic period. Farther south in Montana, Wyoming, North Dakota, and South Dakota the Indians included: Dakota (Sioux), Crow, Teton Dakota (Western Sioux), Comanche, Shoshone, with the Mandan, Hidatsa, and Arikari living in the Missouri Trench area along the eastern border. The Kiowa were first recorded in southern Montana; however, their linguistic affiliations with Tanoan may reflect a Southern Plains origin.

Further to the south in Nebraska, Kansas, and Oklahoma were the Caddoan-speaking tribes of the Pawnee, Wichita, and Caddo. The Apachean group, including the Lipan, Jicarilla, and Mescalero, resided in eastern New Mexico and the Texas Panhandle. Indigenous Indian groups in Texas include the Caddo (Northeast Texas), Tonkawa (Central Texas), Jumano (West Texas) and various Coahuiltean and Karankawan tribes of South Texas and the coastal areas.

Although numerous Native groups occupied part of the Northern Plains for various periods during historic times, it is unclear how long specific groups had been in the region. Many Native groups (e.g., Dakota) were relatively new to the Northern Plains when the Euro-Americans first encountered them, therefore they would have had minimal direct connections to the prehistoric sites, including some forms of the medicine wheels.

Ethnographic accounts attribute the creation of medicine wheel Subgroup 4 and possibly Subgroup 3, to the Blackfoot, as memorials, burial lodges

and/or burial markers (Kehoe 1954; Ewers 1980; Dempsey 1956; Brumley 1985). Possibly, other Plains groups employed this same practice, but it is most evident among the Blackfoot. Fourteen of the 17 features in Subgroup 4 are in the historic territory of the Blackfoot. In addition to the ethnographic and archeological ties to medicine wheels, the Blackfoot are known to have a native term for medicine wheels, which is *atsot-akeeh' tuksin*. The literal translation is; "from all sides" (atsot), "a small marker of stones" (akeeh'), "for posterity" (tuksin)" (Dempsey 1956:177).

First hand information on the Blackfoot religion collected in 1937 indicates that the Blackfoot religion was "a tool to be used to make ones' progress through life a trifle easier; often a means to personal ascendancy" (Kidd 1986:169). Blackfoot religion is a personal experience where no priesthood is recognized. Blackfeet believe that everything possesses life and no species can be eliminated as a possible source of power (Kidd 1986:173 citing Lowie 1935:251). The enlisting of supernatural aid is the most conspicuous feature of Blackfoot religion. Once an individual obtained a spirit, as acquired through a vision, that spirit became his guardian for life. The items carried by that individual which represented that particular spirit were not worshipped, but used to connect with or contact one's spirit.

The ethnographic accounts which link the Blackfoot to the Subgroup 4 features document that the Crow Indians were unfamiliar with the stone features in this group. This is in spite of the supposedly close correspondence between the Blackfeet, Crow, and Arapaho religions (Kidd 1986:168). Early attempts to link the Big Horn Medicine Wheel to a particular group have variously associated it with the Cheyenne (Grinnell 1922), Crow (Wilson 1981), and Shoshone (Allen 1913 cited in Wilson 1981:349). The Cheyenne connection with the Big Horn Medicine Wheel is through the apparent visual similarities between the overall configuration of the Wheel to the Sun Dance lodge (Grinnell 1982:22). Berthrong (1963:62-63) believes the Cheyenne received the

Table 2.5 Language Groups and Locations of the Major Plains Indians.

Language Group	Common Name	Location (1650-1700)
Algonkian	Blood Piegan	Southern Alberta
	Gros Ventre	Southern Alberta
	Blackfoot	Southern Alberta
	Cheyenne	Western Wisconsin (move to NE Colorado)
	Plain Cree	Eastern Saskatchewan
	Plains Ojibwa	Western Manitoba
	Arapaho	Northeast Montana, southern Saskatchewan (move to southern Wyoming)
Kitunakan	Kutenai	Southern Alberta
Athapascan	Sarcee	Western Alberta
	Apache (Lipan, Jicarilla, Mescalero)	Southeast Colorado, Eastern New Mexico, Texas panhandle (move to South Texas, Arizona, south New Mexico)
Siouan	Assiniboine	Southeastern Saskatchewan
	Crow	North Montana, Southeast Saskatchewan
	Teton Dakota	South Dakota, Wyoming
	Mandan	North Dakota
	Hidutsa	North Dakota (Missouri Trench)
Tanoan	Kiowa	Southern Montana (move to western Kansas, Oklahoma)
Uto-Aztecan	Shoshone	Eastern Wyoming/Montana
	Comanche	Western Wyoming/Northern Colorado (move to Texas Panhandle)
Caddoan	Caddo	Eastern Texas, Eastern Oklahoma, Louisiana, Arkansas
	Pawnee	Northern Kansas, Nebraska
	Wichita	Southern Kansas, Central Oklahoma
	Arikari	North Dakota
Tonkawan	Tonkawa Tribes	Central Texas
Coahuiltean	Coahuiltean Tribes	South Texas
Karankawa	Karankawan Tribes	Texas Coast

Sun Dance from the Arapahos and it represented an opportunity for individuals to seek favors from powerful spirits. The Cheyenne called the Sun Dance ceremony the "new-life-lodge" or "renewing the earth" (Berthrong 1963:63).

Allen's (1913) connection to the Shoshone is based on a story told to him by an elderly informant in sign language, in which the shape of the wheel, the 28 spokes, and the rock structures, were all discussed. Aspects of the story may be

questioned, but the general description of the structure fits the Big Horn Wheel very well.

No direct linkage has been discovered between a specific group's oral tradition and the building of medicine wheels. Each of the above group associations with medicine wheels can be challenged because of the lack of hard evidence linking any of them to a particular feature; quite likely, many groups used the same feature. In support of the latter contention, the Big Horn Medicine Wheel was archeologically demonstrated to have been constructed over a period of time, with the addition of the rock cairn-like features subsequent to the main Wheel. Different parts of the Big Horn Medicine Wheel possibly served different functions for specific groups and may have changed through time.

The more southern Indian groups, such as those arriving from the north in the past 500 years (Comanches, Kiowas, and Apaches) and the indigenous groups (Tonkawa, Coahuilteca, and Karankawa) which reside in the region of the Leon River Medicine Wheel, are not known to have oral traditions about medicine wheels (Foster, personal communication 1994). Comanches, who controlled this portion of Central Texas after ca. A.D. 1700, and have ancient affinities with the northern Shoshonean speakers (Gunnerson and Gunnerson 1988:29), are known to have regarded high places as sacred locations (Foster, personal communication 1994), such as the Wichita Mountains and Medicine Mounds (Narcomey 1988:60; Kenmotsu et al. 1994).

2.7 SUMMARY OF MEDICINE WHEELS

This chapter has provided an overview of the 67 previously identified medicine wheel sites. These sites are restricted to the northern Plains and concentrated in southern Alberta. However, over the years, this site type category has accumulated numerous types and shapes of surface stone configurations that have hindered general discussions concerning these unique features. Because of the various configuration differences

included in this one site type, medicine wheel sites have now been divided into eight subgroups, with no one theory put forth to account for all the variation in shapes recorded. Often interpretations center around the probability that these unique features were/are related to various religious/spiritual beliefs of the native peoples. Most of the 67 features have not undergone intensive professional excavations, thus little direct evidence exists to substantiate the various theories and document medicine wheel ages. The few sites investigated have provided ages which range from the recent historic period back to nearly 5,000 years BP. Many of the proposed interpretations will be difficult to substantiate since archeologist do not recover spiritual beliefs and artifacts relating to spiritual activities are difficult for non-Natives to interpret. Many of these sites no longer contain intact deposits to even probe the possible explanations.

Earlier on in the investigation of medicine wheels, interviews with Natives and research into ethnographic accounts enlightened researchers as to possible interpretations for some of the recorded forms. Presently, subgroup 3 and possibly subgroup 4 appear as burial lodges of the Blackfoot. In at least one instance, archeological investigations at the Ellis Medicine Wheel helped document this specific use of this one specific feature type (subgroup 4). Other than this association between the Blackfoot and the subgroup 3 and possibly subgroup 4, no other direct ties to specific Native groups have been substantiated. In general, Native groups in Central Texas and adjacent regions have no remaining oral histories which relate to any specific feature or medicine wheels in general. This fact and the difficulty in interpreting the archeological material recovered from these features creates substantial difficulty in interpreting and isolating the origin of these unique features.

3.0 THE MEDICINE WHEEL RENEWAL CEREMONY AND ASSOCIATED EVENTS

J. Michael Quigg

3.1 INTRODUCTION

On 18 May 1994, the Leon River Medicine Wheel was rededicated and restored as a Native American religious structure. The renewal ceremony, hosted by AIREC, was conducted under the overall direction of the Medicine Wheel Alliance whose headquarters are in Huntley, Montana, and headed by spiritual leaders Mr. William Tallbull, a Northern Cheyenne, Mr. Haman Wise, a Shoshone, and Mr. Floyd Youngman, a Lakota Sioux. Below is a description of this unique ceremony and events surrounding it.

Traditional Elders Mr. Lee Lonebear of the Medicine Wheel Alliance and Mr. Luke Brady of the Medicine Wheel Coalition arrived from Lame Deer, Montana on 10 May 1994 to construct a sweat lodge to be used in conjunction with the renewal ceremony (Figure 3.1). The cherrywood used by Mr. Lonebear and Mr. Brady in the construction of the lodge frame was brought from Montana as were many rocks to be used for heating. The sweat lodge was constructed a few meters west of the Medicine Wheel and built large enough to hold nearly 30 people (Figure 3.2). On the evenings of 11 and 12 May 1994, Mr. Lonebear conducted flexible sweat ceremonies, for instructional purposes, for several members of AIREC including Mr. Shiloh Perkins, Mr. Smith, and Mr. Al Mouse. The sweat lodge was consecrated and local individuals were given the right to lead sweats for others. Mr. Perkins and Mr. Kimball Smith were passed the right, taught the songs and prayers, and given the pipe to preform flexible sweats on their own.

The renewal ceremony, held on 18 May 1994, was attended by about 50 individuals which represented at least five tribal nations (Comanche, Wichita, Caddo, Alabama-Coushatta, and Tigua), as well as members from AIREC and some non-Native Americans including Dr. Jack Jackson and two

individuals from Mariah, Dr. Chris Lintz and Mr. Mike Quigg.

During the all-day event, Traditional Elders of the Medicine Wheel Alliance, Youngman and Tallbull, were interviewed by Ms. Lippert concerning the significance of the Medicine Wheel renewal event and its religious and social meaning to the modern Native American. These interviews continued over the next two days (see Chapter 4.0 for details).

The renewal ceremony began about 9:00 am at the Comanche National Indian Cemetery grounds immediately north of the Medicine Wheel, with the raising of the United States flag, prayers, and singing. Following this, the group congregated adjacent to the Medicine Wheel for instructions from Mr. Tallbull. After being seated, Mr. Tallbull addressed the gathering (Figure 3.3). A verbatim narration of his speech is presented below in its entirety as transcribed from a video tape of this event.

3.2 MR. TALLBULL'S ADDRESS

"It's been a really great honor for me to be a part of this. As you know, throughout the history of Indian People across this country, (we) have had ceremonies that renew all things the creator had provided us. There are renewal ceremonies that take place in the spring. The earth renews itself; the plants renew themselves; the animals and birds, they renew themselves each spring. And it is appropriate that we do the renewal ceremony following the age old ceremonies that we pass down to our grandchildren. It renews the spirit of our people; It renews the power of the medicine wheel.



Figure 3.1 Mr. Luke Brady and Mr. Lee Lonebear, Northern Cheyenne Traditional Elders, on Either Side of Ms. Dorothy Lippert. The Sweat Lodge is behind them.

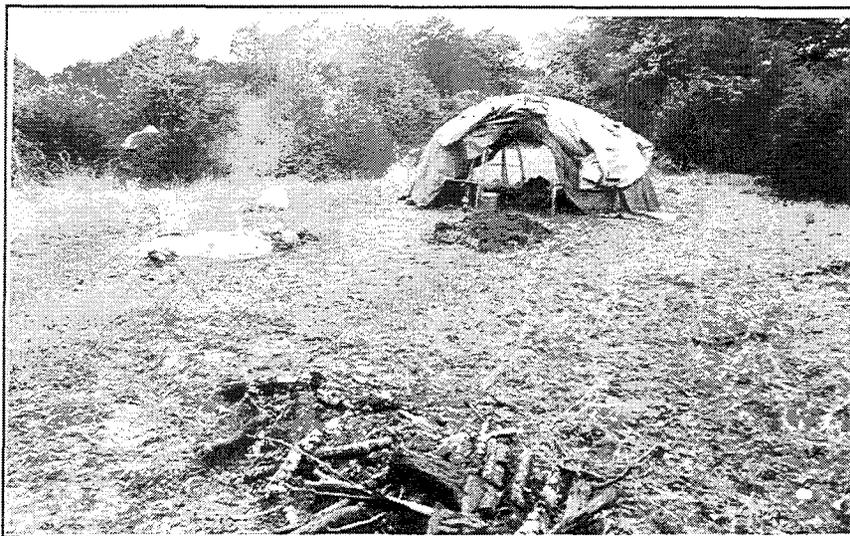


Figure 3.2 Newly Constructed Sweat Lodge with White Ash Left from Heating Rocks and Earth Altar in Front of East Doorway (May 1994).



Figure 3.3 Mr. William Tallbull (far left) Delivering Comments Concerning the Importance of the Renewal Ceremony. Seated (left to right) are Arnette Arkeketa, Shiloh Perkins, Philip Narcomey, Ray Hernandez, and Ardena Rodriguez.

I have been concerned about the places in this country that the ancient people have left behind for us to use in these times of renewal. And we come here as the Medicine Wheel Alliance (unintelligible) to restore. . . (tape interrupted by car). . . We will hopefully restore it, with your help, to make it a place where our people can come.

Since we were placed on reservations, we have lost connections with many of these places that were designed for renewal purposes. As we come back to these places to reconnect ourselves with these places, the spirits that guard these places still recognize who we are; still recognize the prayers that had been said here many, many years ago. We have come to return so that we can continue the connections and relationship with the site.

The people use these sites in times of turmoil. When there were famines and disease, people came. And it was the place where atonements could also be made for the mistakes of our people. When we have tragedies, such as major flooding, earthquakes, droughts, this is where we came to ask for help. And the spirits that abound here will once again hear prayers that they haven't heard for a long, long time. You must remember that all the relatives that we have are here; and the animal life, all the birds, the insects and all the plant life that's here--those are our relatives. And you treat relatives with respect. You ask them for help when there is a prayer.

There were times when we realized that we had forgotten for a long time to ask for help of the spiders, the ants, and the grasshoppers. And we were reminded by

them--'Why don't you ask us for help. Because of the numbers, we are powerful people.' And so, those relative spoke out--they really wanted to help. Because they need the same things we do.

The spirit life is very complex. There are spirits that float and never touch the ground; there are spirits that are found in trees with plant life. And wherever there is a site like this, the ceremony is a spirit assembled here. This is where people normally came to ask for help. The turmoils of people have been here. And we want to restore the wheel so that people, your relatives, your grandchildren, will have a place to go. This is why we are here today-- to do the restoring of the wheel.

When I made an attempt to restore the identity of the (Big Horn) Wheel in Wyoming, I was threatened with a jail term. And I had said to the (U.S.) Forest Service 'people that made this wheel left it for us. We come to restore it from time to time. It is not an archeological site per se. It is a living, cultural site'. Remember that!

The things that we do sometimes are not understood. But, nevertheless, for our survival, for our physical health and spiritual health, we need to do all we can to restore these sites across the country. We have a few sites up north that are practically overrun by people-- tourism. And we hope that this site will be protected, so that it will not lose its identity. And we will restore it as we have always restored these sites. We are the very same people that built it-- we're from the same people. We still know the protocol; we still know the prayers. We're no different than those people that built it.

And it looks like we're going to be spending most of the day here--it's a very large wheel--and we're going to certainly try to restore it. And I'm going to ask the help of the men folk to help place the stones. And whenever you can come on pilgrimage--people come here on pilgrimages. They should also bring a stone to fill in the gaps in the wheel itself. All of us are going to restore it. Once we have laid the stones down, then we will bless this site as it has always been blessed.

Once that has happened, then I will do a cleansing ceremony. And I'll cleanse each and every one of you here today. And we will go to the west side of the wheel (pointing) and that's where we're going to sit and this is where the work is going to start--on the west side.

We must leave a place here for people to come to build a ground--to bless the ground for people to bring food offerings. One of the things that the spirits have continued to say to us is that the people have not brought food. So we're going to have to restore that vow of offerings. We come back to offerings. It's important (unintelligible).

No matter who you are, if you want to say 'I want to feed the spirits of the wheel', no matter where you are, just take a piece of bread and you align it directly towards the wheel--five pieces of bread on the ground. That will actually help you.

There is a young man that works for the grandfathers. Grandfather acknowledges all the offerings that have been placed on this earth. This young man picks them all up and brings it to the grandfathers, and says 'Here are the offerings.' The old man acknowledges all the offerings that

have been made, no matter where you are.

We all know that the Great Spirit we call God is everyone's spirit. He appears, he is everywhere you look. And when you come here on a pilgrimage, normally we stop four times before we get here to offer a prayer. This is an important part of the ceremonies. When we go to a place which is sacred. And to come here is like going to church. To come here, you're going to be talking to God.

Now if you come here to say you're going to pray for all the people. You've got to remember every word that you said. Because you're talking to the Great Spirit and you have to live the words that you say. If you pray for the people, you can not pray for yourself. You pray for me. You can pray for (unintelligible). Always remember that. The meaning of the prayer is very vital.

And the thing that you should remember is that when you have prayed for someone--then you can not get angry with them. Remember that. Because once when you do, you're not true to your sayings. That's important. Anytime you say a prayer the Great Spirit listens. And he determines whether or not you are sincere in what you say. You have to live the words that you're saying. You can not ignore them once they are spoken. You have to live by them.

So in looking at the sites that we have in the northwest, in Montana, we see many of these sites. And it was a mistake on our part to tell the people what they were. All of a sudden we were surrounded by tourists. Begin trashing a lot of the sites that we held sacred, and we have a problem. For protection of this site, it may be necessary to build fences like this

around it, so the people won't go in. A lot of people may come here--do not know anything about the sacredness of the stones that have been placed here.

We have to protect the wheel the best we can. What we do now is that. . . We begin. . . This is going to be a long day. We'll go back to where the sweat lodge is and work from there. What we do is that you always look to the west as far as the circle. The wheel will be on the east side of you. That's where you start. That's where the prayers are said; that's where the opening is.

And when we get through with the site, if it's not already been determine to be a Traditional Cultural Property, it's going to be one. And it should have some better care than it has in the past. I want you to be a part of that. You people are going to allow your next generation to come and visit the site. Let's keep these traditions alive; lets keep them honorable. So that they will fulfill their place on this earth.

There are places like this where a person came--only one person came to the site. And all of a sudden, the circle appeared in front of him. And he put stones down. That's the way the wheel was made in Wyoming. Ten thousand feet up on the plateau, someone 10,000 years ago had come and seen a circle appear. It was on a mountain. The mountain itself was a lodge that houses the spirits that rule the universe. This circle that he saw, he put stones around there and made spokes.

In 1980 I went there--I've gone there since 1947. Took my eldest up there in 1980. When I was there, I was on the west side of the wheel about 40 feet to carry out my ceremony. Once I was through, I got up and reached down to

pick up my pipe. All of a sudden a wheel appeared--the circle about 6 feet. And I looked at it, then I walked away. I got to thinking that maybe there are other circles here that I've never seen before. I even looked up at the sky. I always come back to that circle. When I got back home and I gave thanks to the spirits. I took some small stones and put them in an area (moves arm in a circle). They have given me a place to go. I had to put the stones in the area as I explained to you. This is where I go. I had never questioned how the wheel got there, or why. But for some reason I was told this is how the big wheel came to be. Whoever was there, the spirits provided the altar from which the ceremonies could take place.

And because I was shown a wheel, I thought that it would be proper for me to do this. And I felt good about it when I heard that a wheel was here. This is the witness, the spirit that comes from the Great Spirit we can't speak to them--we can speak to the ground. And to me, when we go there, we have to look at it; we have to feel it--the power of the spirit is there.

Stones--the reasons the stones are used is because the stones stood for eternity. And there is a prayer to the stones. You pick the stones (and say) 'You are the oldest, and because you are the oldest, you're the wisest. You are the ones that have seen millions of years go by'--you speak this.

And I'm glad that I could be here today to tell you these things. Many of you already know these things. And its only a reminder that we need places like this more and more these days. It is the Great Spirit that blesses the ground upon which the wheel appears. And the stones are a reminder for us. It is up to us, the people

to keep this alive, to pray for each other--we need them more and more every day.

I tell young people even if you lose your language, don't ever lose your spiritual connection to this earth. Maintain your connections! Say your prayers! Give offerings! Whenever you go on a picnic, take a piece of bread and offer it to the spirits. Put it on the ground. Teach the little children to do this. Always remember this; it is part of us. The children should be taught. If you sit on the left side when you pray and listen to the prayers. That way, they will help you in your prayers. Your children's prayers will grow.

So if anyone has anything to contribute here, it's time to do that. Anyone want to say something can do so now. If not, we will start."

3.3 THE CEREMONY

Following Mr. Tallbull's speech, the group moved to the new sweat lodge west of the Medicine Wheel where a small fire was lit. Mr. Tallbull and Mr. Wise discussed the specific procedures and sequences of steps to be implemented in the rebuilding of the Wheel structure; they said prayers, then purified themselves with smoke from sweet grass and sage. The men who were going to participate in the Medicine Wheel reconstruction were individually purified with the spiritual smoke provided by Mr. Wise and Mr. Tallbull; the women were smoke-cleansed en mass, but were not allowed to participate in the rebuilding events. Mr. Wise led a group of about 20 men (Table 3.1) to the Medicine Wheel to perform the preparatory prayers prior to the actual reconstruction. Mr. Tallbull and Mr. Wise led the procession of men to the western edge of the Medicine Wheel.

Table 3.1 Men Involved in the Leon River Medicine Wheel Rebuilding.

Name	Association
Haman Wise	Shoshone, Traditional Elders and Rebuilding Director
John Waukechon	AIREC, Vice President
Timothy (Shiloh) Perkins	AIREC, Repatriation Chairman
Ray Hernandez	AIREC Member
Richard (two braids) Villegas	AIREC Member
Steve Russell	AIREC Member
Louis Axeman	Assistant to Steve Russell
Marty Silvas	Tiguas, War Chief
Albert Avientas	Tiguas, Tribal Council
Mike Muniz	Four Winds Intertribal Society
Philip Narcomey	Comanche, Tribal Reburial Association
Mark Wauahdooh	Comanche
Gilbert Nieto	U.S. Army, Aztec Healer
Virgil Swift	Wichita Tribal Representative
Paul Pahdocony	Commanche Representative
Ron Howard	AIREC Board Member
Leslie Standing	Wichita Representative
George Ramirez	AIREC Member
Cory Torino	AIREC Member
Kimball Smith	Fort Hood, Archeologist/Lakota Sioux
Jack Jackson	Fort Hood, Archeologist
Mike Quigg	Mariah, Archeologist
Chris Lintz	Mariah, Archeologist
Richard Schott	AIREC Member

The two Traditional Elders moved to the middle of the structure where prayers were offered. They then retired to the group of men along the western perimeter where prayers were recited. The procession of men then moved single file in a clockwise direction around the perimeter of the outer stone circle and additional prayers were said at the north and east positions; a smaller group consisting of the two Traditional Elders and the male representatives of the invited tribes continued

to the southern cardinal point for the final prayers, before rejoining the other men along the east side.

Reconstruction began with each man selecting a single white limestone rock, (ranging in size from about 8 x 10 to 15 x 15 cm) from one of four available large rock piles dumped by trucks on the eastern side of the Medicine Wheel. In single file, each man followed a prescribed route down a path marked by a paired set of spokes through the inner wheel and to the location for the placement of each

rock under the direction of Mr. Wise. The new rocks were added about every 30 to 40 cm (1 to 1.5 ft) to the rocks already existing in the alignment and were used to fill in any gaps or areas devoid of rocks. Wooden stakes (placed previously by the archeologists) at the intersections of the inner and outer circles in the missing parts of the Medicine Wheel guided Mr. Wise in the placement of the new rocks. The outer ring was reconstructed first, followed by reconstruction of the paired spokes, with the inner circle being completed last. Care was taken to not block the pathways in the paired spokes along either the inner or outer circles. During two breaks from placing the rocks, the participants gathered along the eastern side of the outer wheel and additional instructions and reminders were provided about the meaning, significance and solemn obligations for handling each rock. Each rock represents a person, the group was told, and as the rocks are carried through the prescribed route in The Wheel, the bearer is to reflect on the burdens and suffering of the person represented by the rock, and by extension, the burdens and sufferings of the family or tribe. The physical reconstruction was completed about 4:00 pm, at which time Mr. Wise provided additional instructions regarding the dedication ceremony.

After a short break, the men reassembled outside the eastern margin of the outer ring, removed all metal and manufactured material items such as jewelry, wallets, glasses, keys, coins, belts and shoes, and selected one stone each. Traditional Elders Tallbull, Wise, and Youngman gathered in the middle of the wheel, then in single file each man carried his rock into the middle and was seated just west of center, facing east, with the three Traditional Elders in front. Two songs were sung and a ceremonial pipe was lit and smoked by each individual while Mr. Wise explained the significance of the day's events and instructed those present how to respect and treat the Medicine Wheel in the future. Each of the 16 spokes or paths had different significances. Individual testimonies and dedicatory commitments were given and the leaders stressed how this

Medicine Wheel will become the focus of healing, prayers, and solidarity for the Southern Plains Indians. Each man then placed the rock he had carried on a pile in the center of the inner wheel to create a small rock cairn. A prayer was said and participants departed from the center by the way of the eastern spoke or path. The final activity involved the removal of the wooden guide stakes. Both men and women reassembled at the sweat lodge. Mr. Tallbull performed the cleansing of each man involved in the rebuilding, followed by all other people present. This ended the physical rebuilding, the blessing of the wheel, and the renewal ceremony.

3.4 OTHER EVENTS

A dinner feast was held several miles away in barracks at North Fort Hood and all present were fed a buffet dinner. Board members of the host AIREC group, Ms. Arkeketta, Mr. Perkins, Mr. Howard, and Ms. Rodriguez, conducted a give-away to honor people involved in the performance of the events. Pendleton blankets were given to each member of the Medicine Wheel Alliance, representatives of each tribe, selected members of AIREC, members of Mariah, Fort Hood archeologist, and selected guests. Some tribal representatives spoke following the give-away.

Following the dinner and give-away, a Comanche delegation led a group of nearly 30 individuals to the Comanche National Indian Cemetery grounds to perform a cemetery rededication ceremony. Mr. Wallace Coffey, Comanche Tribal Chairman, presided while two Comanche Traditional Elders, Mr. Tom Wahnee and Mr. Elrod Manassi, sang songs, said prayers, and conducted the proceedings over each of the marked graves. Upon completion of this rededication, each individual in attendance was blessed and purified by the Traditional Elders as they departed the grounds.

A sweat followed the Comanche National Indian Cemetery rededication ceremony. Twelve men and women participated in the newly constructed sweat lodge west of the Medicine Wheel. The

four round sweat was lead by Mr. Youngman, a Lakota Sioux, assisted by Mr. Wise. The sweat lasted from 10:30 pm until about 2:30 am.

3.5 SUMMARY

The rebuilding ceremony consecrated the Leon River Medicine Wheel as a sacred place, which will serve as a focal religious site for southern Plains Native Americans. The existing rock structure will continually be refined as new stones are placed between existing rocks in conjunction with people coming to pray, make offerings, and obtain power at the Medicine Wheel. The renewal activity was significant in that it has brought together for the first time representatives of the Tiguas and Comanche Nations, who were historical enemies. The establishment of new ties, acknowledgement of the various religious beliefs, and willingness of the various tribes to work together, should be a positive example for all to follow.

Since the renewal ceremony in May 1994, the Leon River Medicine Wheel and sweat lodge has continued to be used for various spiritual gatherings. It is anticipated to continue to serve as a sacred place. Trees along the immediate edge of the Medicine Wheel were cleared back from the outer ring rocks to allow movement around the structure. A low wooden fence was constructed to keep people from accidently wandering across the Medicine Wheel.

4.0 ORAL INTERVIEW DOCUMENTATION

Dorothy Lippert

4.1 INTRODUCTION

A common concern for many Native Americans today is the perceived loss of traditional ways. The renewal and rededication of the Leon River Medicine Wheel gave Indians from Texas and Oklahoma a chance to unite in an effort aimed both at preserving a sacred structure and at reemphasizing the importance of following traditional ways. This chapter will focus on the significance of the Medicine Wheel structure and the rebuilding ceremony, to modern Indian people.

The rebuilding ceremony took place on 18 May 1994, at the site of the Leon River Medicine Wheel near Gatesville, Texas. Both Native Americans and non-Indians participated in moving rocks to reconstruct the feature. Rocks were placed into a wheel shape according to the direction of Traditional Elders. The ceremony included prayers and other religious rites.

Information was acquired from interviews with members of the Medicine Wheel Alliance (MWA), a group formed to protect the Big Horn Medicine Wheel in Wyoming. This group works to preserve Native American sacred spaces and religious rights. Members of this group oversaw the rebuilding and rededication of the Leon River Medicine Wheel.

Five interrelated issues were developed prior to the rebuilding, and these concerns structured the series of interviews. These issues pertain to the function and significance of the Medicine Wheel to contemporary Native American people. The five issues are: (1) ascertaining whether or not traditional views supported the functions ascribed to medicine wheels in the archeological and historical literature; (2) determining the significance of the Medicine Wheel to traditional Native American religious beliefs and practices; (3) determining the significance of the Medicine

Wheel to modern Native Americans; (4) delineating the proper protocol for the protection and treatment of the Leon River Medicine Wheel; and (5) delineating the modern religious use of the Medicine Wheel.

The following is based on a series of interviews with four Traditional Elders associated with the Medicine Wheel Alliance; Mr. Lee Lonebear, Mr. William Tallbull, Mr. Floyd Youngman, and Mr. Haman Wise. Interviews with Mr. Lonebear, Mr. Youngman, and Mr. Wise were taped. Portions of a general conversation with Mr. Tallbull and a section of a presentation by the coordinator of the MWA, Ms. Nicol Price, were also taped. Additional information was acquired in general conversations throughout the three days of the event. In some cases, written notes were taken.

Among traditional Native Americans, religious knowledge is carefully treated. It is uncommon for information of a sacred nature to be casually passed down without appropriate ceremony or ritual. Undertaking this series of interviews was a sometimes unsettling task; although I am Native American, I was always aware that I had not undertaken any sacrifices or fulfilled any vows that often accompany learning sacred information.

The use of such information to accompany an archeological report produced its own set of hazards. Many modern Native Americans dislike and distrust archeology, and subsequently, are hostile toward me for studying it. I was able to defend the writing of this report as a means of ensuring that the information given in the interviews was treated appropriately, that is to say, with respect. Those interviewed often consented to speak with the expectation that this information will be used only to the educational benefit of Native Americans.

Brief biographical sketches of those interviewed follow.

Mr. William Tallbull

Mr. Tallbull is the Chairman of the Medicine Wheel Alliance. He is also appointed by President Clinton to the Advisory Council on Historic Preservation, and is on the Native American Graves Protection and Repatriation Act Review Committee.

Mr. Tallbull is Northern Cheyenne. He serves as the cultural chairman of his tribe, and is on the faculty of Dull Knife Memorial College in Lama, Montana.

Mr. Tallbull studies ethnobotany, and is compiling samples of herbs for educational use. He has produced a book on Cheyenne ethnobotany. In addition, he teaches the oral history of the tribe. The Cheyenne chiefs came to him when they became concerned about the loss of the tribe's traditional histories, and he agreed to work for the preservation of those histories.

Mr. Tallbull oversaw the rebuilding ceremony in general but left the actual building process up to Mr. Wise, who is Shoshone, saying that their tribe had more experience with this sort of structure. This is interesting, in light of the information he gave in general and in focused discussions, which indicated that he and his tribe had traditions regarding stone circle formations.

Mr. Tallbull is a traditional and conservative man. He is very much concerned with preservation of tradition and believes that Indian people today are wandering too far toward white materialism. When asking permission to interview him, he became concerned about what would happen to the information. He worried that it would be used to make a profit, and this would not be appropriate. Out of respect for his concerns, this interview was not taped.

He also expressed his apprehension about the presence of white people in the rebuilding ceremony, saying that if it had been up to him, he would not have allowed them to participate. He

did not protest this, possibly because Mr. Wise, who was in charge of the actual rebuilding accepted the support of the non-Indians. Mr. Tallbull did acknowledge that the Creator may have included them for a certain purpose.

Mr. Tallbull was informally interviewed at the Dyer Restaurant in Gatesville, Texas. The discussion began on a slightly uneasy note, because of his suspicions concerning the use of the information. By the end of the talk, however, things were on a much more friendly level.

Ms. Nicol Price

Ms. Price is the coordinator of the Medicine Wheel Alliance. She became involved after learning of environmental issues surrounding the Big Horn Medicine Wheel. She acts as an assistant to Mr. Tallbull and has aided him by reading documents and attending meetings with him. Ms. Price is not Native American.

Ms. Price was not formally interviewed, but a portion of a presentation she made about Historic Preservation was taped. In addition, she gave information during casual discussions.

Mr. Floyd Youngman

Mr. Youngman identified himself as a Sioux from the Fort Peck Reservation at Poplar, Montana. He has been a Pipe Carrier for 14 years, and serves as a drug and alcohol counselor.

The interview with Mr. Youngman took place in the hotel room of Ms. Annette Arkeketa, president of AIREC, who was also present. Mr. Youngman spoke at length, even though the interview did not start until 10:30 pm after an evening of teaching songs to members of AIREC.

Mr. Youngman seems to hold less rigid views than Mr. Tallbull. He performed a pipe ceremony at the end of the rebuilding, and also assisted Mr. Tallbull with a cleansing ceremony for all who attended the event. This involved the use of

tobacco ties and cloth in the colors of the different directions.

Mr. Youngman is very concerned about the education and well-being of young Native peoples. He spoke about the problems facing Indian children today, and wanted to make sure that the information given in the interviewed would be used for educational purposes.

Mr. Lee Lonebear

Mr. Lonebear was invited to Texas to build a sweat lodge near the Leon River Medicine Wheel before its rededication. The sweat lodge is intended to be used by members of the local Indian community. He is Northern Cheyenne, and a member of the Crazy Dog Society. He is a Medicine man.

Mr. Lonebear was interviewed at the Dyer Restaurant in Gatesville on the morning before he left to return home, prior to the rebuilding and rededication ceremony. Luke Brady, also a member of the Crazy Dog Society and Mr. Shiloh Perkins, Chairman of the AIREC Repatriation Committee, were present but did not participate in the interview.

Mr. Lonebear learned healing rituals from his uncle and works in conjunction with physicians trained in Western medicine to treat people on his reservation. He built the lodge near the Wheel, and taught Mr. Perkins, Mr. Mouse and Mr. Smith how to perform a "young man's sweat."

Mr. Lonebear also seems less rigid in his attitudes than Mr. Tallbull. He purposefully taught a "flexible" ceremony so that his students would be able to treat a wider variety of people. In addition, he saw few problems with the inclusion of white people and even archeologists in the ceremonies.

Mr. Haman Wise

Mr. Wise is a full-blooded member of the Shoshone Nation. He is authorized by the tribe to speak on cultural and religious matters. He supervised much of the rebuilding process. The interview took place in a room at the Gatesville Best Western Motel.

Mr. Wise is more conservative than either Mr. Youngman or Mr. Lonebear. He was quite concerned about the use of the information obtained in the interview, and frequently noted that he could speak no further on various topics while being taped. He was also wary of allowing public access to the Leon River Medicine Wheel because of experiences with the Big Horn Wheel.

At later times, Mr. Wise explained certain aspects of the wheel and Shoshone ritual in more detail. These explanations may be referred to, but will not be incorporated in this report in deference to the wishes of Mr. Wise.

4.2 ARCHEOLOGICAL, HISTORICAL, ETHNOGRAPHIC, AND TRADITIONAL USES OF THE STRUCTURE

Many uses of medicine wheel structures have been reported in historical and archeological literature. Four distinct uses of the wheel were postulated prior to undertaking the interviews. These are: (1) use as a memorial; (2) construction of the feature in astronomical alignment; (3) marking the burial of a known individual; and (4) use of the wheel as an altar (See Chapter 2.0). These uses were discussed and elaborated on to varying degrees by those interviewed. These uses and others were discussed by the Traditional Elders. Responses varied about the use of the feature, but everyone clearly identified it as a sacred structure, and many stated that it had been placed there for the use of the Indian people.

4.2.1 Memorial Structure

An example given by Mr. Wise indicates that medicine wheels have served to mark a specific location and event. He believes that a wheel in Split Rock, Montana, marks the spot where the Comanche and Shoshone split into two groups. He had earlier in the day spoken to a Comanche man in the Shoshone language and said that he could understand the Comanche language because of the former unity of the two tribes. When food sources were dwindling, half of the tribe turned South and followed the bison down from the high plains. These people became the Comanche, and they, or their descendants, built the Leon River Medicine Wheel. This statement about the Comanche is interesting in light of Berlandier's note that, "You may see Comanches and others seek out some high and lonely place where they build a sort of sepulchre of stones" (Berlandier 1969).

4.2.2 Astronomical Alignment

Haack (1987a) has proposed that the stone structures known as tipi rings or medicine wheels were used in astronomical calculation. None of the individuals interviewed gave any evidence for this. Mr. Youngman spoke of the importance of establishing seasonal rituals. He gave examples of different ceremonies held at different times of the year, but did not relate these to specific use of the wheel.

4.2.3 Burial Cairn

Only one mention was made of the medicine wheel in relation to grave sites, but Mr. Wise declined to elaborate on the subject. He had spoken of the Comanche National Indian Cemetery, and the possibility that some of the people who had built the Leon River Medicine Wheel were buried nearby in that cemetery. Mr. Wise also discussed the different shapes of stone alignments, and the fact that half-moon circles were done for different ceremonies than the full circles. He said that sometimes this pertains to grave sites and related

it to rock art, in that it is significant to Indians, but is not easily revealed to non-Indians.

4.2.4 Altar

Mr. Wise also spoke of the wheel as an altar, but this was while relating the concept of the wheel as a religious space. "The one thing I say about the wheel is that it's a temple. It's an altar, it's a shrine. It's a place for our ceremonial way." The term "altar" may more properly be used to refer to the stone cairn structure built in the center of the wheel, or to similar structures made of earth or stone in the area.

The presence of altars in a given area can indicate that the space is sacred. Mr. Tallbull tells people to make their offerings visible, so that it can be clearly demonstrated that sacred sites are still in use and still valuable to Indian people.

In more abstract terms, medicine wheels are places where sacrifices can be made. Mr. Tallbull spoke about making sacrifices, and feeding the spirits at the medicine wheel. One should place five bits of bread on the ground in the direction of the wheel, and this will be acknowledged as an offering.

4.2.5 Other Uses

It is possible that the medicine wheel is linked to existing religious ceremonies such as the Sun Dance. Mr. Lonebear stated that when shown a picture of a stone circle, his uncle said that it looked a lot like the Sun Dance circles. The shapes of both structures are similar, but Mr. Lonebear did not elaborate on this topic.

4.3 SIGNIFICANCE TO TRADITIONAL NATIVE AMERICAN RELIGIOUS BELIEFS AND PRACTICES

The religious beliefs expressed by the people interviewed may all be described as "traditional." The source of these beliefs and practices is as important in their being labeled traditional as the beliefs themselves. In the Native American

community, there are various ways of acquiring knowledge, and often the methods are as important as the information itself. Thus, information gained through the interviews was limited, at times, due to the fact that the conditions and situations were not appropriate for the handing down of certain types of knowledge.

This section will discuss the acquisition of knowledge and various beliefs and practices involving medicine wheels. These concepts include the idea of the afterlife, the role of the wheel in community integration, and the significance of the size and shape of the structure.

4.3.1 Sources of Information

In general, sacred knowledge is passed on from one person to another. Elders of the tribe are respected as sources of traditional information, and people needing spiritual aid learn from these people. All of the people interviewed spoke seriously of the teachings of their traditional elders. This was held to be the only appropriate method of learning. Because of this, it seems improbable that these gentlemen are giving information from ethnographic historical data.

Mr. Lonebear stated that he had to earn the right to learn certain ceremonies. His uncle began to teach him after he had gone through his first Sun Dance, saying that now he had earned the right to know certain healing rituals. After a series of successful piercing ceremonies, his uncle began to teach him other rituals. His uncle told him to learn carefully, since one day he would be passing the information to someone else. Mr. Lonebear expects that someday someone will ask to learn from him and he will teach that person.

In conversation about the learning of rituals, Mr. Tallbull mentioned that some ceremonies are being lost because they are so difficult to perform. He gave an example of one in which the participant must stand up to the neck in water for four days. Because few people are willing to endure this, that ritual is being lost. He spoke of the necessity for

keeping traditions alive, saying that the young people could someday embarrass their elders by asking questions which the elders cannot answer because they have lost that knowledge.

Mr. Tallbull also stated that it would be useless to try and record ceremonies in English, since this language is "like feathers." Because of the instability of the language, important meanings would be lost. This would also dismiss the possibility that information presented would be from an ethnographic report written in English.

4.3.2 Afterlife Concept

The medicine wheel was not clearly linked to an afterlife concept by any of the individuals interviewed. Several people spoke about the need to respect the spirits present at the site, and Mr. Youngman said that people "should always be thinking of the ones behind them." The term "spirits" may be used to refer not just to an intangible component of human beings, but also to similar aspects of plants and animals. Mr. Tallbull spoke of the strength of tree spirits and said that the trees remaining in the Wheel would carry the offerings of the people. He also said that spirit life is complex and gave examples of different types of spirits.

4.3.3 Community Integration

The Wheel was identified both as a place for people to gather, and as a place where people should come as individuals. This difference most likely reflects different tribal beliefs and backgrounds. Several people spoke of how their own tribe's religious beliefs differed from those of other groups. The Leon River Medicine Wheel can be seen as a source of community integration even when used in ceremonies performed by solitary individuals.

Mr. Wise related how the only people permitted to go to the Wheel are those who have had a vision or a dream. These people should go to the Wheel and ask for knowledge which is then shared with

the rest of the tribe. He said that Indians go to the Wheel area individually, "to confront the one person that we all pray for." Although this sort of religious activity is individual, it plays a role in community integration since the knowledge or inspiration is expected to be shared with the rest of the tribe.

The responsibility of individuals to tribes was also brought up during the rebuilding of the Wheel. The men replacing the stones during the ceremony were said to be carrying the weight of their tribes. During the ceremony, one man asked if a wheelbarrow should be used since there were so many stones, but this idea was rejected since that would lessen the sacrifice of the participants.

Another ritual that takes place at the Leon River Medicine Wheel Site is the Sweat ceremony. People from many tribes gathered to participate. Mr. Lonebear stated that people from all races can take part in this ceremony. He noted no gender restrictions. The sweats that have taken place thus far have included women and men who are both Indian and non-Indian. This ceremony seems to be a means of community integration for spiritual purposes.

4.3.4 Shape and Size of the Feature

Both the shape and size of the Leon River Medicine Wheel are significant, however, the importance of both aspects cannot be specifically revealed. According to Mr. Wise, different tribes have ceremonies that utilize certain shapes of stone alignments. The half-moon circles may pertain to grave sites, and the wheel pattern itself refers to the wheel of life. The different spokes represent certain things, and both the inner and outer circles have meaning.

The circle has an important place in Native American spirituality. A participant in the rebuilding spoke with Mr. Wise about how the Indian Reservations were drawn in squares and that this was contrary to an Indian way of thinking about space. Mr. Wise replied that Indian

spirituality is round and he believes that the reservation shapes are a means of persecution.

Again, because of the nature of the knowledge, and the fact that the situation was not appropriate for revealing such information, Mr. Wise declined to discuss this topic further while being interviewed. Later on, he did speak more clearly about certain meanings attached to the Wheel's size and shape, but this information will not be discussed in this report.

4.4 SIGNIFICANCE TO MODERN NATIVE AMERICAN RELIGIOUS BELIEFS AND PRACTICES

The use of the term "modern" is problematic when describing Native American beliefs. Many religious ways that are currently being followed are linked to those held by the ancestors, and the fact that contemporary Native Americans adhere to the beliefs does not mean that the religious ways should be labeled "modern." Traditional beliefs are held and revered by numerous living Indians of all tribes. One may be both a modern Indian and a traditional one.

Certainly, many contemporary American Indians live fairly acculturated lives. "Urban" Indians are often thought to be less "traditional" than their reservation counterparts. In this setting, the label, "traditional," refers to the social activities and values that each group holds, rather than to the religious beliefs themselves. Many "Urban" Indians adhere to "traditional" religious ways.

Many of the Native Americans who took part in the events at the Leon River Medicine Wheel may be placed in the category of "traditional" Native Americans because of their participation and their intentions to return for future events.

The traditional/modern categories, if used to label only living peoples, should be seen as more of a continuum rather than separate labels. If these categories are used to distinguish between the living peoples and their ancestors, then the term

"traditional" is problematic, as it seems to indicate that one cannot be both a modern American Indian and a traditional one. This stereotype is one that is frequently encountered by Native Americans, as the average American seems to expect that Native lifestyles have remained static since the late 1800s, and that the "traditional" Indians have long since died.

Christian Elements

Among the more modern elements of Native American religious beliefs and practices are elements of Christianity. Missionary activity resulted in converts to numerous denominations. Christian elements have also been blended with various Native beliefs, most notably in the case of the Native American Church.

With regard to the rebuilding and rededication of the Leon River Medicine Wheel, no Christian elements were related by those interviewed. In a short ceremony at the Comanche National Indian Cemetery, members of the Comanche Nation prayed for the spirits of their relatives buried there. Many Comanche are members of the Native American Church, a faith which combines elements of Native spirituality with Christian tenets.

A fair amount of antagonism was directed toward "white religion" and historical efforts to replace traditional Indian religion with various Christian faiths. No one interviewed seemed to have problems with the Native American Church and its Christian elements, or with contemporary Christian faiths in theory, but the loss and replacement of Indian religious beliefs was linked to the loss of Indian culture in general.

The difference between faiths was illustrated by Mr. Wise during comments on the need to protect ceremonies and sacred spaces. "I wish the white society could understand where we're coming from. I don't go to their temples and demand to know everything. I don't ask why does the Pope wear the cap, or what the altars mean. . . I don't

go asking him about it, why should they come and ask us?"

4.5 PROPER PROTOCOL FOR PROTECTION, ACCESS AND TREATMENT OF THE LEON RIVER MEDICINE WHEEL

As it is a sacred structure, access to the Leon River Medicine Wheel must be carefully controlled. Both material and spiritual concerns should be taken into consideration. Access to the feature and use of the Wheel are to be regulated with respect to both gender and ethnic concerns. In general, public access is to be strongly discouraged for fear of desecration through tourism. A possible chronology of religious activity was discussed, as was the actual use of the feature. Certain subjects regarding protocol cannot be completely discussed due to Native American religious proscriptions.

4.5.1 Control and Access

Tribal Restrictions

No tribal restrictions were listed by those interviewed. Both Mr. Wise and Mr. Youngman believe that the medicine wheel belongs to the Comanche way, and Mr. Youngman was pleased when members of the tribe who attended the ceremony asked him for more information about this wheel and its use. Although the Comanche were thought to have built the Leon River Medicine Wheel, access and use is not limited to this tribe, nor to Plains tribes in general.

Mr. Tallbull, Mr. Wise, and Mr. Youngman stated that this Wheel is for the use of the Indian people, and people from all tribes are entitled to attend. Mr. Tallbull discussed his own tribe's customs and how these differed from those of Mr. Wise. He does not have a problem with Mr. Wise leading ceremonies according to his own tribal beliefs. Mr. Youngman elaborated, "We don't say, 'This is for the Oto. This is for the Navajo.' We don't say that. We just say 'The People'."

Public Access

In order to preserve the sacred nature of the structure, public access should be restricted. Because of their experiences with the Big Horn Medicine Wheel, members of the MWA are adamant about limiting access to the general public. They did not want to see the Wheel opened to the kind of tourism that occurs at the Big Horn Wheel in Wyoming. Mr. Wise was uneasy about letting non-Indians know about the Wheel, saying that once they had learned a little, they would be back wanting to know more. He believes that non-Indians want to know about sacred spaces in order to make money from tourism, and that this is a desecration of Indian religion.

Many Native Americans are concerned about the selling of Native religious practices. Texas has many non-Indians who conduct ceremonies and charge moderate to exorbitant fees. It may be noted that one of these businesswomen attempted to participate in the first of the reburial ceremonies at Comanche National Indian Cemetery, but was asked not to interfere. Allowing public access could open up the Wheel to this sort of religious corruption.

In general, people who charge money for ceremonies are not considered true religious leaders. Money is often given as a gift to honor and thank people who conduct ceremonies, but it is never considered a payment for a ritual. Mr. Lonebear's uncle told him never to charge a fee for his ceremonies. He said that when he teaches people to conduct Sweat Ceremonies, he only requires that they not charge others to attend.

Public access to the Wheel could result in a loss of its spiritual power. The rocks that make up the structure are themselves sacred. In some tribal customs, each rock is related to an individual act of worship. The rocks, themselves, give the Wheel much of its power. Ms. Price spoke of the desecration of the Big Horn Medicine Wheel and how tourists had taken rocks away as souvenirs.

The power of the rocks was demonstrated when one man sent a rock back to the park to be replaced. He wrote that he had been having very bad dreams since taking it.

Many Native Americans are angry over the use of Native Ceremonies by so-called "New Age" groups. Mr. Wise discussed his struggles against a group in Wyoming called the "Rainbow People." These individuals believe that they have the right to use sacred spaces because of their claims that they are part Indian and part white. Their actions did not indicate that they held any sort of Native religious beliefs, and Mr. Wise challenged their rights to use certain mountains.

Mr. Wise felt that his rights to go to the sacred mountain and pray were being denied in order to allow access to this group. Mr. Youngman stated, "There are people out there who want to be Indian. That is why the whole Wheel is off balance. By calling themselves (Indian), they are causing friction, dividing The People. . ."

Gender Restrictions

Gender restrictions vary by tribe, and although Mr. Wise discussed this topic extensively, he declined to state absolutely that women should be forbidden from participating actively in ceremonies at the Leon River Medicine Wheel. He discussed female roles in other ceremonies, and indicated that he would feel more comfortable if women played a spiritually supportive role, rather than a physically active one. This attitude was at odds with the attitudes of many of the Indian women attending the ceremony.

A major point of contention had been the exclusion of women from the rebuilding of the Wheel. Most of the women who attended the ceremony had understood that they would be assisting in the physical work. Those who had wanted to help were somewhat irritated at being excluded.

Several of the Comanche women asked Mr. Tallbull about this, saying that women take the lead in Comanche ceremonies. His response and the general attitude of the men who were leading this ceremony was that the exclusion of women from the physical labor of the rebuilding was a traditionally appropriate way of doing things. Mr. Tallbull said that after women pass menopause they are capable of leading ceremonies because they will not conflict with the power of the Wheel.

According to Mr. Perkins, women who wish to pray at the Wheel are welcome to do so. Only men, however, are allowed to carry rocks in the rebuilding process. Women also participate in sweat lodge ceremonies at the site.

Ethnic Restrictions

Conflicting opinions were gathered with regard to non-Indian participation in the rebuilding ceremony and in other ceremonies at the Wheel. Mr. Lonebear noted that the sweat ceremony is used by many non-Indians. If these people had fasted and earned the right, he saw no problem with their participation. He noted, "We even had archeological people in there sweating with us!"

Mr. Wise similarly saw nothing wrong with the attendance and assistance of whites at the rebuilding ceremony. He said that he thought that they were respectful of Indian religion. He did not classify them as wannabes because they did not try to produce an Indian background in order to be included.

Mr. Tallbull was concerned about the presence of whites during the ceremony. He said that if it had been up to him, he would have asked them to leave. He had left the ceremony up to Mr. Wise, and did not protest the non-Indian presence. He admitted later that the Creator may have had a purpose in placing the whites at the ceremony.

The difference in opinions of the gentlemen interviewed may not be problematic in developing a protocol for use of the Wheel. As long as

access to the Wheel is not thrown open to the general public, it seems probable that those non-Indians who will visit the area will be accompanied by somewhat traditional people, and will therefore be suitably reverent.

4.5.2 Chronology of Religious Events

No set time table was given for religious events at the Leon River Medicine Wheel. Mr. Youngman mentioned that the people who use the Wheel will have to determine the timing of rituals themselves, however, he did discuss the seasons in which certain ceremonies traditionally take place. For example, in the spring, one prays for a good planting season, a good year for a garden, and a good berry harvest. The summer and fall are times for healing rituals. In the fall, one may pray for a good harvest. No specific dates were given for ceremonies at the Leon River Medicine Wheel.

4.5.3 Use of the Feature

The gentlemen all varied in opinion of who should be allowed to use the Wheel and for what types of ceremonies. They acknowledged that this was a reflection of the different tribal beliefs and practices. Mr. Tallbull stated that young men may come to the area for vision quests. He said that they should not go into the middle of the Wheel.

Mr. Wise discussed the Shoshone use of the Wheel, which varied from the practices mentioned by Mr. Tallbull. Entrance into the center of the wheel is permitted, but further description of the religious practices is not appropriate. This apparent contradiction with Mr. Tallbull's beliefs is a reflection of tribal variation.

Mr. Youngman was specific in listing people who are forbidden from the Wheel. He would ban: people with guns, people with hate in their hearts, people who are intoxicated, and women "in their moon." Similar menstrual taboos were mentioned by Mr. Lonebear and Mr. Tallbull.

4.5.4 Protection of the Wheel

Everyone interviewed was concerned for the safety of the Wheel. Most agreed that some sort of fence would be necessary to protect the stones. This would not disturb the spiritual strength of the feature, as the spirits at the Wheel are not limited by physical boundaries. The spirits may have the ability to protect the Wheel themselves, as illustrated by the example at the Big Horn Medicine Wheel, in which the man who had taken a rock was plagued by bad dreams until it was returned.

A wooden fence is currently under construction around the Wheel. The fence is approximately 3.5 ft high and sits 7 ft from the outer circle of stones. The area around the Wheel has been cleared to a distance of 10 ft from the outer circle.

The gate to the fence surrounding the Comanche National Indian Cemetery and the Leon River Medicine Wheel is locked and the keys are in the possession of Mr. Perkins and Mr. Richard Two Braids. If, as is hoped, a cultural center is constructed at the Wheel, the curator will keep a key and serve as a chaperon for those wishing to pray at the Wheel.

Mr. Youngman thought that a sign could be placed at the Wheel to tell people it was a sacred site and that they should be careful around it. This came up in a discussion about keeping people with guns from the Wheel, and the subsequent acknowledgement that the Wheel is built on a very large Army base. A sign could, however, cause trouble if it attracted curious visitors.

The proximity of Comanche National Indian Cemetery may provide some protection for the Wheel, according to Mr. Wise. He believes that people walking by may see the cemetery and realize that this area is a ceremonial one. ". . . anybody walking by a cemetery is respectful and knows what it is. They might see the Wheel as part of it." This comment should not be taken as indicating that the cemetery and the Wheel have a

specific link, other than both being sites worthy of respect.

4.6 MODERN RELIGIOUS USE OF THE LEON RIVER MEDICINE WHEEL

The Traditional Elders all stated that the Leon River Medicine Wheel is for the use of the Indian people. Mr. Youngman believes that its appearance at this time indicates both challenges and a hopeful future for Native Americans. The use and benefits of the Wheel will vary according to the individuals and groups who come to the Wheel, but it may provide both personal and tribal strength, as well as serve as a means of community integration. The Traditional Elders commented on the use of the Wheel, but this subject cannot be discussed casually, and the preparation and performance of rituals may not be divulged here.

4.6.1 The Powers

Personal/Individual Power

On this topic, variation occurred along tribal lines. Different people responded according to their own traditions, and it is not accurate to state definitely that the Wheel is a source only of one type of power or inspiration. Many interpretations are allowed and respected.

Personal power may be derived from the Wheel on a strictly individual basis, rather than as part of a specific event or ceremony. The type and extent of personal inspiration would vary from individual to individual, and is not easily quantified or described.

Mr. Tallbull discussed the Wheel and the surrounding area in relation to vision quests. This is a religious experience in which individuals seek spiritual knowledge and inspiration during a solitary ceremony. This could involve use of the area around the Wheel because of the religious strength of the site.

According to Mr. Wise, the only people allowed to go to the Wheel are those who have been called by a vision or dream. These individuals would arrive seeking knowledge and having received it, would return and share the information with the tribe. In this use, both personal and tribal power would be acquired.

Tribal Power

The different tribes could receive power from ceremonies held at the Wheel in both spiritual and nonreligious ways. The spiritual power and its method of acquisition are not entirely suitable topics of discussion for this report.

It should be noted that ceremonies held at the Wheel by various Indian tribes may serve as a point of tribal unification and definition. Because traditional knowledge continues to be lost, the production of a religious ritual is concrete evidence of devotion to traditional Native American ways of life.

Pan Indian Integration

Because the Wheel is to be used by members of many different Indian tribes, it should serve as a means of uniting the local Native community. The term "Pan Indian" is problematic, as it seems to indicate a larger, more pervasive world view. Individuals from separate tribes will gather together to conduct religious ceremonies at the Leon River Medicine Wheel, but this should not be viewed as indicating a complete unity of political views or perspectives.

4.6.2 Chronological Procession

At this time, no set dates or seasons for ritual events have been decided upon. This could change according to the religious needs of those using the Wheel.

4.6.3 Performance/Attendance Restrictions

This has already been remarked upon in Section 4.5.3.

Those interviewed gave different responses as to who should and should not attend or conduct ceremonies at the Wheel. In general, restrictions were given for gender, ethnic background, and personal condition.

4.6.4 Preparation of Facilities, Ceremonial Items, and Personal Preparations

Preparation of the Wheel and surrounding area and preparation of ceremonial items will be made by those conducting and participating in ceremonies. These may vary from ritual to ritual. Personal preparations may be described as cleansing one's body and spirit. An example would be a sweat lodge ceremony. This topic is not considered appropriate for discussion in a nonreligious setting.

4.6.5 Structural Division of Use Areas

According to Mr. Perkins, people will be allowed to pray around the Wheel, within and outside the fence. The outer circle of stones is only to be entered during a serious crisis, and then only by the Elders of the Leon River Medicine Wheel. This conflicts with information given and demonstrated by Mr. Wise. Mr. Perkins' information may come from Mr. Tallbull or Mr. Youngman and illustrate the difference in tribal beliefs.

4.7 SUMMARY AND CONCLUSIONS

In the course of these interviews, the Traditional Elders revealed much about use and treatment of medicine wheels and other sacred structures. They gave information that in some cases correlated with archeological and historical knowledge about medicine wheels and sometimes contradicted it. They mentioned the relation of

wheels to memorial structures, burial cairns, altars, and the Sun Dance.

They also discussed the use of the structure with both traditional and more contemporary issues in mind. The Wheel was not specifically linked to the concept of an afterlife, but it may serve today as a means of community integration. The size and shape of the feature was discussed, but this topic is restricted.

The relation of the Wheel to traditional beliefs and modern people was expressed by the Traditional Elders in their comments about the loss of tradition among many young Native Americans. They are aware that many contemporary Indians do not actively seek knowledge of traditional beliefs. They were encouraged by the number of people who attended the rededication ceremony, as this indicates that traditional ways are being respected by modern peoples.

They were explicit on some points, notably those involving access to the structure. This was probably due to their experiences with the Big Horn Medicine Wheel, where tourism is a major problem. They all strongly stated that they hope the Leon River Medicine Wheel is kept from desecration by the general public.

The Traditional Elders discussed certain uses of the Wheel, and its influence on tribes and individuals. They were more restrained when speaking about the actual procedure for using the Wheel because teaching about religious matters is a very careful process.

The Traditional Elders declined to speak on certain topics, especially during a "formal" interview. This was due to the fact that sitting down with a set list of discussion topics in mind is not the usual way of acquiring sacred knowledge. Certain types of information must be earned. My age, gender, and perhaps educational goals may also have provided unspoken restrictions.

All of the gentlemen interviewed were concerned that this information could fall into careless hands, and that it could be used by people with "New Age" beliefs. They all feared that this would allow the Wheel to be exploited both financially and spiritually. They recommend that this report be used for the education of Native Americans, but that the information not be casually divulged to others.

In conclusion, undertaking this project was both a gratifying and unsettling process. I was always aware during the course of the events surrounding the rededication that I was a Native American writing on a somewhat restricted topic to accompany an archeological report. These three aspects of this project could and did combine in sometimes unnerving ways.

For example, Mr. Tallbull gave information freely during the day of the rebuilding, probably because he was sitting in a group of Native Americans who were interested in learning what he had to impart. Asking him for information later brought a somewhat more guarded response; he was suspicious that what he said could be used for dishonorable purposes. I could only honestly state my intentions, and behave respectfully toward him, and this was what allowed me to learn more from him about the Wheel.

Although this was a sometimes difficult project, it was an interesting and important one. Rather than being told cold facts about a sacred structure, the people who know its inner workings have been allowed both to speak and to be silent, and they hope that the information in this report will aid and educate contemporary Indian peoples. In addition, this reliance on a Native perspective seems to be an important step in resolving conflict between archeology and Native Americans.

5.0 REGIONAL AND LOCAL ENVIRONMENTAL SETTING

J. Michael Quigg

Fort Hood is situated in Central Texas and encompasses parts of both northwestern Bell and southeastern Coryell counties (Figure 5.1). This portion of Texas occupies the transition zone from the humid east to the semi-arid west, and the environmental gradient is steep enough that distinct changes in landscape and vegetation are observable moving east to west across the Fort. Much of the following was extracted from James T. Abbott (1994) who presents a more detailed description concerning the local environment.

5.1 BEDROCK GEOLOGY

Geologically, Fort Hood is situated nearly 30 km west of the north/northeast to south/southwest trending Balcones Fault zone, which is a major physiographic and ecologic break within Texas (Woodruff and Abbott 1986). The escarpment separates the dissected Edwards Plateau to the north and west from the gently rolling upper Gulf Coastal Plain to the south and east. The physiography was primarily formed by faulting in the Miocene, although some structural adjustments probably began as early as the Cretaceous (Woodruff and Abbott 1986). Although the relief provided by the escarpment is typically less than 100 m (and barely perceptible in Bell County), major differences in character of relief, climate, soils, and vegetation are apparent between the two sides of the fault zone. Fort Hood, within the southern portion of the Lampasas Cut Plain, is notable for the presence of two distinct, flat-lying to gently rolling upland surfaces (Hayward et al. 1990; Nordt 1992) reflecting geological controls on long-term landscape development. The present landscape is a result of dissection of the eastern margin of the physiography of the uplifted Edwards Plateau, and reflects variability in the resistance of various geologic formations to erosion.

Fort Hood is in an area underlain by flat-lying lower Cretaceous rocks. The oldest rocks exposed on the fort belong to the Trinity Group, including the Glen Rose Formation and Paluxy Formation. The Glen Rose Formation consists of alternating beds of fossiliferous limestone, dolomite, and marl that achieves a total thickness of up to 114 m (375 ft), although only the upper part is exposed on Fort Hood. The formation is relatively thin-bedded and tends to alternate between relatively resistant limestone and erodible marl resulting in a characteristic stair-step topography. The Glen Rose is exposed primarily by the valleys of Cowhouse Creek and its major tributaries (House Creek, Table Rock Creek, Clear Creek, Turkey Run Creek, etc.) on the western side of the fort. The Paluxy sand consists of fine to very fine quartz sand with interbeds of shale and limestone that rests on top of the Glen Rose Formation.

Resting on top of the Trinity Group rocks are rocks of the lower Cretaceous Fredericksburg Group. The lowest unit is the Walnut Clay, which consists of highly fossiliferous clays, limestones, and shales up to 53 m (175 ft) thick. The Walnut Clay is widely exposed on the fort through lateral stripping of the overlying rocks, and forms the principle substrate of the broad, intermediate upland (Killeen) surface. Above the Walnut Clay lies the Comanche Peak Limestone, which consists of hard, thin-bedded limestones and shales that form the intermediate slopes of the higher upland (Manning) surface. The highest extensive rock unit is the Edwards Limestone, a thick-bedded, cherty limestone up to 18 m (60 ft) thick that forms the resistant cap of the high upland mesas. Geologic mapping by Barnes (1970) does not differentiate between the Edwards Limestone and overlying rocks of the Washita Group, including the Kiamichi Clay, Duck Creek Limestone, Fort Worth Limestone, and Denton Clay in the eastern half of the facility, but field examination of the area suggests that the massive Edwards is usually the uppermost rock unit on the higher surfaces. Edwards Limestone is the overwhelming source of

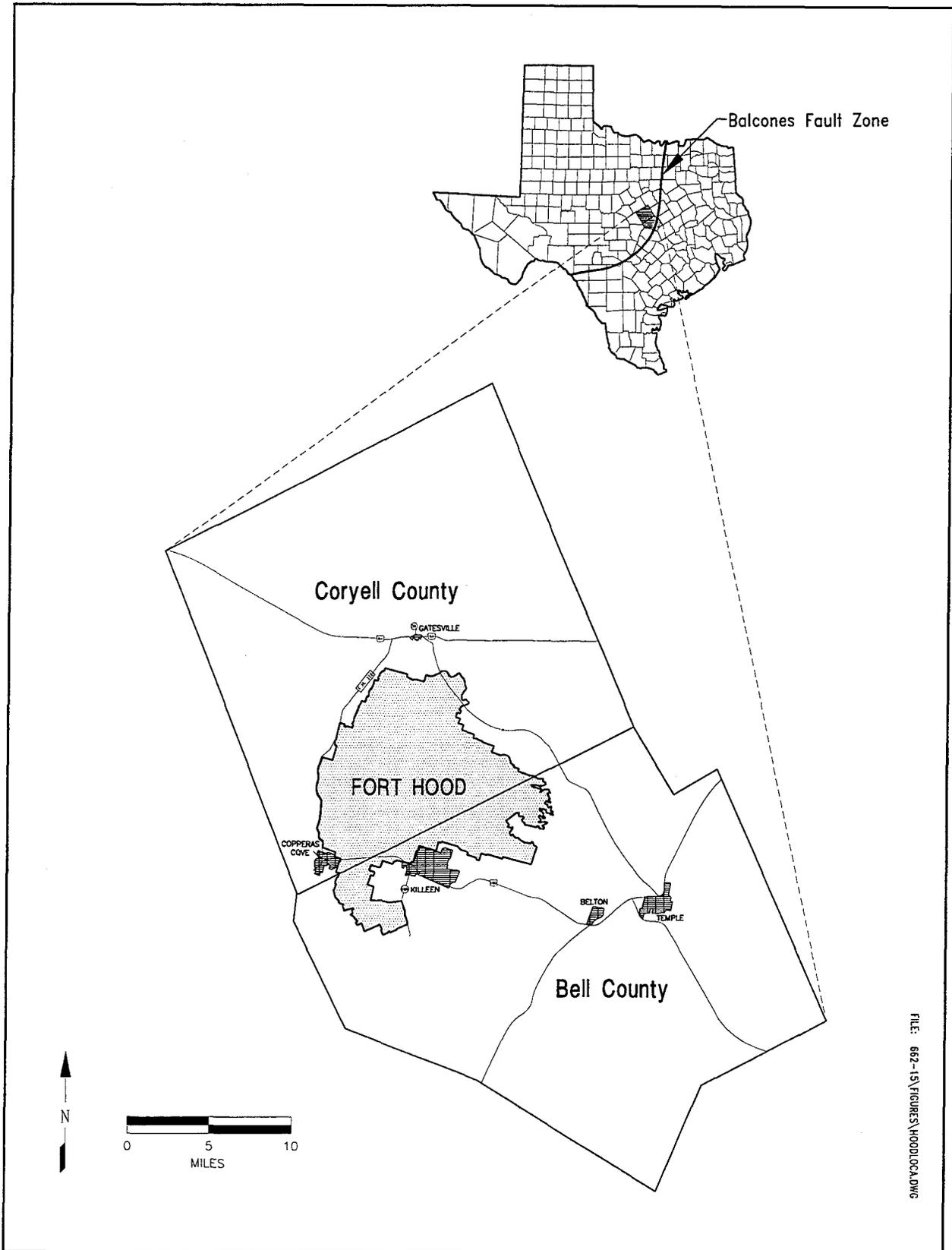


Figure 5.1 Location of Fort Hood in Bell and Coryell Counties, Texas.

chert on the base, occurring as tabular or nodular forms in the bedrock, as a residual lag on the surface and in soils on chert-bearing strata, and as alluvial and colluvial gravels.

5.2 MODERN CLIMATE

The modern climate of the Fort Hood area is humid subtropical, characterized by long, hot summers and relatively short, mild winters. Summer temperatures are high, with an overall average of 28.3°C (83°F) and an average daily maximum of 35.5°C (96°F) in Coryell County. Summers are also characterized by relatively high humidity, which combines with the temperature to provide sweltering summer days and balmy to sticky nights. Average temperature in winter is 9.4°C (49°F), however, rapidly moving invasions of arctic air originating over the northern Plains (known locally as "blue northers") are common, and can send temperatures plummeting tens of degrees in the span of less than an hour. The lowest temperature on record for Bell and Coryell counties is -20°C (-4°F), recorded in Temple on February 11, 1899. Overall, summers are unremittingly hot while winters are a sequence of short periods of bitterly cold and relatively pleasant days. The frost-free period averages 260 days, with freezing temperatures occurring after April 11 or before October 23 one year in ten.

Total annual precipitation is approximately 863 mm (34 inches). Rainfall occurs year-round, with frontal storms dominant in winter and convectional thunderstorms dominant in summer. A little more than half of the precipitation (55%) occurs during the summer months (April through September). However, this precipitation is concentrated in two peaks which occur in late Spring and early Autumn; the period from mid-June to late August is relatively dry, and the precipitation that does fall typically occurs as brief, localized thunderstorms of variable intensity. Snow is rare in the area, and measurable accumulations only occur once or twice a decade since most snow melts as fast as it falls. In all months, average

evaporation exceeds average precipitation (Larkin and Bomar 1983).

The climate of Central Texas is the result of several interacting factors. Synoptic weather patterns are dominated by meridional flow during the summer months and zonal flow in winter. The primary sources of moisture for all parts of Texas are warm Maritime Tropical air masses originating over the Gulf of Mexico, but moist Pacific air masses can provide considerable moisture at times (Carr 1967). During winter months, frequent frontal passages typically prevent moist Gulf air from invading inland as far as the Balcones escarpment, which result in the winter precipitation minima. In late spring, the frequency of the frontal passages decrease markedly, allowing moist gulf air to invade Central Texas. The precipitation maxima occurs in late spring due to thunderstorms generated in the warm, conditionally unstable air and frontal storms generated as infrequent late spring cold fronts encounter and force aloft the maritime air mass. The dry midsummer results from the dominance of a semi-permanent high pressure cell that develops over the Plains, which is broken as late summer easterly waves once again bring Gulf moisture to the region. Occasionally, unusual conditions in the Pacific can result in intense rains during the winter months. This pattern was responsible for the heavy rains of the winter of 1991-1992, when intense development of the El Niño current off the western coast of Mexico resulted in a strong influx of Pacific moisture that led to weeks of heavy rains and intense flooding. Such intense rains far exceed the ability of the rocky landscape to absorb the increase in precipitation, leading to catastrophic flooding capable of profoundly altering the landscape in a matter of hours.

5.3 SOILS

Soils on Fort Hood are the result of a suite of pedogenic processes that occurred under the influence of the semi-arid to subhumid climate prevailing during most of the Holocene. Important processes include the chemical

weathering of limestone and input of organic matter; dissolution, translocation, and reprecipitation of calcium carbonate; and formation, translocation, and residual concentration of clay minerals. In general, leaching has been insufficient to remove soluble bases from the profile and most soils are calcareous- and cation-rich. A few of the soils on the Fort, particularly on more stable parts of the high, upland, dominantly siliceous substrates, and the Pleistocene terraces of the larger streams, may reflect relict climatic conditions from the late Pleistocene when effective moisture was greater and leaching of the soils was more effective. These soils are typically thicker, more strongly leached, and more highly rubified than surrounding soils, and also commonly show signs of erosive truncation.

5.4 BIOTA

According to Gould (1975), Fort Hood lies in the southern part of the Cross Timbers and Prairies Vegetation Area. Allred and Mitchell (1955) term the vegetation of Fort Hood the Hill Country Savannah, while Kuchler (1964) identifies it as a Juniper-Oak Savannah. Blair (1950) places the area on the northeastern margin of the Balconian province, a short distance west of the boundary of the Texan province along the Balcones fault zone. All recognize that the biotic assemblage in the area of Fort Hood represents a transitional zone between elements of the Blackland Prairie to the east and the Edwards Plateau to the west.

5.4.1 Vegetation

A detailed examination of vegetation on the facility (Espey Huston and Associates 1979) indicates that the Fort as a whole is composed of 57% woodland and scrub, 38% grassland and savannah, and 5% developed urban areas, and includes 267 distinct species or varieties of plants. The eastern side of the facility (East Range) is typified by dense oak/juniper forest and scrub, while upland areas on the west (West Range) and south (West Fort Hood) are generally more open, ranging from

open forest to an open savannah populated with scattered stands of trees. Juniper forests are relatively rare, and typically indicate areas that were previously cleared. Grasslands are most common on the intermediate upland surface within the live fire area and in West Range, while the high upland surface is typically wooded. Riparian habitats are common along drainages, and exhibit a variety of hardwood species. The Impact area in the center of the base is dominated by grasslands even on the high upland surface, probably as a result of artillery impact and resulting fires. Mosses and liverworts occur in profusion around localized springs and seeps, and forbs, grasses, and other pioneering species are common in areas of vehicle impact.

Woody vegetation on Fort Hood is dominated by a few arboreal species, primarily ashe juniper (*Juniperus ashei*), live oak (*Quercus fusiformis*), Texas red oak (*Quercus texana*), Texas ash (*Fraxinus texana*), Texas persimmon (*Diospyros texana*), and cedar elm (*Ulmus crassifolia*). A variety of woody scrub, vines, and leafy species occur in the understory, including flamel leaf sumac (*Rhus lanceolata*), redbud (*Cercis canadensis*), Mexican buckeye (*Ungnadia speciosa*), fragrant sumac (*Rhus aromatica*), poison ivy (*Rhus toxicodendron*), mustang grape (*Vitis mustangensis*), and the ever present greenbrier (*Smilax bonanox*). Post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*), the dominant trees in the cross timbers, are of relatively minor importance on Fort Hood, which conforms more closely to the assemblage typical of the eastern Edwards Plateau. Mesquite (*Prosopis glandulosa*), typical of areas to the west, also occurs in relatively low numbers. A relict population of big-tooth maple (*Acer grandidentatum*) also occurs on the Fort, far removed from its natural range in the southern Rocky Mountains. Riparian habitats support a diverse assemblage of woody species, including pecan (*Carya illinoensis*), slippery elm (*Ulmus rubra*), burr oak (*Quercus macrocarpa*), black walnut (*Juglans nigra*), plum (*Prunus americana*), American elm (*Ulmus americana*),

netleaf hackberry (*Celtis reticulata*), and red mulberry (*Morus rubra*).

Grasslands on the Fort consist of a mix of species typical of both the tall-grass prairie to the east and short-grass prairie to the west. Common species include blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), Texas grama (*Bouteloua rigidisetata*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum avenaceum*), silver bluestem (*Bothriochloa saccharoides*), buffalo grass (*Buchloe dactyloides*), and bermudagrass (*Cynodon dactylon*). Equally common, and usually more abundant in disturbed areas, is a variety of forbs and weedy species including broomweed (*Xanthocephalum texanum* and *X. dracunculoides*), prairie-tea (*Croton monanthogynus*), painted euphorbia (*Euphorbia cyanthropora*), ragweed (*Ambrosia artemisiifolia*), triple-awn (*Aristida* sp.), and snow-on-the-prairie (*Euphorbia bicolor*).

5.4.2 Fauna

The Fort lies in the Balconian biotic province of Blair (1950) and includes wildlife species characteristic of the surrounding Austroriparian, Texan, Tamaulipan, Kansan, and Chihuahuan provinces. An inventory of species by Espey Huston and Associates (1979) documented the presence of 22 species of amphibians and reptiles, 80 species of birds, and 15 species of mammals. Many more species are likely to occur because the Fort lies within the range of over 48 species of mammals, 79 species of reptiles and amphibians, and 324 species of birds (Espey Huston and Associates 1979). Bird species occurring in the greatest numbers include the tufted titmouse (*Parus bicolor*), cardinal (*Cardinalis*), Carolina chickadee (*Parus carolinensis*), bobwhite (*Colinus virginianus*), house sparrow (*Passer domesticus*), and lark sparrow (*Chondestes grammacus*). The turkey vulture (*Cathartes aura*), while not occurring in numbers as great as the smaller birds, is a particularly prominent fixture on Fort Hood. Wild turkey (*Meleagris gallopavo*) is another local

species that was prominent and may have been more frequent in the past. Common mammals that occur include white-tailed deer (*Odocoileus virginianus*), northern raccoon (*Procyon lotor*), black-tailed jackrabbit (*Lepus californicus*), fox squirrel (*Sciurus niger*), gray fox (*Urocyon cinereoargenteus*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), and deer mouse (*Peromyscus maniculatis*). With the exception of the gray fox, predators are relatively uncommon, but documented species include the coyote (*Canis latrans*), and bobcat (*Lynx rufus*).

5.5 SUMMARY OF REGIONAL SETTING

Environmental aspects that would have made the Fort Hood area attractive to prehistoric peoples are numerous. One is the abundance of water available from the numerous springs and seeps that dot the landscape and from the stream and river network that they feed. A second important factor is the area's overall quantity and quality of chert that is profuse in many parts of the modern landscape. Local chert resources represent a material resource that would have strong appeal both to indigenous groups and to neighboring inhabitants of relatively chert-poor areas to the east, west, and southeast. A third aspect is the vast array of usable vegetation and animal resources in a confined region that provides protection from external groups and the harsh weather conditions.

5.6 LOCAL SETTING, SITE 41CV1505

A detailed study of the site's 1994 vegetation was not undertaken prior to this archeological investigation although a few selected plant species were collected and subsequently identified (Severinson, personal communication 1994). One 5 to 6 m² patch of fragrant annual penny royal (*Hedeoma acinoides*) was inside the inner ring, east of center, which were once under juniper trees. The general area of the Medicine Wheel contained many small bulbs of crow poison (*Nothoscordum bivale*). Small plants of the

Muster family were also present along with a few species of low growing unidentified grasses including grama grasses. Broomweeds (*Xanthocephalum texanum* and *X. dracunculoides*), although prevalent over much of Fort Hood, were not on site which indicate a lack of recent soil disturbance or overgrazing.

Carlson (1993:29) indicated that in July 1990 the site appeared to have been visited by cedar choppers as evidenced by the abundant dead cedar (juniper) branches across the site. Cut branches were removed from the medicine wheel prior to their mapping, but trees were not cut at that time.

Before the 1994 tree and brush clearing activities by AIREC, trees and brush covered most of the site area and the Medicine Wheel. Tree species at the Medicine Wheel were dominated by oaks and junipers. The oak trees varied in diameter from 10 to 50 cm. Junipers were much smaller than the oaks, with bases of the trunks no larger than roughly 30 cm in diameter. The 1990 Medicine Wheel map by Jackson and Smith revealed the trees and brush covered nearly two-thirds of the feature, with the tree line encroaching the outer ring on the west, north, and south sides.

This site falls within an area that was classified as having Topsey-Pidcoke soils (McCaleb 1985). Specifically, the Pidcoke soils dominate 41CV1505 as the solum is thin and overlies indurated limestone with quantities of fossil oyster shells. The depth of solum varied from 7 to 20 cm. This soil is moderately well drained with moderate slow permeability.

6.0 SITE DESCRIPTION

J. Michael Quigg

6.1 SITE 41CV1505

This site consists of a broad, prehistoric surface scatter of moderate amounts chert debitage and limestone burned rocks, infrequent stone tools, and a unique large stone alignment, known as the Leon River Medicine Wheel, distributed across a gently sloping intermediate upland surface in Central Texas (Figure 6.1). The cultural artifacts were dispersed over some 66,000 m² (Texas A&M University 1990 Site form). An Angostura point base, one unidentifiable dart point base, and one Scallorn arrow point were collected from the surface in 1990. These three diagnostic artifacts indicate some 6,000 to 7,000 years of potential human occupation from the late Paleoindian to Late Prehistoric periods. Potential mixing of deposits and poor context is reflected by the recovery of these time sensitive projectiles on this upland surface. The lithic debitage was all of locally available Edwards Chert. Besides the three diagnostic projectiles, other cultural artifacts observed or collected include two clusters of end scrapers, two disturbed burned rock features, a pestle, a large uniface scraper, a gouge, a biface mid-section, cores, choppers, hammerstones, and some historic materials. The historic items include metal fragments, whiteware ceramic sherds, stoneware, bottle glass, and tin can fragments scattered across the southeastern area of the site. No foundations, depressions, or other historical structural remains were observed.

A total of eight clusters of cultural material within the overall site were identified as features. The Leon River Medicine Wheel was designated as Feature (F) 1. Three small burned rock concentrations beyond the vicinity of F 1 were designated as Fs 2, 3, and 4. Features 5, 6, 7, and 9 are inside or in immediate proximity of the Medicine Wheel (see Figure 7.5 for locations). One buried feature (F 8) was discovered during

excavation at the Medicine Wheel and will be addressed in Section 7.3.

Feature 2 is a deflated burned rock concentration exposed in a shallow dirt road bed with rocks occurring over an area 9 by 3 m, roughly 30 m south of a gully. Feature 3 is another burned rock concentration exposed in a deflated area along the south edge of a dirt road about 20 m southeast of the repatriation cemetery grounds and covers about 3 x 3 m. Feature 4, noted in 1990, is a burned rock concentration covering an area about 3 by 5 m, located nearly 20 m southeast of F 3. These burned rock concentrations consist of small- to medium-sized angular limestone rocks mixed with a few tabular limestone pieces. The dispersed nature of these concentrations imply that the present features have little remaining context.

Feature 5 is an intact concentration of burned rock located in the northeastern quadrant of the Medicine Wheel, between the outer and inner ring. This concentration consists of a low, 1-m-wide pile of burned rocks, one and two rocks thick, along what once would have been the location of a spoke segment along the northeast side of F 1.

Other associated features and rock clusters (Fs 6 and 7) are outside but immediately adjacent to the Medicine Wheel. Feature 6, a small circular ring of eight rocks, is on the very outside edge of the outer ring on the western side of the Wheel. A few partially burned wood fragments inside the 35 cm diameter middle of the hearth create the appearance of a recent hearth. Feature 7, a roughly 2.5 m diameter cluster of mostly buried rocks, is on the very outside edge of the outer ring at the southwestern corner. This cluster appears as a flattened cairn with an ill-defined circular boundary. A cluster of five limestone rocks (no Feature number assigned) was under a small tree about 6 m beyond the outer circle, to the northeast. Feature 8, a burned rock cluster, was discovered buried in test pit (TP) 16 and will be discussed under the archeological results. A small

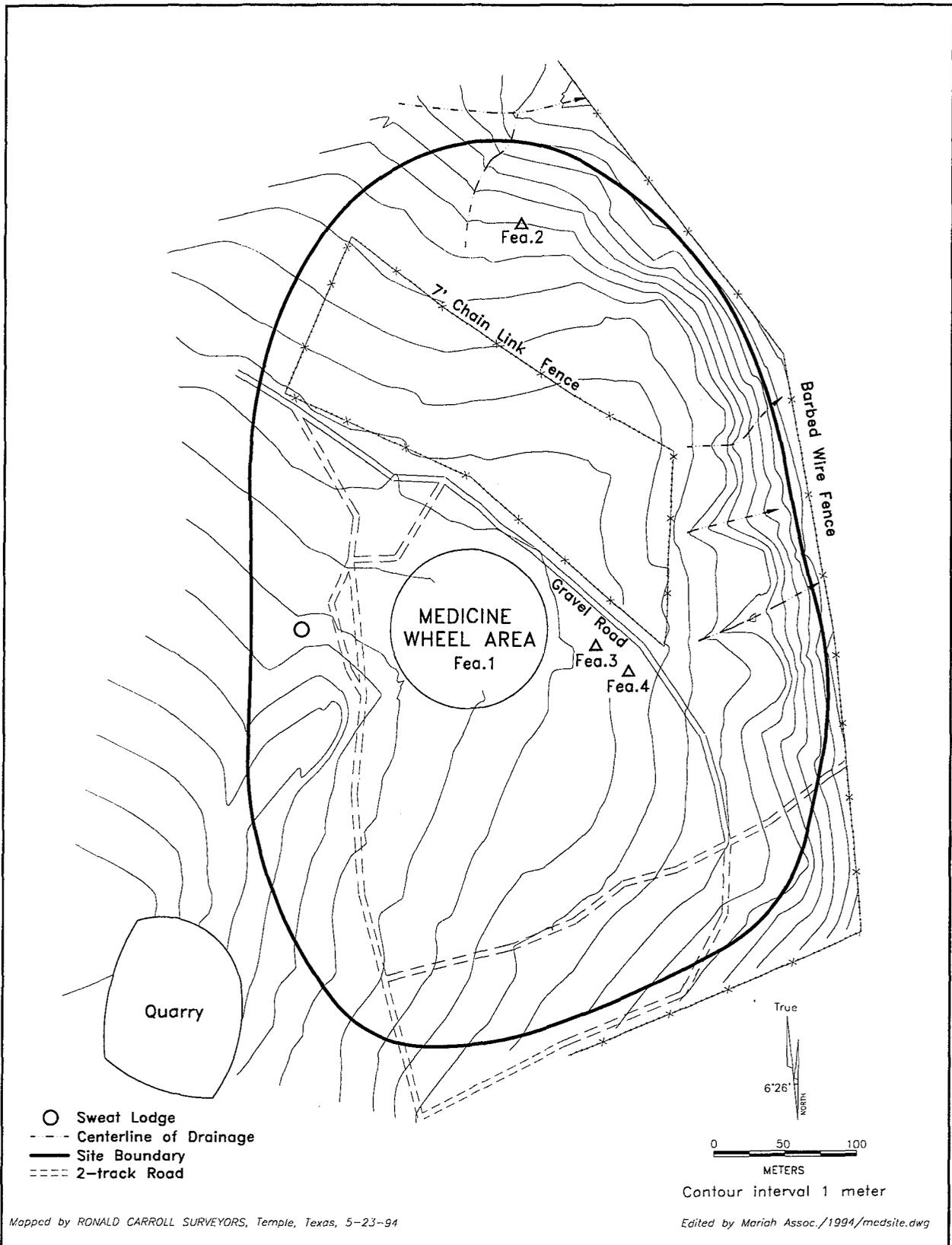


Figure 6.1 Site Map, 41CV1505.

hole, about 20 to 30 cm at the opening (no feature number assigned) was observed just outside the southern margin of the Wheel rocks and in among the small trees. The small dirt pile adjacent to the hole implies this is a rodent burrow.

Feature 9 is visible on the surface as a long linear, subdued relief ridge that crosses the western portion of the Medicine Wheel. The narrow ridge is about 32 m long and exhibits 5 to 10 cm of relief, which is most prominent on the eastern (or downslope) side. Small fossil oyster shell fragments are concentrated on top of the natural soil along this ridge. This feature shows up clearly in 1990 photographs taken of the ridge (Jack Jackson personal collection, frames 2, 3, 4, 6, 13, and 15) because of a distinct lithologic contrast between the ridge and the surrounding soil. The ridge underlies the rocks comprising the different components of the Wheel (inner and outer rings, and Spokes E and F), especially the inner ring which clearly rests on top of this ridge.

One apparent non-natural concentration of mostly small fossil oyster shell fragments in a low mound (not assigned a feature number), approximately 1.5 m in diameter and 35 to 40 cm above the surface, is located around a cut juniper tree stump on the southwestern corner of the Medicine Wheel. This mound feature is 1.5 m northwest of the southern end of F 9. This mounded concentration of fossil oyster shell fragments appears to be a man-made dump of sediments, rather than remnants of bedrock sediments accumulated around the base of an uprooted tree, since no adjacent depression from the "tree throw" is present, and the juniper stump in the mound does not appear to have been significantly displaced prior to being cut.

6.2 THE SURFACE STONE ALIGNMENT

The Leon River Medicine Wheel stone alignment (F 1) is not a completely intact feature (Figure 6.2). The western portion of the projected complete wheel was all that was exposed on the surface when discovered in 1990 (see Figure 1.2). The western side was covered in short, thin grass,

while most of the remaining area was covered in trees and thick brush. At the time of discovery, the eastern portion was postulated to have been either hidden beneath dense vegetation and organic matter, totally buried in the soil, or possibly removed.

This Medicine Wheel consists of segments of two large concentric polygon "rings" connected by at least seven pairs of parallel rows of rock lines forming spokes which connect the inner ring to outer ring. The inner and outer rings are open at the junctions with the spokes and so create the appearance of pathways linking the open interior space to the outside. Thus, the inner and outer rings are not complete. No central cairn or other rock feature was recognized inside the inner ring, although 11 limestone rocks were scattered 6 to 8 m east of the projected center (Figure 6.2). The overall alignment was constructed of locally available limestone rocks which vary from about 4 to 25 cm in diameter. Rocks were placed in single rows, one adjacent to another, to construct the overall pattern. Many rocks were half to three-quarters buried with many exhibiting lichen growth on parts or all of their exposed surfaces. Other limestone rocks are sitting on the surface near a recognized rock line, suggesting some post-construction displacement of individual rocks. No natural limestone rocks were on the surface inside the Wheel or in the general vicinity. Therefore, the non-embedded surface rocks not forming part of the stone alignment are thought to represent rocks displaced from the original alignment. The most likely source of these limestone rocks would have been the sloping terrain down to the unnamed creek east of the Medicine Wheel. Positive source identification is not possible given the land surface alterations in the vicinity of the Medicine Wheel.

The projected complete shape of this alignment would have been a 16 sided polygon with 16 paired spokes evenly spaced between the inner and outer rings (Figure 6.3). The projected outside ring would have been nearly 60 m in diameter while the inside ring is about 30.8 m east-west and 31.2 m north-south. Both the interior and exterior

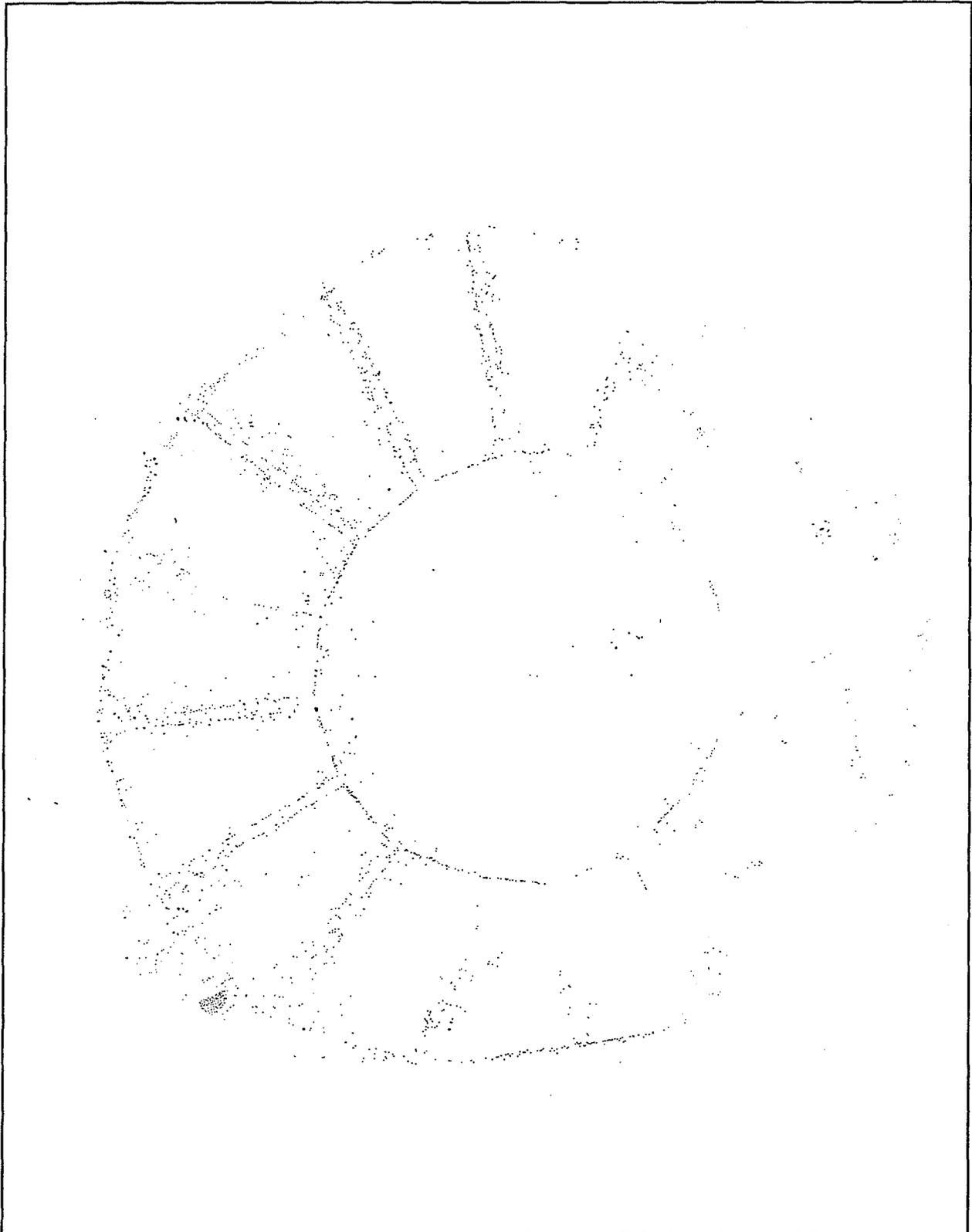


Figure 6.2 The 1994 Plan Map of the Leon River Medicine Wheel (drawn from overhead blimp photograph taken with a wide angle lens which may cause margin distortions).

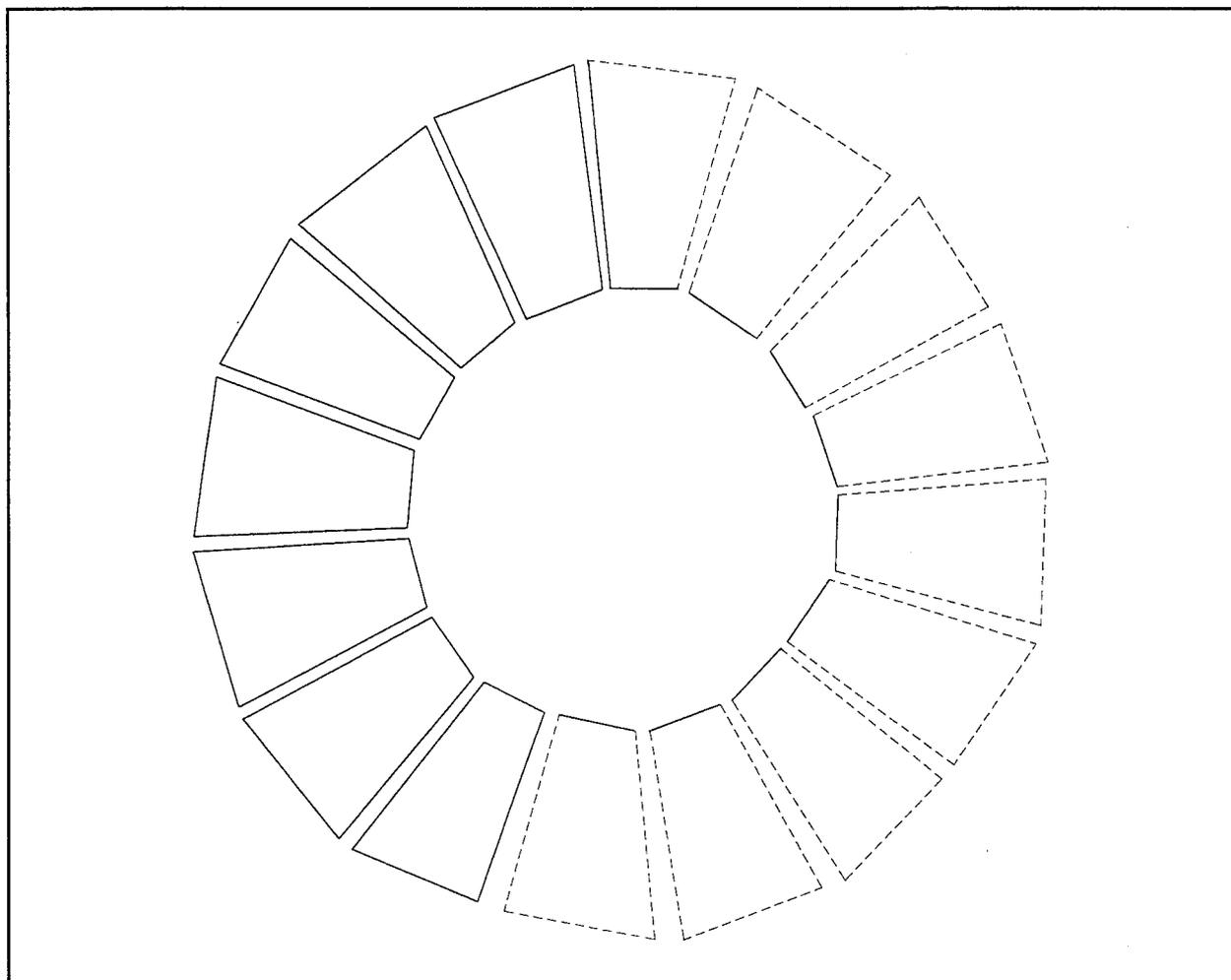


Figure 6.3 Projected Complete Shape of Leon River Medicine Wheel.

rings exhibited straight line segments (Figure 6.4) between the openings of the paired rows of stones forming each spoke (Figure 6.5). The inner ring is almost complete with well defined segments on all sides, except for the eastern side, where the tops of a few mostly buried rocks are now visible in about seven of the straight line segments.

The measurable straight line segments of the inner ring vary in length from 5.0 m to 5.4 m long and average 5.4 m, (Appendix C) and connect one spoke edge to the next (Figure 6.6). The openings created at the junction of the spokes and the inner ring vary from 107 cm to 60 cm with an average of 80.6 cm wide (Appendix C). Some of the

measured differences may be a function of one or two missing or displaced rocks.

The western third of the outer ring exhibited mostly displaced rocks, although rocks were sufficiently present to recognize seven sections of a 16-sided polygon. The entire eastern half of the outer ring was not visible on the surface even after removal of the tree and leaf litter. Very few buried rocks were observed and plotted on the eastern side (see Figure 6.2), and it is unclear whether these detected rocks were once part of the outer ring or part of the broken up bedrock sticking up through the shallow soil.



Figure 6.4 Straight Line Segments of Inner Ring on West Side.



Figure 6.5 Spoke F, View from Inner Ring (Foreground) to Outer Ring (Background).

A previously unobserved 22.5-m-long rock segment of the outer ring at the very southern side was uncovered under the tree litter (Figure 6.6). This rock segment was unlike the other intact western segments, since it cut straight across two 'panels' of the Wheel and lacked any openings at spoke junctures; this uninterrupted linear rock segment was also positioned closer to the inner ring unlike the segments along the western side (Figure 6.7). The seven straight segments which constitute the outer ring between the identified spokes, excluding the anomalous southern line discussed above, exhibit lengths that vary from

10.8 to 11.9 m with an average of 11.3 m (Figure 6.7). The openings at the end of the spokes or pathways in the outer ring vary from 65 to 100 cm wide with an average width of 72.5 cm. Since the outer ring has experienced considerable rock displacement, the size of pathway openings may be imprecise.

The present spokes or pathways consist of two parallel lines of rocks that connect the inner and outer rings (see Figure 6.5). These two rows of rocks create a single spoke and vary in length from 14.6 to 16.4 m with an average length of

15.5 m (Figure 6.7). The shortest distance between the inner and outer ring measured 12.8 m on the southern side, in the projected position of Spoke I. The greatest distance between the inner and outer ring is at Spoke A, opposite Spoke I, at a point where the outer ring is not well defined. Along the western side, where the wheel is mostly intact and best defined, the spokes lengths are consistently 15.4 m. The regularity of the spoke length changes at the location where tree lines are encountered on northern and southern sides. The spokes display a very narrow range of width between the two parallel rock lines of between 75 to 85 cm. Between the parallel rows of rocks forming Spokes F and G, are tiny, crushed, fossil oyster shell fragments, which appear to be an intentional lining of these spokes or pathways.



Figure 6.6 Southern Section of Outer Ring Which was Covered by Vegetation.

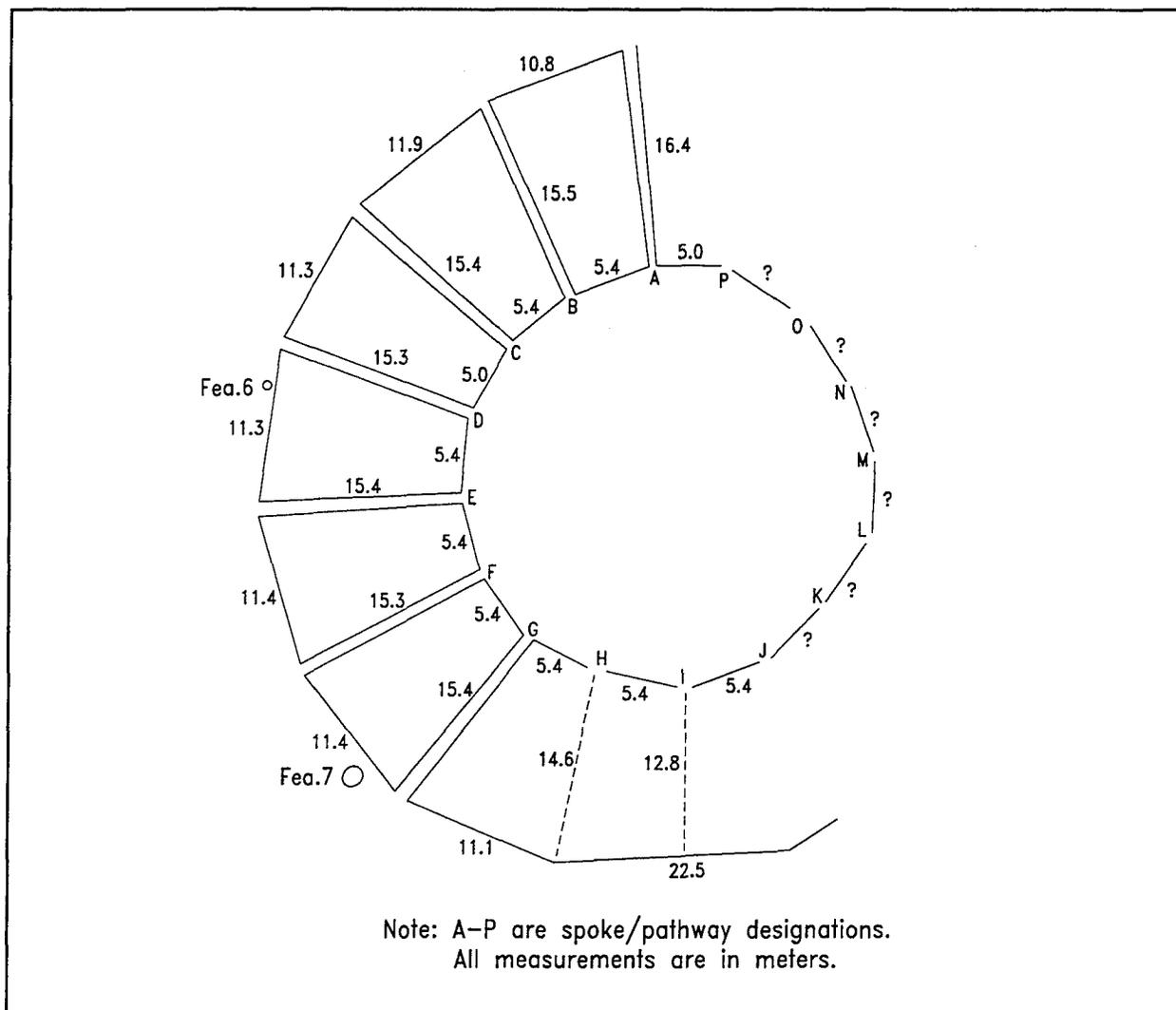


Figure 6.7 Measurements of Spokes and Line Segments.

7.0 1994 ARCHEOLOGICAL FIELD INVESTIGATIONS

J. Michael Quigg

The field investigations between 2 and 13 May 1994 at 41CV1505 were conducted by five archeologists, a geomorphologist, and several technical consultants. Onsite investigations were directed toward describing, assessing, and evaluating the features and artifact materials at site 41CV1505 and especially documenting the unique and rare surface stone alignment of the Medicine Wheel. It was anticipated that following the rebuilding ceremony on 18 May 1994, further investigation at the Medicine Wheel would not be permitted. Therefore, the two weeks of investigation was the sole opportunity to gather the necessary field data to assess this unique feature.

The 1994 field investigations were made possible by the tree clearing activities conducted by members of AIREC and Four Winds Intertribal Society, who removed all the brush and all but three trees from the Medicine Wheel. The three trees left standing inside the Wheel consisted of one large oak tree with a beehive on the very north edge of the inner ring (this tree was partially burned in May 1994 to control the bees during brush clearing activities), one large oak tree inside the inner ring of the south side, and one shorter juniper tree between two spokes on the west side, which contained prayer bundles.

The broad surface lithic scatter on site 41CV1505 was traversed by an archeologist and geomorphologist who inspected the surface, erosional areas, borrow pits, etc. Following the surface inspection, seven site assessment forms were completed which document the archeological and geomorphic potential and provide site-specific recommendations. These assessment forms were developed by Mariah for implementing prehistoric site assessments throughout Fort Hood during the 1992 and 1993 program (Trierweiler 1994). A new sketch map of 41CV1505 documented the overall relationship of the natural environmental characteristics to the archeological observations.

In addition, the site topography was mapped in detail using a total station mapping instrument. Included on that topographic map were natural features (drainages and hills); modern cultural features (roads, fences, and borrow pits); and such archeological phenomena as site boundaries, rock alignments, artifacts, features, and excavation units. During the initial site discovery in 1990, four shovel tests were dug outside the Medicine Wheel feature with negative results. Therefore, no further shovel holes or other excavation units were excavated beyond the Medicine Wheel limits during the May 1994 investigations.

The 1994 investigations at the Medicine Wheel used geophysical techniques including GPR and electromagnetic induction (EMI) to detect specifically arranged limestone rocks in the buried matrix which may have constituted the eastern part of the alignment. An electronic distance measuring (EDM) instrument operated by individuals from Ronald Carroll Surveyors was employed to accurately document the Medicine Wheel configuration, and the location of trees, rocks, features, and other necessary data points. Subsurface archeological and geoarcheological excavations, detail rock recording, and tree sampling were undertaken to aid in feature evaluation. Overhead blimp photography was employed to visually document this feature immediately following the archeological excavations, and again following the Wheel's reconstruction ceremony.

Since most of the Medicine Wheel's surface was initially covered with leaf litter, no attempt was made to conduct a systematic surface collection of prehistoric cultural materials. Army personnel had used this specific location in the past and military and recent historic artifacts scattered over the site. The large oak tree left on the south side of the inner ring had at one time contained a wooden deer blind built of milled lumber and round nails with several round nails still visible in the trunk where steps once had been. Military camouflage

netting, round nails, and flat glass were found on the surface around the bottom of this tree. During Mariah's 1994 field investigations, prehistoric stone tools and a sample of historic items were opportunistically collected from the Medicine Wheel's surface.

The following sections provide specific methodological information that relate to investigation tactics employed in assessing site 41CV1505 and the associated surface stone alignment.

7.1 GEOPHYSICAL INVESTIGATIONS

A geophysical study was initiated at the stone alignment to address the possibility that the eastern half of this stone alignment was buried below the surface. The details of EMI and the GPR methods and results are presented in Appendix A. The highlights of the field procedures are presented here. For control purposes, a 2 m grid was established over a 2,500 m² area which encompassed the visible middle part of the Medicine Wheel and the projected eastern side (Figure 7.1). The grid system was physically marked with non-metallic pin flags in 4 by 4 m blocks and laid out in a north-south and east-west orientation. Heavy rains the first day saturated the ground which gradually dried over the three day recording period. The differential moisture content of the solum during the recording period possibly affected the interpretations of the sensitive electronic signals. Initially, EMI was used at 2 m intervals in two directions followed by a second pass at the same spacing but at points between the first; thus, available data exists at essentially 1 m intervals. The EMI readings collected at 0.5 seconds translates to an on-ground sampling interval of about 0.25 m radius. A digital polycorder was used to accumulate the EMI data.

A 500 megahertz (MHz) antenna was employed during the GPR work along specific areas of the eastern and southeastern sides between the visually present inner ring and the unknown outer ring (see Appendix A; Figure A-3). The GPR was pulled

across surface perpendicularly to suspected buried rock alignments. Electronic data was recorded at 25 scans per second which translates to a sampling interval width of about 0.03 m. Data were recorded in the field by an analog recorder and signal processor which yielded a visual plotted signal for instant display to field check capabilities.

The preliminary geophysical results were discussed in the field to provide some guidance to the subsequent archeological excavations. Color preliminary maps with the EMI data were delivered to the field operation over the next three to four days to guide archeological investigations. However, detailed analyses of the data, the final supporting maps, and the commentary concerning the data were not fully available before leaving the field. Initially the positive anomalies were regarded as the targets of archeological excavations, however, we soon discovered that the less conductive locations, or negative anomalies (potential limestone rocks), were the appropriate areas to be targeted.

7.2 SITE AND FEATURE MAPPING

The initial investigations made a concerted effort to locate deeply buried rocks hidden beneath leaf litter and fully expose the detected rocks by clearing away the surrounding vegetation. The "weed wacker" machine was used to clear vegetation and exposed many previously undetected rocks, especially the line of rocks on the south side of the Medicine Wheel among the trees.

Using an EDM instrument, a three person mapping team focused on recording individual rocks in the stone alignment to facilitate feature documentation and the subsequent drawing of a detail plan map of the Medicine Wheel (Figure 7.2). Permanent datums were established outside the alignment on the west and south sides so that any potential future work could be linked to the same map from outside the feature. The two datum points consisted of a metal rebar placed in

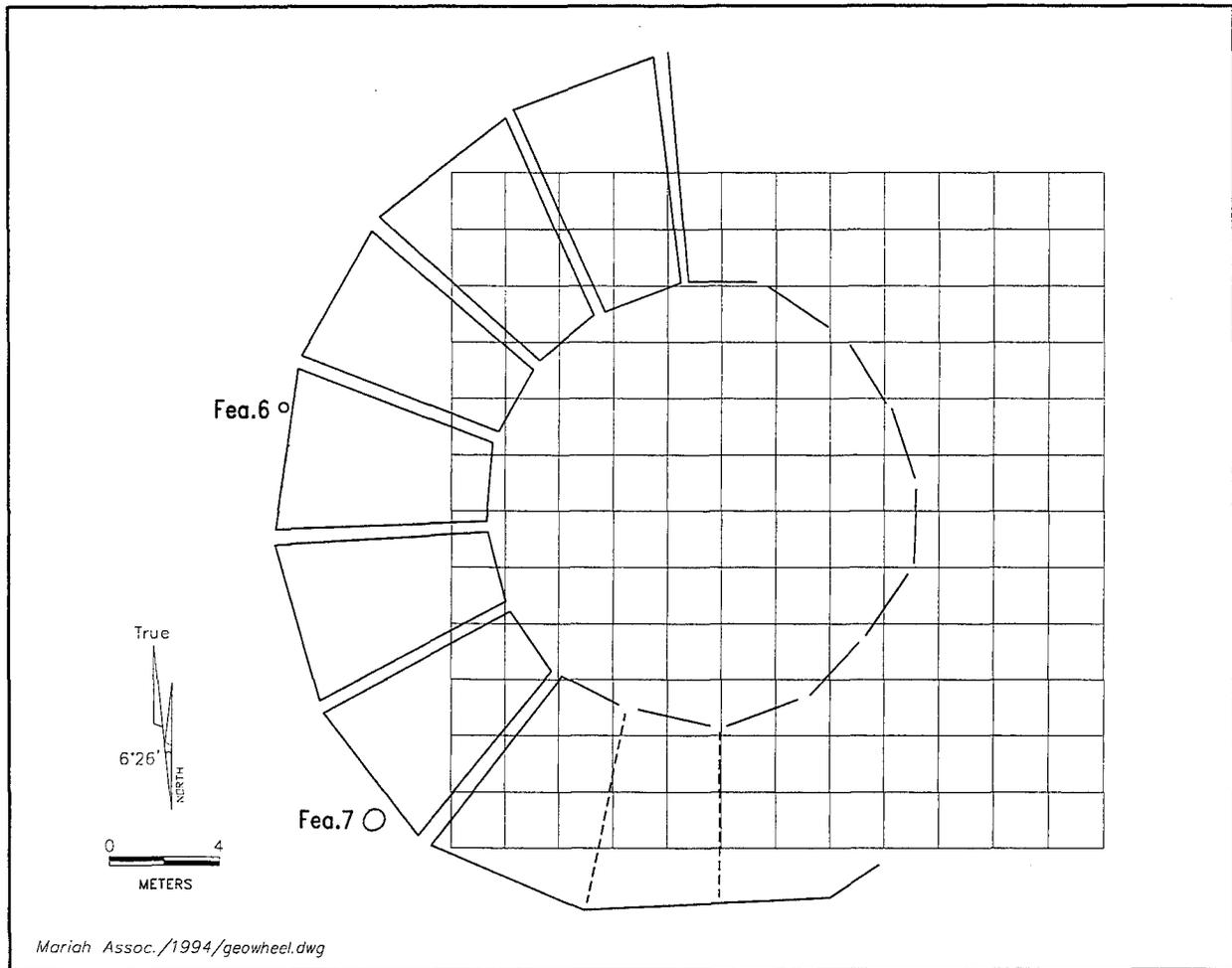


Figure 7.1 Geotechnical Grid Outline Used to Investigate Potentially Buried Rocks on East Side of Medicine Wheel.

a 25 cm diameter cement footing just below ground level. The 1994 Medicine Wheel plan map was not intended to document the exact position of every rock visible on the surface, but rather to document sufficient rock positions to fully define the precise form of this surface stone feature, various associated features and materials, and feature-specific topography. The nearly 800 collected data points obtained for the rocks and other selected objects of interest, such as specific trees sampled and collected artifacts, were entered into AutoCAD 12 for the production of maps.

Preliminary Medicine Wheel plan maps were generated by the second day of the field session, and were used in the field to guide and record the ongoing investigations. Following the completion of the archeological excavations on 13 May, the survey crew returned to record all the excavation units and other objects of archeological concern under the direction of an archeologist. These data points were merged into the previous data to produce the final maps of the alignment and the overall site setting. These maps were produced on large paper copies and an electronic disk version for AutoCAD 12 manipulation.

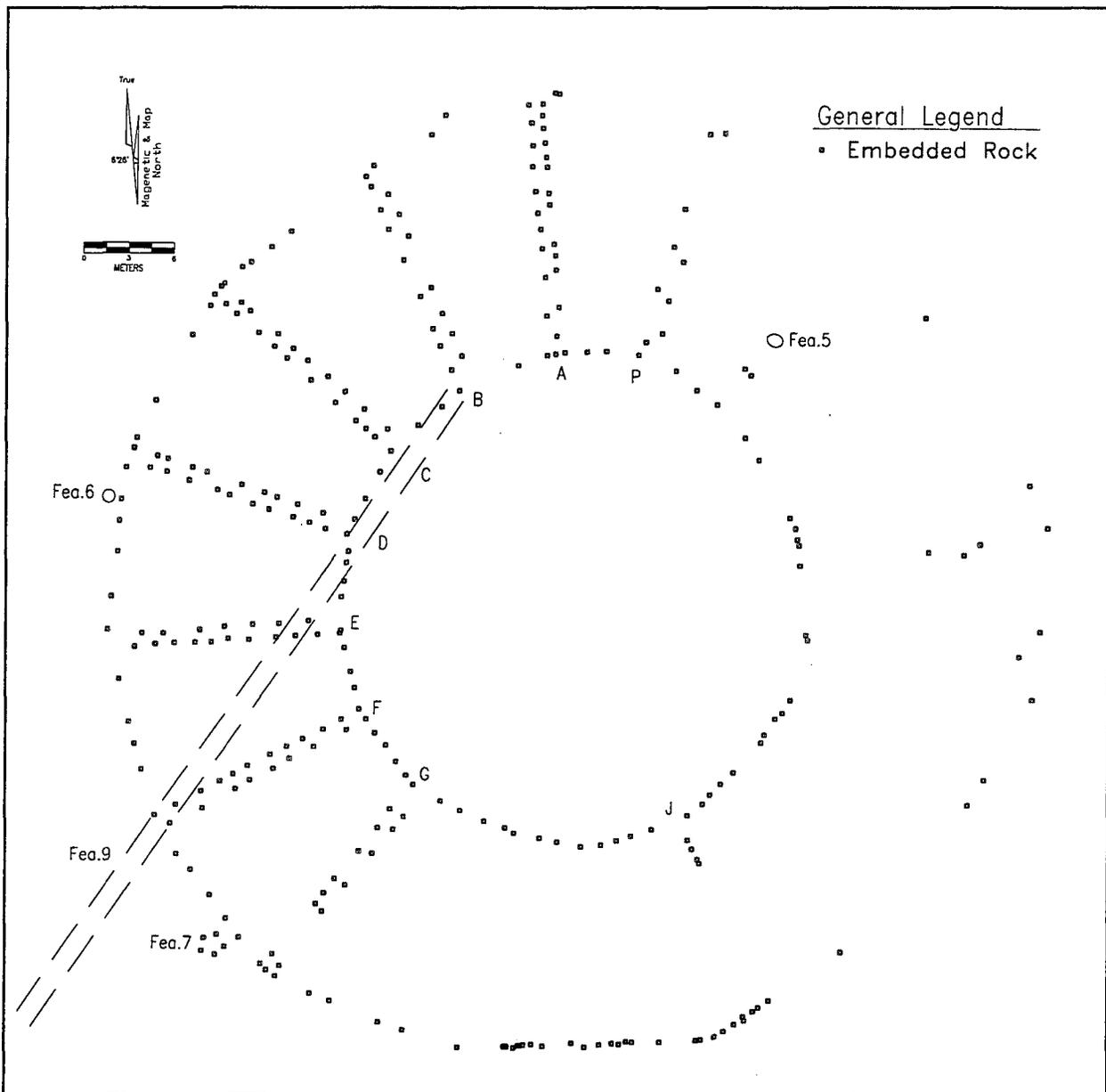


Figure 7.2 1994 Plan Map of the Leon River Medicine Wheel.

7.3 EXCAVATION METHODS

The subsurface archeological excavations used a range of excavation unit sizes consisting of 1 x 1 m, 1 x 3 m, 1 x 4 m, and 2 x 2 m to serve as horizontal control. These units were judgementslly placed to investigate various parts of the Medicine Wheel alignment and to extract specific kinds of information. Some excavation

units were placed to explore the context of associated artifacts, especially those inside the inner ring, such as units 6, 8, 33, and 35; others (units 1, 2, 11, 12, and 18) were carefully positioned to examine specific rock alignment sections forming part of the Wheel (Figures 7.3 and 7.4); still other units were placed over identified ancillary features (units 3, 10, and 17) or units used to investigate buried rocks which

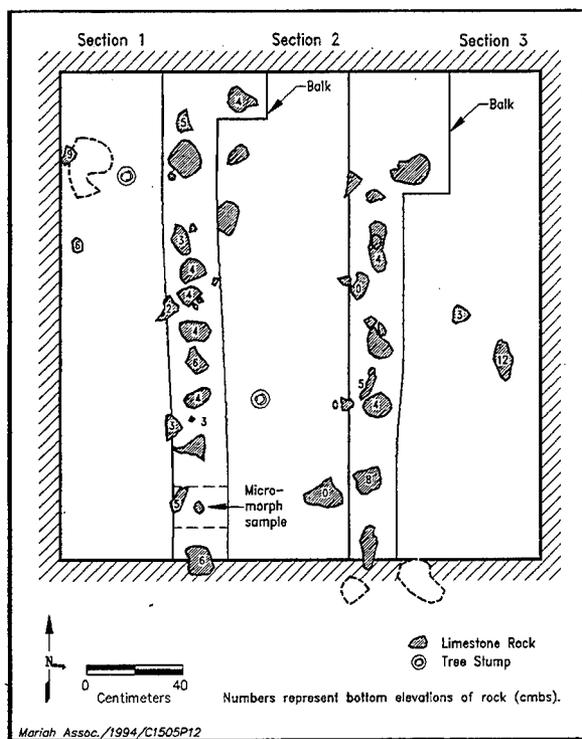


Figure 7.3 Test Pit 12 Over Juncture of Spoke A and Outer Ring.

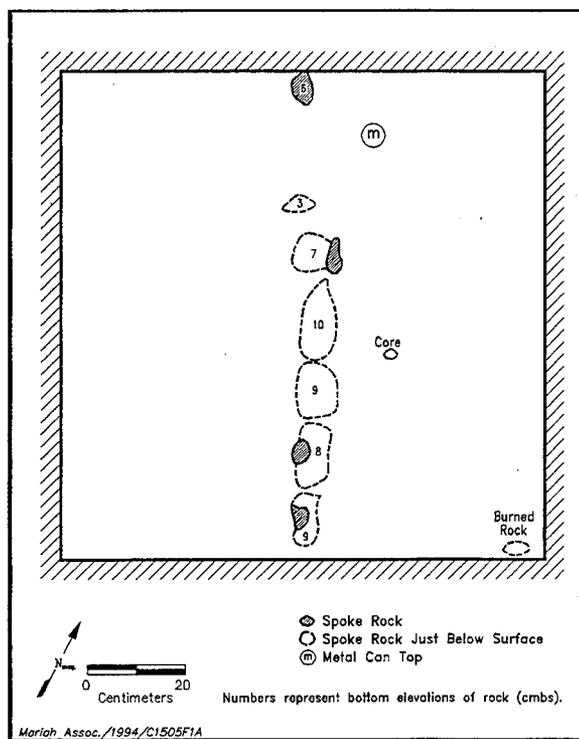


Figure 7.4 Test Pit 26 Over Buried Portion of Spoke J.

might be part of the original Medicine Wheel alignment as determined by the EMI data (units 4, 5, 19, 23, 24, 25, and 26) (Figure 7.5).

For vertical control, most test units were excavated as a single level which varied in thickness from 5 to 20 cm below surface (cmbs); the only exception was in TP 31 where natural and cultural stratigraphy dictated the use of multiple arbitrary levels. Artifacts, charcoal, snails, and so forth, were collected from all subsurface excavations.

A single level record was completed for each excavation unit regardless of its size. The level record provides a documentation of excavation depths, soil observations, the material recovered, samples and photographs taken, and a summary of the excavated level.

Where the unit was larger than 1 x 1 m, the size and shape was drawn on a separate sheet of graph paper and discovered artifacts, rocks, location of

samples, etc., were plotted on these drawings. After excavations were completed, each unit was photographed for a permanent record.

Profile drawings were not completed for all excavation units, since the overall sediment profile was shallow and did not reveal obvious soil layers or color changes above the bedrock. The geoarcheologist documented the stratigraphy of selected units. Excavation units 21 and 31 (which focused on F 9) were specifically dug by the geoarcheologist to obtain first-hand geomorphological and stratigraphic information. The geoarcheologist was on site at all times to examine the excavated units and provide immediate interpretation to help guide excavations.

Samples for various analyses were carefully selected, collected, bagged, and labeled. These samples included charcoal, bulk sediment matrix for floatation of charcoal and other botanical remains, small blocks of matrix for micromorphology studies, matrix for texture

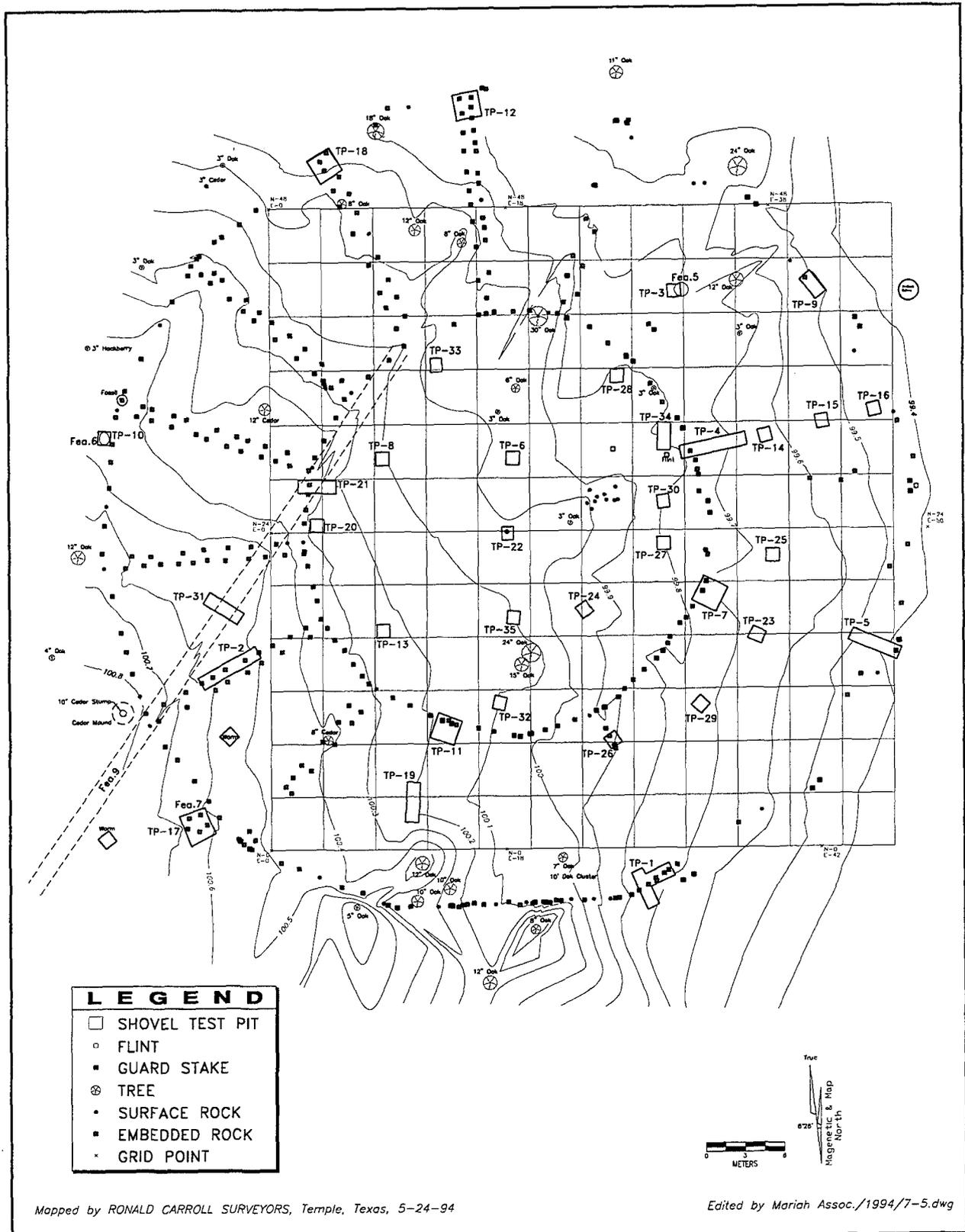


Figure 7.5 1994 Plan Map Depicting Excavation Units, Features, Medicine Wheel and Other Attributes.

analysis, *Rabdotus* sp. land snails, and other materials. Charcoal and *Rabdotus* sp. snails were two items which were intended for radiocarbon and epimerization dating, and special attention was paid to locating and recovering these items. Sediments were dry screened through 1/4-inch mesh hardware cloth; any artifacts were collected, bagged, and labeled.

Concentrations of cultural rocks or artifacts were identified and assigned feature numbers based on the judgement of the field archeologist. Subsequently, each feature was then dealt with in a more comprehensive data recording strategy. A feature form was completed which documented construction details, stratigraphic position, associated artifacts, and collected samples. Features 1 and 5 through 7 were clusters of surface materials inside the Medicine Wheel feature, while Fs 2 through 4 were clusters of cultural material outside the stone alignment.

7.4 ALIGNMENT ROCK RECORDING

Individual rocks identified as part of the medicine wheel had specific attributes recorded which included length, width, thickness, weight, shape, depth embedded in sediment, rock type, presence/absence of lichen, presence/absence of a calcium carbonate beard, and judgements of whether or not the rock was in situ. These attributes were linked to specific rocks plotted with the EDM instrument, which documented their specific locations within the Medicine Wheel feature. Thus, a rock with an assigned EDM number of 134 reflects the actual shot number whose precise location is recorded by the EDM instrument. The rock attribute data collected was from a sample of rocks incorporated in the outer and inner rings, and the spokes. Rock depths were measured from ground surface to the deepest part of each rock. Rock weights were obtained using a fish scale accurate to 1/4 kilogram. Distance measurements were made to the nearest centimeter. The shape of each rock was subjectively documented as either angular, round, or blocky. Besides documenting attributes on a

sample of Medicine Wheel rocks, most large buried rocks discovered during the excavations were documented in the same manner.

7.5 TREE SAMPLING

Since the 1991 dendrochronology performed by David Journey (1992) was successful in determining the ages of three oak trees, it was anticipated that this technique would be helpful to determine the relative age of this medicine wheel. The 50-cm-tall tree stumps which remained following the hand clearing effort became targets for sampling. No new trees were cut. Slabs of oak trees, 3 to 7 cm thick, were cut with a chain saw near the base of selected trees and collected for potential analyses. Fifteen slab samples were collected from trees ranging from 8 to 55 cm in diameter. None of these samples were as large as the trees sampled by Mr. Journey in 1991. The location of the sampled trees was recorded using the EDM. Recovered wood slab samples were numbered with the EDM shot numbers and were retained for possible analysis.

7.6 BLIMP PHOTOGRAPHY

A photographic specialist was hired to take low altitude, overhead photographs of the stone alignment following the excavations to document the archeological investigations and record the overall stone alignment configuration. The initial set of photographs was taken the morning of 13 May 1994. A tethered 7.3 m (24 ft) long helium-filled blimp was used with a patented leveling device that allowed photographs to be taken from elevations ranging from 3 to 61 m (10 to 200 ft) above the surface. The ground operator guided the blimp into position with the aid of the wind. The camera was mounted below the blimp and was capable of rotating 360°, tilting 90°, and focus on small objects using a power zoom lens. The operator was able to see the target through the camera lens prior to taking the picture. A second photo session was undertaken on 30 May 1994 which documented the reconstructed Medicine Wheel (see Figure 1.3). Ten 5.5 x 4.0 cm (2.25

x 1.5 inch) color negatives, were obtained from for each of the two separate photographic sessions.

7.7 LICHEN STUDIES

Each rock was visually examined to identify the presence of lichen. Since 64% (160 out of 249) of the recorded rocks exhibited some lichen growth, a decision was made to explore the use of lichenometry to help determine the age potential of the feature (Bradley 1985:112-119). A few selected rocks were collected because they contained different types of lichen growth and represented the different segments of this feature. A lichen specialist examined the rocks for the kinds of lichen present, their growth rate if known, and other conditions that might lead to delineating the approximate length of times these rocks had been in place in this feature.

7.8 GEOARCHEOLOGICAL INVESTIGATIONS

Charles Frederick

The geoarcheological investigations were designed to complement the archeological excavations by addressing specific issues of formation process and stratigraphy that would provide information on the time elapsed since construction, and the terrestrial process responsible for near surface modifications during that period. The apparent absence of the eastern half of the feature initially led us to hypothesize that it was present but buried in this portion of the site. This hypothesis was tested by geophysical methods, as well as more traditional means of evaluation. A one-inch-diameter soil probe was used to obtain information on the depth of the solum (depth to bedrock) across the site on a 4 m grid. The soil from each probe was collected in 5 cm increments in order to be used for additional geochemical study at a later date, if warranted. The solum thickness data was then gridded and a contour map produced and subsequently compared with the results of the EMI survey.

An extensive surface feature reconnaissance on the site in the Medicine Wheel's vicinity was undertaken to obtain an impression of terrestrial processes that were active in the area. In addition, several different surface attributes were recorded on the grid established for the geophysical investigations to evaluate the origin and influence of the site surface's microtopography. Overland flow or sheetwash is one process capable of moving significant quantities of sediment on gentle slopes and we postulated that such flows could redistribute enough sediment to bury the feature in a relatively short period of time, especially if the surface upslope had been disturbed during the historic period. After a relatively heavy thunderstorm it became apparent that overland flow was active on site and that its occurrence was not uniform across the feature. Specific corridors or preferential flow lines were present and could be observed during a rain or after a rain by observing the location and size of leaf litter debris dams. After one such rain, the orientation and size of leaf litter debris dams across the feature were recorded on a 4 m grid using a brunton compass to document the location of the major overland flow axes. A compass reading oriented normal to the long axis of the debris dam was used to construct a map illustrating the intensity and direction of overland flow across the feature. The location of the major flow axes was also drawn at that time. During the initial stages of the field work, we anticipated that comparison of the solum thickness with areas of active sheet erosion would be useful in understanding and explaining the burial of the Medicine Wheel features as well as provide information regarding the relationship, if any between soil thickness and overland flow.

While making observations on the intensity and distribution of overland flow activity, awareness of other terrestrial processes influencing soil development and transportation in the immediate vicinity of the Medicine Wheel was increased and additional observations were made. In particular, the incremental accumulation of leaf litter beneath trees and worm activity appeared to be the most likely processes involved in burial of surface

objects like rocks associated with the feature. Most of the live oak trees observed on the feature occupied broad, low-relief (< 10 cm) mounds and the major overland flow corridors occupied the areas between these mounds. Therefore, a systematic observation of the occurrence of leaf litter was made to see if there was any correspondence between the accumulation of leaf litter and overland flow. Bioturbation by surface casting earthworms was another process capable of translocating fine earth soil material and would thereby result in the incremental burial of the feature through time. Standard observations on the location and frequency of surface casting earthworm activity were taken, and two 1 m² plots were established to evaluate the rate of soil translocation by earthworms.

In addition to investigating specific geomorphic processes influential in the formation and maintenance of microtopography, one particularly anomalous microtopographic feature was investigated in detail. Feature 9 is a long (> 32 m), relatively narrow, low-relief ridge which forms a straight, northeast-southwest oriented line across the western half of the Medicine Wheel. This feature would not be very obvious were it not for the fact that it is composed of a different lithology than the surrounding surficial soil. Specifically, F 9 is composed of Cretaceous age oyster shell gravel, the texture and color of which make it stand out against the dark colored residual soil that dominate the surface of the site in the vicinity of the Medicine Wheel. Besides its anomalous appearance, this feature was investigated because it appeared to rest on top of the natural soil but lie beneath the rocks of the Medicine Wheel. At the time it was first observed, this relationship suggested that the feature may provide stratigraphic information lacking elsewhere on the site. Two test pits were excavated into this feature using different excavation techniques, and in each case a plan map of the floor was drawn one or more times, and at least one wall was cleaned, described, and drawn after the unit was terminated. The stratigraphic information obtained from these

excavations provide a critical link in understanding the age of the Medicine Wheel.

Another dating technique applied at this site is a relative age dating technique that has been employed at investigations of stone alignments (tipi rings and effigy sites) on the Great Plains. This process technique is known as boulderflow, and has also been referred to as the "Dormaar test" after the author who first described the technique (Dormaar 1976). Dormaar (1990:205) defines the process of boulderflow as "the effect of water flowing over a boulder on the soil underneath" and through time this process results in an intensification of the soil profile beneath the boulder. Abbott (1987) has noted that the phenomenon described by Dormaar is consistent with an increase in soil moisture which occurs beneath a boulder in part due to concentration of water on a specific place by the boulder. Over time, the increased weathering of the soil beneath the boulder leads to measurable differences between the soil beneath boulders placed on the surface at different times, or between the soil beneath a boulder and the adjacent soil not covered by a boulder. A number of specific chemical alterations of the soil profile have been described by Dormaar (1976), but only one of these is employed in the field application of this technique. Field application of this technique involves applying dilute hydrochloric acid to the soil profile beneath a boulder in order to examine the depth to the top of the calcic horizon, which is then compared to the deflection observed beneath the natural soil adjacent to, but far enough away from, the boulder so that it is not influenced by the boulderflow process. In this study, we selected several boulders in different parts of the wheel and then used a 1 inch diameter soil probe to core beneath each boulder. A second core or control sample was taken from the surface about 50 cm away from the boulder in question in a manner similar to that performed by Abbott (1987; 1988). Eight boulders and control cores were sampled in this manner and tested in the field using the technique applied by Dormaar (1976) and subsequently modified by Abbott (1987). No

calic horizon was observed in the soil at the site, so the qualitative application of this method in the field failed to provide useful information. The absence of a calcic horizon may indicate that the solum at the site is relatively young and insufficient time has elapsed since the soil began to form for complete leaching of carbonates to have occurred.

Four groups of samples were submitted to the Soils and Physical Geography Laboratory at the University of Wisconsin at Milwaukee for quantitative determination of carbonate content by means of a chittick apparatus in hope of discerning a difference in the carbonate distribution as a function of depth beneath the boulders quantitatively. The results of these analyses are discussed later in Section 8.5.

Taken together, the geoarcheological information generated during the excavation provides critical data regarding the age of the Medicine Wheel, as well as the processes which have influenced the burial of the feature since its construction. The results of these investigations are discussed in detail in Chapter 8.0.

8.0 INVESTIGATION RESULTS

J. Michael Quigg

8.1 HISTORICAL INVESTIGATIONS

Following discovery of site 41CV1505 and the associated surface stone alignment in January 1990, Fort Hood archeologist Dr. Jack Jackson conducted archival and oral history interviews concerning the unique stone alignment. An archival search of monthly records for Fort Gates, a military outpost funded in 1952 and located within 8 km of the Medicine Wheel (National Archives Microfilm Publication #617, roll 398), yielded no indication or mention of any type of Indian village or ceremonial site in this vicinity (Jackson, personal communication 1994).

Dr. Jackson conducted a phone interview with the wife of the previous landowner, Mrs. Troy Lee Hunt, in February 1990 (Jackson, phone record 1990). The Hunts lived on this property from the late 1920s until 1942, when they sold the property to the U.S. Government as part of the land acquisition for Camp Hood, a military training installation. Their house was located about 1.2 km south of the Medicine Wheel feature. Mrs. Hunt indicated their family farmed only the bottom lands, using the uplands for grazing, and she had no recollection of this feature being present on their land. Based on this phone conversation, Dr. Jackson rejected the hypothesis that the stone alignment was part of an ornamental garden by the former land owners.

In a subsequent phone conversation between Mrs. Hunt and Mike Quigg (phone record of 8 June 1994) it was learned she could not remember conducting any land clearing activities, construction activities using rocks, occasions to fill wet muddy roads with rocks, ponds, or rock quarry activities on their property. She did remember large oak trees near the house and barn, and junipers, "not as tall as people," on the hill. She either did not want to talk much about the property or could not remember much about

portions of her land far from the homestead. These two conversations with Mrs. Hunt yielded no definitive information concerning the existence of the Medicine Wheel. On at least one point, she did not correctly recall the areas they farmed, since the upland appeared farmed in the aerial photographs.

8.2 AERIAL PHOTOGRAPHY AND MAP ANALYSES

To investigate when major land altering activities occurred on or near 41CV1505 and the Medicine Wheel, various map files and aerial photographs were consulted. The U.S. Department of Interior, Geological Survey (USGS), EROS Data Center in South Dakota; the Cartographic and Architectural Branch of the National Archives in Maryland; and the Texas Natural Resources Information System in Austin were all contacted for available aerial photographs. The General Land Office (GLO) and the *Maps of Texas and the Southwest, 1513-1900* (Martin and Martin 1984) were consulted. Old topographic maps and earlier explorer's maps of various ages were inspected to determine the existence of any early references to a religious site, medicine wheel, Indian villages, place names with the word "medicine" in it, or prominent features appeared in the vicinity of 41CV1505.

An 1886 topographic reconnaissance map by the Department of the Interior, USGS, showed roads, railroads, towns, creeks and rivers, named isolated hills and gaps in the region, but nothing relevant occurred in the immediate location of 41CV1505. Since this 1886 map did not show the location of Native American camp sites, it was not unexpected that this Medicine Wheel would not have been depicted on this map even if widely known. Apparently, little development occurred in this region between 1886 and 1921, since the same base map was restamped and used after 1921.

Topographically, 41CV1505 is on the eastern sloping end of a broad upland some 12 m above a

small intermittent drainage. Considerable tree growth restricts visibility of the surrounding countryside. Six aerial photographs exist for the area. While the individual rocks of the Medicine Wheel feature are too small to be identified on these images, its location can be discerned from the vegetation patterns of the area.

The earliest aerial photograph available is from 2 June 1937. A second-generation negative was used to obtain prints with a subsequent enlargement made of the specific area of the Medicine Wheel feature. Since the site is on the very margin of the original photograph, long tree shadows exist in the target area. Because coarse photographic grain emerges from the enlargement, it is impossible to determine if the Medicine Wheel was present at the time of the photograph. In general, the 1937 aerial photograph reveals houses, roads, hills, valleys, cultivated fields, and vegetation. This photograph shows that most of prehistoric site 41CV1505 was cultivated, with only a small, triangular section covered with some trees and grass. The Medicine Wheel lies in this uncultivated area. The Wheel location is based on a comparison of the vegetation pattern observed in the 1937 aerial photograph with the on-ground vegetation pattern observed in May 1994. The large live oak tree on the south side of the inner ring and the oak "bee tree" on the north edge of the inner ring both appear on the 1937 photograph, but the juniper "prayer" tree on the northwestern side, between the inner and outer ring is not visible. Juniper trees are absent in the general vicinity of the Medicine Wheel, with most trees appearing to be species of oaks, or at least deciduous trees with leaves. Cultivated fields lie to the west, northwest, and south sides of the projected position of the Medicine Wheel. No houses, roads, or trails are apparent on, or near the Medicine Wheel. A small unplowed, grass-covered hill with an eroded eastern side is visible a few hundred meters to the southwest of the Medicine Wheel. The southeastern side of the hill displays a long, narrow, water-filled cut which is probably the remains of a small quarry pit.

An enlarged section of a 5 August 1941 aerial photograph (scale 1:20,000) shows the previous cultivated fields still unvegetated, no change in vegetation at the Medicine Wheel location, the hill to the southwest is unchanged, but again, the coarse photographic grain of this enlargement hinders the detection of the Medicine Wheel feature and the evidence is inconclusive (Figure 8.1). The overlay indicates the location of the Medicine Wheel. Computer enhancement of this photograph was tried without success. The photograph was scanned into Adobe Photo Shop on a Macintosh computer and contrast stretching and edge enhancement were attempted.

The 10 October 1951 aerial photograph (scale 1:16,000) clearly reveals a long, narrow, water-filled rock quarry pit on the southeastern side of the grass-covered hill to the southwest of the Wheel location. A light nonvegetated line from the hill area is visible across the western side of the Medicine Wheel area (Figure 8.2). At least two spokes and the western half of the inner ring of the Medicine Wheel are visible on this photograph. The previously cultivated grassy areas remain obvious, although a few small juniper trees appear in parts of the field. Juniper trees have not yet invaded the Wheel feature area, but have intensified along the fence lines of the cultivated fields and on top of the hill to the southwest.

An enlarged 7 January 1966 aerial photograph (scale 1:20,000) shows the previously cultivated fields dotted with juniper trees, indicating that these fields are abandoned (Figure 8.3). The juniper "prayer" tree on the western part of the Medicine Wheel, is visible as a small dot, and the dirt road (light line) across the grass covered western part of the Medicine Wheel is still visible. Even with the good clarity of this enlarged photograph, the Medicine Wheel rocks cannot be discerned.

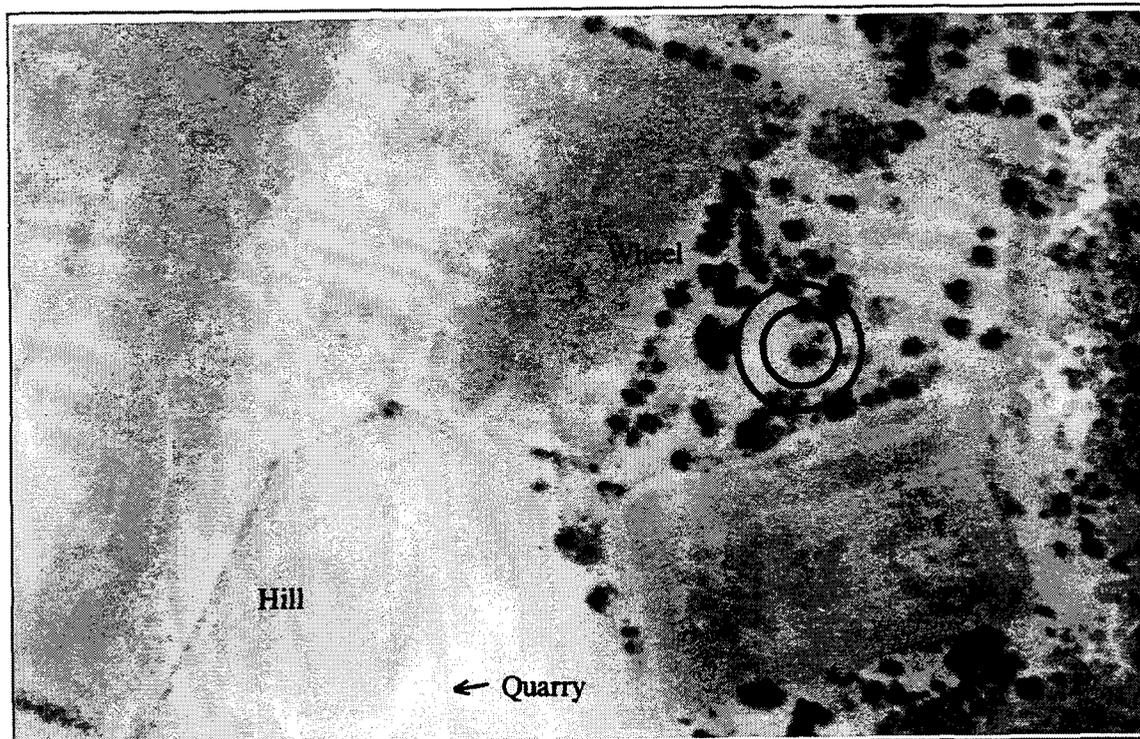


Figure 8.1 An Enlargement of 1941 Aerial Photograph (scale 1:20,000) Showing Cultivated Fields Around the Medicine Wheel in the Triangular Shaped Wedge of Trees.

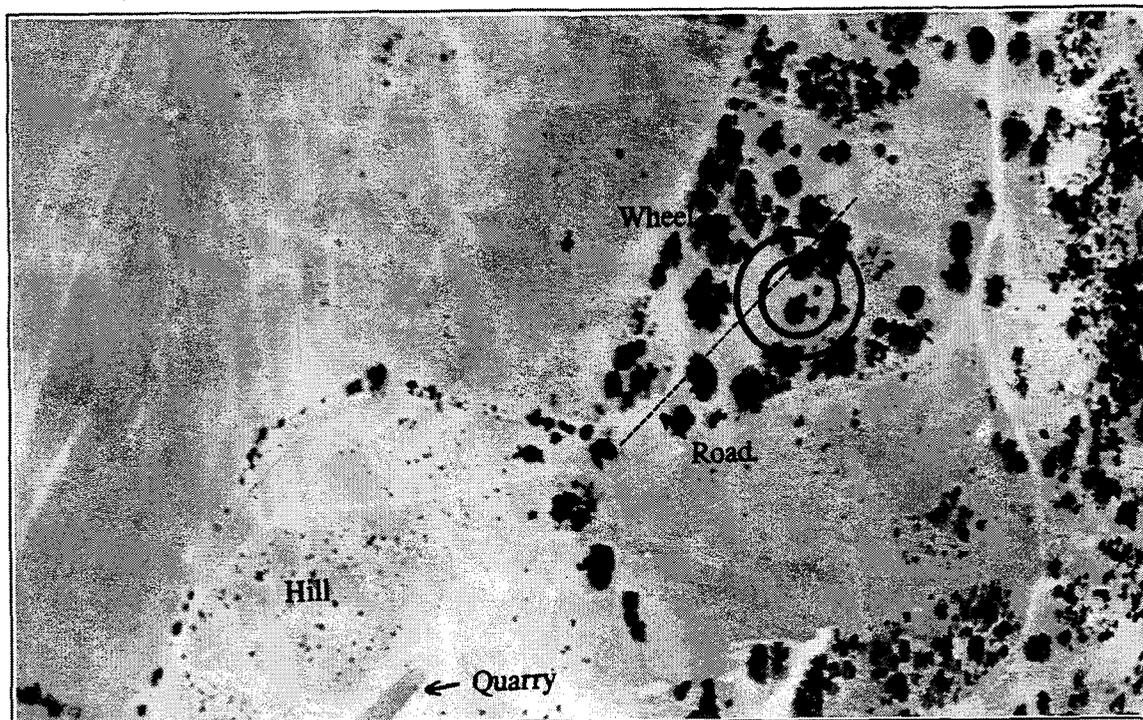


Figure 8.2 October 1951 Aerial Photograph (enlarged) Showing 41CV1505 and Dirt Track Crossing (white line) Through the Western Side of the Wheel.

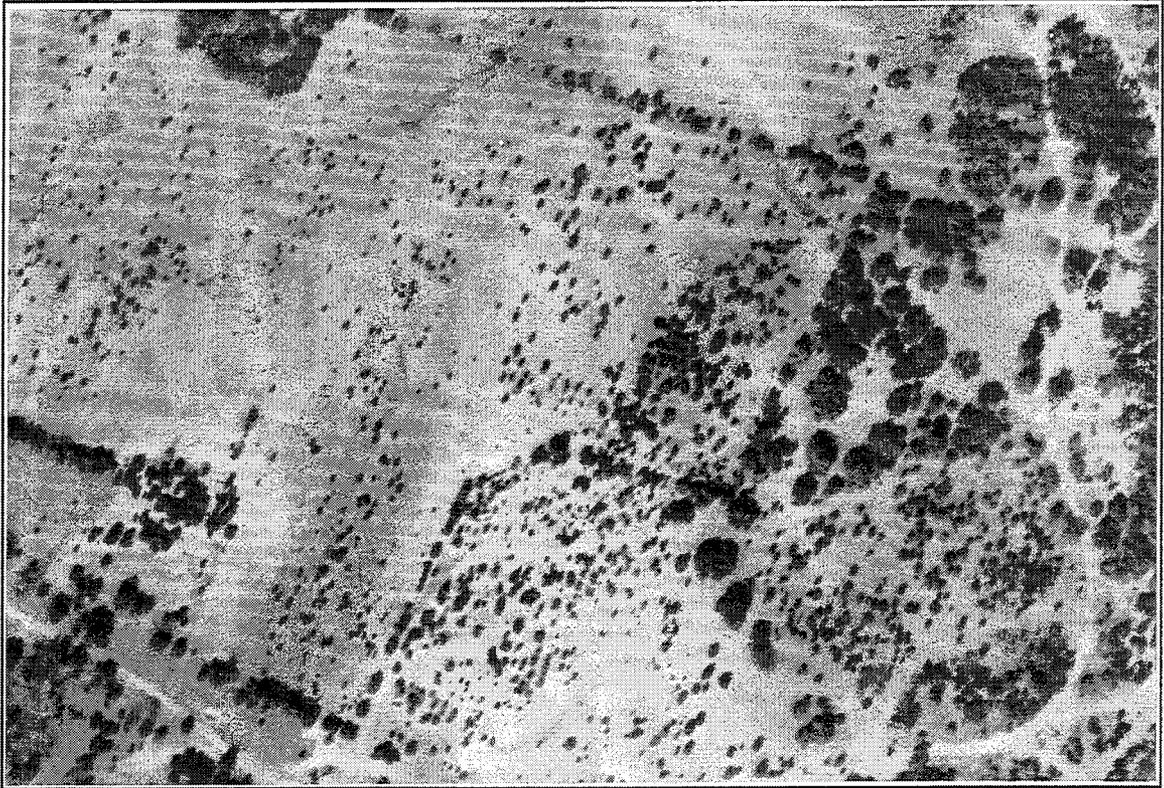


Figure 8.3 Enlargement of 7 January 1966 Aerial Photograph in the Vicinity of 41CV1505 Showing Increase of Junipers in the Once Cultivated Fields. The Juniper "Prayer" Tree and Road on the West Side of the Medicine Wheel are Apparent.

The 2 November 1981 aerial photograph (scale 1:80,000) reveals continued increase in the number and size of juniper trees in the once cultivated fields and elsewhere. The previously detected dirt road across the western part of the Medicine Wheel is no longer visible. Trees in the immediate vicinity of the Medicine Wheel appear much denser than the trees depicted on the 1941 photograph, which indicate a continued growth of the tree canopy and expansion of the oak grove. By 1 January 1990, a 1:40,000 scale photograph shows that the once-cultivated fields adjacent the Wheel alignment are nearly obliterated by the dense juniper trees that have expanded throughout the area.

8.3 GEOPHYSICAL RESULTS

The details of the geophysical investigations are presented in their entirety in Appendix A; the following summarizes those results. In general, the GPR and EMI employed over the missing eastern two-thirds of the Medicine Wheel did not positively identify a continuous geometric pattern of stones buried on that side.

Brennan and Deignan (Appendix A) attribute the negative findings to the fact that the limestone rocks now constituting the Medicine Wheel are not below the surface with adequate spatial density and/or constituents to be detected in the areas investigated. They believe that the observed pattern reflects variations in the solum thickness and directional trends of the bedrock.

8.4 ARCHEOLOGICAL RESULTS

The 10-day archeological investigation yielded a variety of information concerning this site in general and specific data relating to the Medicine Wheel. Below are the findings and results from the excavation of 35 test pits that encompassed 70 m² to depths ranging between 5 and 35 cmbs (Table 8.1). Investigations identified and tested cultural features, recovered prehistoric and historic artifacts, and documented specific characteristics of the Medicine Wheel. Subsequent data analyses included radiocarbon dating, lichen studies, compiling Medicine Wheel attributes, and dendrochronology results. These lines of evidence are discussed in detail below and are then followed by a brief summary.

8.4.1 Feature Excavations

Because scattered burned rock Fs 2, 3, and 4 were far beyond the margins of the Wheel feature and were disturbed by previous cultivation, these were not investigated. Features 5 through 9, in or immediately adjacent to the Wheel, were investigated to some degree.

Feature 5 was explored through a single 1 m² unit (TP 3) situated over the western half of this small burned rock pile (Figure 8.4). Test Pit 3 was excavated to roughly 9 cmbs exposing the underlying fossil oyster shell and limestone fragments which constitute the bedrock. The burned limestone rocks which comprised F 5 were initially exposed and their general boundary and positions mapped before their removal. The burned rocks in TP 3 created an irregularly shaped, half oval with a vertical height of nearly 10 cm in the middle; the rocks extended about 4 cm above and 6 cm below the original ground surface.

The middle and thickest area of this burned rock pile was two rocks thick, while the outer edges were only one rock thick. These burned limestone rocks ranged from 2 to 18 cm in diameter; most rocks were apparently broken in place with some

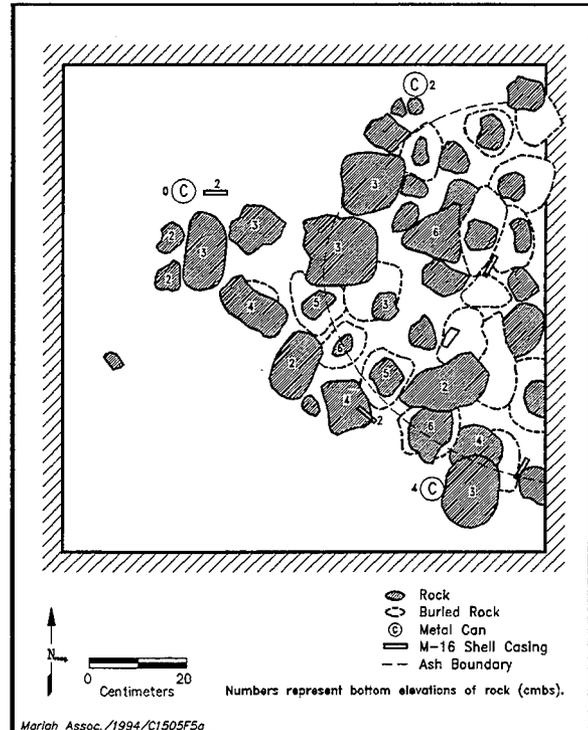


Figure 8.4 Plan View of the Western Half of Hearth Feature 5 at ca. 8 cmbs in Test Pit 3.

pieces remaining side by side after being broken. Roughly 71 burned rocks weighing 36 kg were recovered from the western half of F 5.

The matrix between and on some rocks contained quantities of white to gray ash and black charcoal chunks, mostly toward the middle. A 1.5 liter matrix sample from near the middle of the burned rock pile (0-4 cmbs) yielded nearly 45 g of crisp charcoal, small flakes of foil, and metal fragments. Most recovered charcoal has the appearance of being juniper. No pit was apparent beneath the rocks. Artifacts found inside and along the immediate margins of F 5 were recent historic materials which included crumpled up foil, pull tabs from cans, small metal food cans, M-16 blanks, and wire (Table 8.1). Three chert flakes were recovered from the lower 3 cm of the excavated level, below the matrix which contained the more recent artifacts. Many of the hearth rocks may have once been part of the Medicine

Table 8.1 Leon River Medicine Wheel (Feature 1) Investigations, May 1994.

Unit No.	Unit Size (m ²)	Unit Depth (cm)	Unit Location	Material Results			
				Lithics	Glass	Metal	Other
1	5	12	South side, outer circle	3	-	-	1 charcoal
2	5	12	SW side, spoke F	14	2	2	1 tack
3	1	9	Spoke O, in NE, historic hearth F 5	3	-	22	8 cartridges 1 <i>Rabdotus</i> sp. 1 burned wood
4	5	10	East side, inner circle & spoke	19	-	1	4 edge modified
5	4	8	East side, outer circle & spoke	2	-	-	2 C14 samples 1 hammerstone 4 burned rock
6	1	9	Inside, north of center	2	-	3	1 scraper
7	4	5	East side, inner circle & spoke	2	-	-	-
8	1	10	Inside, NW of center	-	-	-	1 cartridge
9	2	8	NE side, outer circle	9	-	-	-
10	1	15	West side, hearth outer circle	-	-	-	1 <i>Rabdotus</i> sp. 50 <i>Helicina</i> sp.
11	4	10	South side, inner circle & spoke	2	-	-	1 <i>Rabdotus</i> sp.
12	4	11	North side, outer circle & spoke	1	-	-	1 Micromorph
13	1	12	Inside, SW of center	-	-	-	-
14	1	10	GPR signal, spoke N	2	-	-	-
15	1	10	GPR signal, spoke N	3	-	-	-
16	1	11	GPR signal, spoke N	7	-	-	2 Sediment
17	1	20	SW side, outside, rock platform	3	8	-	1 <i>Helicina</i> sp.
18	4	20	NW side, outer circle & spoke B	-	-	-	1 cartridge
19	3	11	South side, spoke H	5	-	-	1 mussel fragment- surface
20	1	13	Inside, west of center	-	-	-	-
21	3	35	Shell Ridge, inner wheel intersection	-	-	-	1 charcoal
22	1	12	Inside, center of wheel	1	-	-	-
23	1	14	GPR signal, east side	-	-	-	-
24	1	23	Inside, SE of center, GPR signal	4	-	-	-
25	1	12	East side, GPR signal	-	-	-	-
26	1	20	SE side, spoke J	1	-	-	1 wood
27	1	10	Inside, east of center	-	-	-	-
28	1	14	Inside, NE of center	2	-	-	1 edge modified
29	1	20	SE side, GPR signal	-	-	-	-
30	1	16	Inside, east of center, GPR signal	1	1	-	-
31	3	12	Shell Ridge, between inner and outer ring	-	-	-	-
32	1	14	Inside, south of center	1	-	-	-
33	1	10	Inside, NW of center	-	-	-	-
34	2	16	Inside, NE of center, GPR signal	17	-	1	1 edge modified 1 hammerstone
35	1	20	Inside, south of center	-	-	-	-
Surface	-	-	-	7	-	29	6 tools
Totals	70	-	-	111	11	58	14 tools

Wheel spokes, since F 5 is along the central part of Spoke O. No other rocks are on the surface in the immediate vicinity. If indeed this hearth was actually constructed of Wheel rocks, then the hearth post-dates the Medicine Wheel.

Surface F 6 was investigated by TP 10, a 1 x 1 m unit that encompassed the entire circular hearth and was excavated to a maximum of 15 cmbs (Figures 8.5 and 8.6). The eight rocks that comprise this rock ring hearth and the three other rocks just outside the outer ring to the south of the hearth were drawn and their attributes recorded. The feature rocks averaged about 5 cmbs. Fresh, crisp charcoal and white ash were inside the 30 cm diameter center, with one recent-looking, partially burned cedar wood fragment lying on the surface inside the rock ring. Roughly 30 tiny *Helicina* sp. and one *Rabdotus* sp. snails were on the surface in this unit. A 15 cm² area of fresh, scattered charcoal lay immediately outside the western edge of the rocks. A single, 15-cm-deep level was excavated with matrix screened. Roughly 50 *Helicina* sp. and one *Rabdotus* sp. were recovered from the top 8 cmbs, but no cultural artifacts were encountered. This apparent hearth was cross sectioned, but demonstrated no subsurface burning, staining, or pit feature. Feature 6 appears to have functioned as a very recent hearth with no sign of other cultural material immediately below the surface.

Feature 7, a mostly buried rock platform, was just visible in a grass covered surface area just outside the outer ring on the southwestern corner of the Medicine Wheel. The top 2 to 3 cm of matrix and the grass were removed from the entire rock-covered area and mapped (Figure 8.7). The northern half of F 7 was exposed in a 1 x 2 m unit (TP 17) to a depth of 12 to 20 cmbs. About 20 liter of matrix were floated in the laboratory. Nearly 95% of the rocks in this feature appeared to be unburned limestone pieces which varied in size from small, rounded chunks about 2 cm in diameter, to tabular slabs just over 10 cm in diameter. Most rocks were angular limestone pieces that averaged about 6 cm in diameter. No

apparent internal rock pattern was recognized, but some of the burned rocks appeared to have weathered in-place into small fragments. No charcoal, ash, or soil stains were detected during the excavations or rock exposure. The floated matrix yielded considerable quantities of tiny (less than 2 cm) fossil gravel fragments and two *Helicina* sp. snails.

Feature 7 was a single rock layer thick with extremely minimal horizontal or vertical overlap of rocks and therefore formed an apparent single rock layer platform with a uniform depth of 5 to 7 cmbs. The matrix surrounding the rocks was a brown clay loam with minor disturbance from grass roots and worm. The brown matrix continued for 5 to 9 cm below the rock layer before the crumbly, fossil oyster, limestone bedrock was encountered.

Recovered artifacts from F 7 include a single window glass fragment from the surface of the southeastern quadrant and one *Helicina* sp. snail. One chert flake and recent glass fragments were recovered from the feature fill in the northeastern quadrant and one chert flake and *Helicina* sp. snail were recovered from 7 to 15 cmbs in that same quadrant. Seven window glass fragments were recovered from the surface in the southwestern quadrant.

On the northwestern corner, about seven burned rocks weighing nearly 0.5 kg were recovered in a 1 m² excavation unit. A few burned rock fragments were recovered in the floated material, with no other historic, stone artifacts, or charcoal identified. This feature appears to have been a small dump of fossil oyster gravels with the modern glass and burned rock included. The infrequent burned rock was possibly incorporated into this gravel when the gravel was scooped up. The absence of charcoal, ash, or oxidation implies that this gravel layer was not related to heating activities.



Figure 8.5 Surface Feature 6 Just West of Outer Ring on West Side.

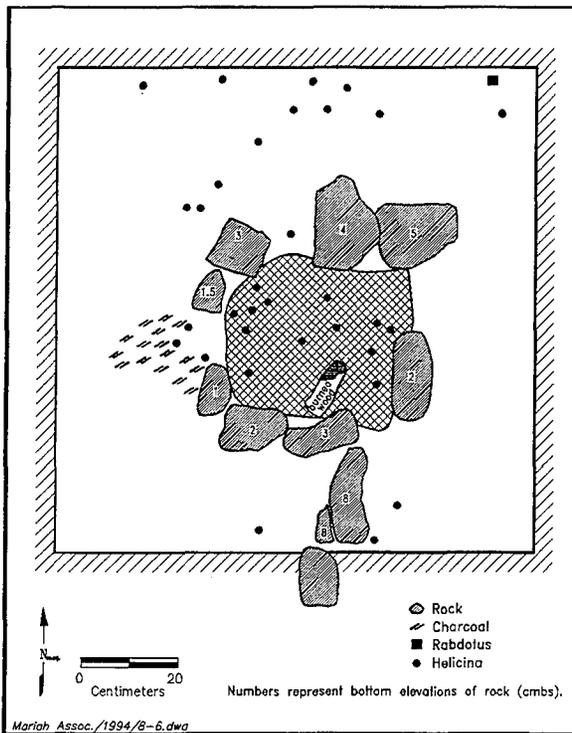


Figure 8.6 Plan View of Surface Hearth Feature 6 in Test Pit 10.

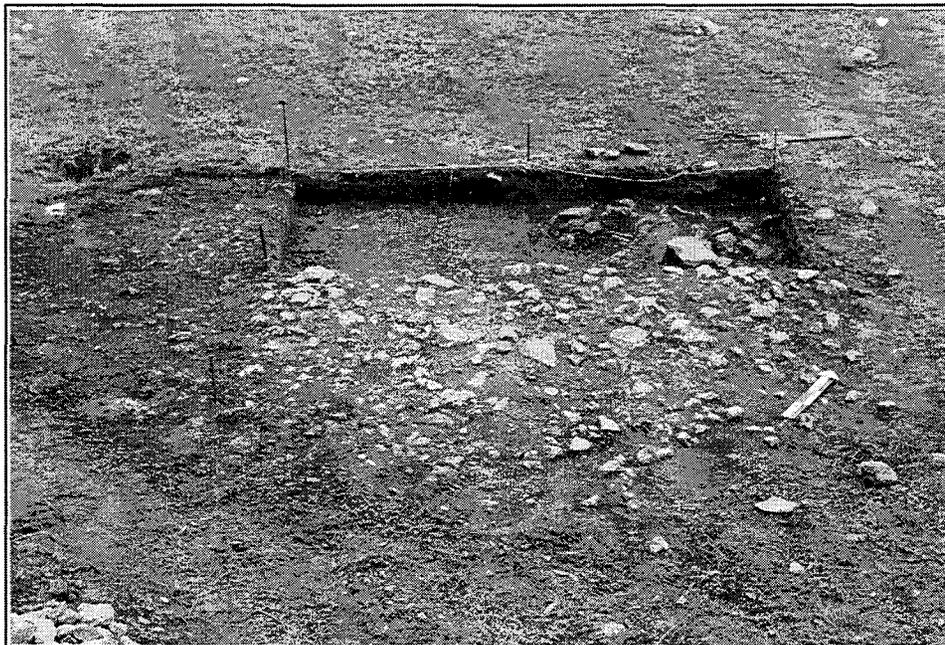


Figure 8.7 Excavated (Test Pit 17) Northern Half of Feature 7.

Buried F 8, an irregular, diffuse concentration of burned rock, was discovered in the lower part of TP 16 (Figure 8.8), near the projected intersection of Spoke N and the outer ring. The postulated intersection was not verified by this excavation. Test Pit 16, a 1 m² unit, exhibited no surface or buried rocks that were directly linked to the stone alignment. This unit was excavated to 11 cmbs with the burned rocks appearing just above the limestone bedrock. Thirty-three burned rocks (7.5 kg) were discovered, five pieces collected as samples. No apparent pattern was detected in the distribution of burned rock across this unit and the exact size, shape, and extent of this concentration is unknown. Burned rocks were first encountered at 4 cmbs and extended down to 13 cmbs. Those in the lower part were mixed in with non-burned limestone chunks. The removed matrix was screened and seven chert flakes were recovered. No charcoal, ash, or pit was recognized in the damp, dark brown clay loam. A 5 liter sample of matrix was floated in the laboratory and yielded two tiny (less than 1 cm) pieces of gray chert, and one 3-cm-long burned rock, but no charcoal.

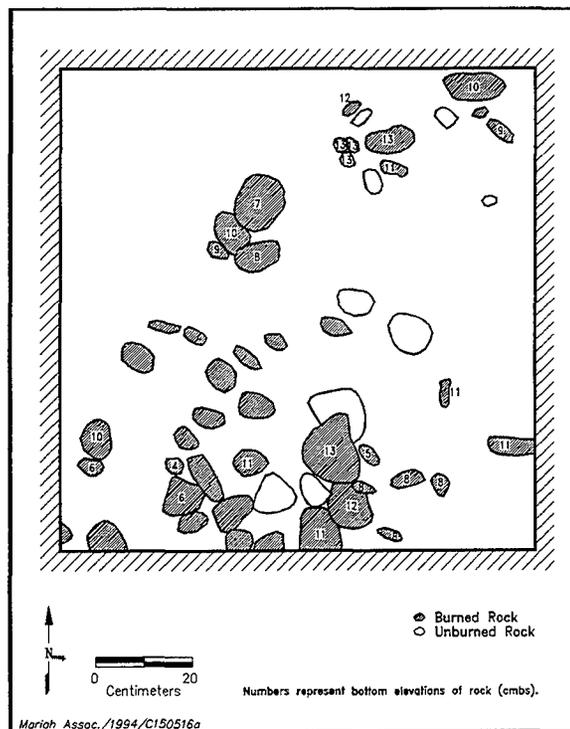


Figure 8.8 Plan View of Feature 8 at 10 cmbs in Test Pit 16.

Feature 9 was investigated with two units (TPs 21 and 31) totaling 5.1 m². These excavations are fully discussed in Section 8.5.4, below.

8.4.2 Prehistoric Artifacts

The limited recovery of prehistoric tools from the surface of the Medicine Wheel includes seven pieces of local chert debitage; three end scrapers, one of East Range Flat chert (#001), one of Owl Creek Black chert (#025), and one of Fort Hood Gray chert (#022); two biface fragments, one of Heiner Lake Tan chert (#038) and one white patinated piece (#009); and one edge modified specimen of Fort Hood Yellow chert (#004). Selected examples are illustrated in Figure 8.9. These recognizable tools were all manufactured from local types of Edwards chert (Frederick and Ringstaff 1994:125-182).

The hand excavation of 35 various size units encompassed 70 m² across this stone alignment (Table 8.1) and provided a sample of prehistoric cultural material from the matrix which contained the Medicine Wheel rocks. The shallow nature of the solum coupled with the 1990 recovery of a roughly 6,000-year-old Paleoindian point and a roughly 1,200-year-old Scallorn point from the surface of 41CV1505, indicate likely mixture of the matrix over the years. Consequently, precise association between prehistoric stone tools and the Medicine Wheel itself remains in doubt. Most of the surface stone tools were recovered from the eastern margin of the inner ring while limited quantities of lithic debitage were recovered from subsurface context, mostly beneath the rocks forming the Medicine Wheel. No stone tools were observed on the surface of the grass covered area across the western side of the Medicine Wheel.

Table 8.1 shows the provenience of the 111 chert flakes and 14 stones tools including two Heiner Lake Tan edge modified flakes, one Heiner Lake Tan scraper, and one quartzite hammerstone recovered from the 70 m². Because most of the stone artifacts were recovered from the screen, their precise vertical depth is unknown. These

stone artifacts did not appear to be from any particular depth, but were seemingly scattered throughout the entire vertical solum profile of about 15 cm.

Hundreds of tiny *Helicina* sp. land snails were observed on the surface of the Medicine Wheel and some were observed while excavating the upper part of the units. A sample of nearly 50 *Helicina* sp. were collected from in the upper 15 cmbs of TP 10. The *Rabdotus* sp. snails were rare, both on the surface and in buried contexts. One *Rabdotus* sp. was recovered about 1 cmbs in TP 10 and was sun bleached white. A second recovered *Rabdotus* sp. snail, from 8 cmbs in TP 11, was used for amino acid epimerization (A/I ratio) dating (see Section 8.4.4).

8.4.3 Historic Artifacts

Historic artifacts recovered from the Wheel's surface include metal and glass objects that appear associated with military food and drink containers dating from the 1940s and 1950s. These include C-ration cans of two sizes, two small jelly type cans (2.5 cm tall by 6.5 cm wide) and two taller (5.0 cm tall by 7.5 cm wide) wet food cans with tops cut open using a small hand can opener. Two civilian food cans, one 11 cm tall by 7.5 cm wide and the other slightly smaller, were present, as were melted aluminum beer cans and several pull tops (Table 8.1).

The excavations yielded various other recent metal objects as well. Test Pit 26 yielded a topless jelly-size can from 3 cmbs. A metal razor blade from a disposable razor was recovered from TP 34 at 4 cmbs. Small smashed fragments of metal were found in units TP 2 (0-5 cmbs) and TP 6 (0-9 cmbs). M-16 shell casings were collected from TPs 3 (n=8) and 8 (n=1) with a larger casing stamped with the number 53 on the bottom from TP 18. Test Pit 4 yielded a 16 gauge shotgun shell fragment. A complete metal roofing tack and a small curved piece of clear glass were found in TP 2 (0-5 cmbs). From the features discussed above, seven clear glass fragments, possibly

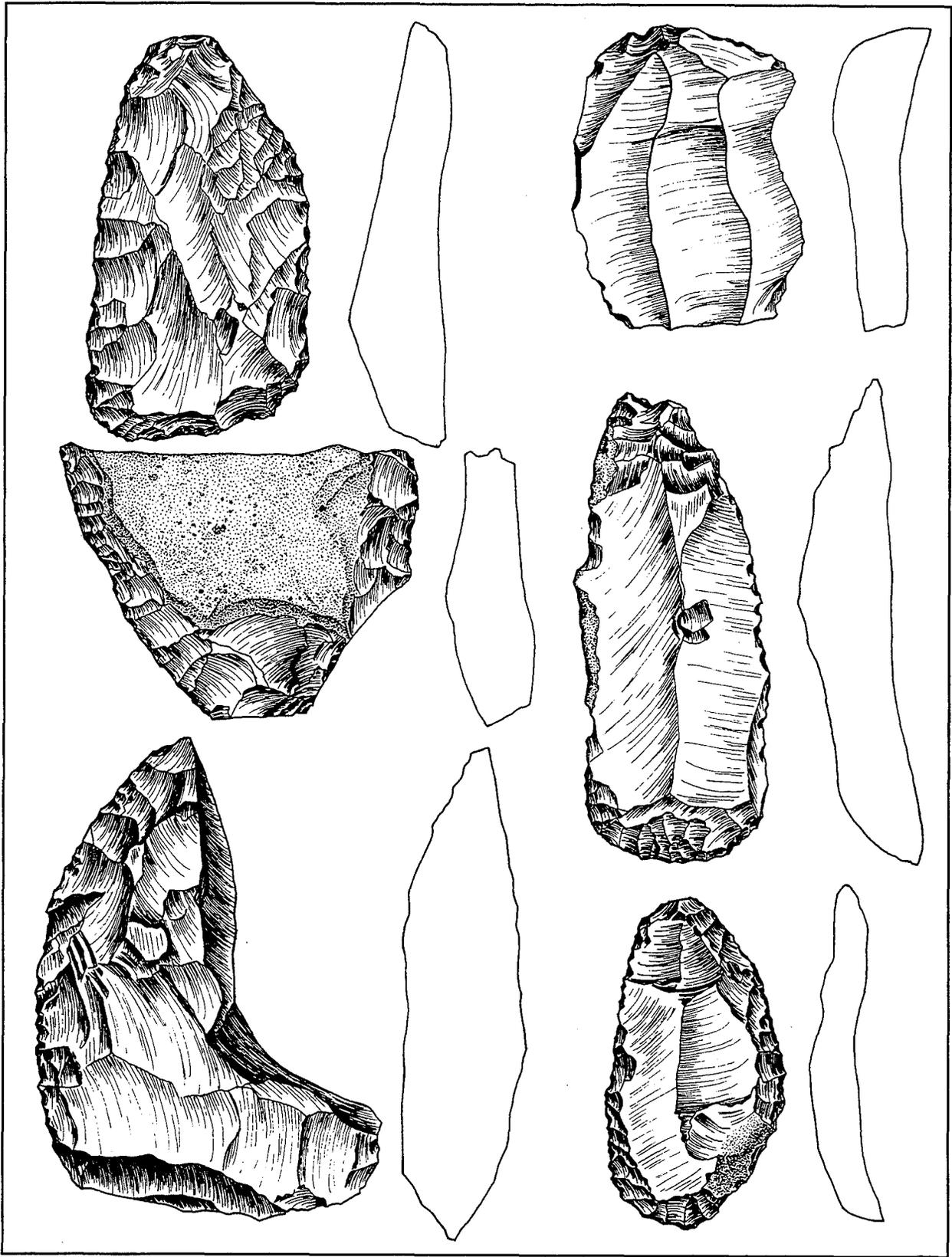


Figure 8.9 Stone Tools from the Medicine Wheel (Scale 1:1).

window glass, were recovered. Finally, an irregular size and shaped amber glass fragment was recovered from the eastern 1 m² in TP 21.

8.4.4 Radiocarbon and Epimerization Dating

Three radiocarbon assays were obtained from charcoal samples collected during excavations at the Medicine Wheel. The details concerning these three samples are provided in Table 8.2. The charcoal sample which yielded the oldest age, about A.D. 1430 (Beta-73351), was retrieved from the shallowest matrix on the very eastern margin of the projected outer ring. In that particular area, the rocks defining the eastern margin of the outer ring were not present. Consequently, there is no observable association between this charcoal sample and the Wheel. This charcoal sample may be related to either events associated with stone tools and burned rock scattered across 41CV1505, or may be the result of natural range fires.

The charcoal sample with the second oldest age, A.D. 1810, was collected from TP 1 at 12 to 19 cmbs. This stratigraphic position places this charcoal sample below the Wheel rocks at the southeastern corner of the outer ring. One of the four radiocarbon age intercepts on the tree-ring calibrated calendria! curve for this sample is as late as A.D. 1930 with no indication of the thermonuclear bomb tests of the late 1050s that caused variation in atmospheric ¹⁴C levels.

A charcoal sample with apparently good stratigraphic context was recovered from TP 21, on the western side of the inner ring, directly below the Wheel rocks, but above the recognizable non-natural linear anomaly (F 9) at 30 cmbs (see Section 8.5.4). Here, the inner ring rocks are in the upper 5 cm of the solum and the recovered charcoal was definitely below that level. Since the result of this latter sample is a 105% ± 0.7% of modern, there is some indication that the Medicine Wheel pre-dates A.D. 1960. Charcoal burned after A.D. 1960 date would have yielded a value of 110% of modern (Dr. Tamers, personal communication 1994). Since this single piece of

juniper charcoal used to obtain this date was possibly displaced from the surface by some type of turbation, the context of this modern age sample remains in doubt.

One other means of absolute dating this Medicine Wheel feature was attempted using a single *Rabdotus* sp. land snail for epimerization dating (see Ellis and Goodfriend 1994:183-201). A single *Rabdotus* sp. snail shell from TP 11 at 8 cmbs (at the inner ring and projected spoke intersection H) was sent to Dr. Glen Goodfriend. After the shell was thoroughly cleaned, an A/I ratio of 0.0184 was obtained. A comparison of this A/I ratio to a regression line based on radiocarbon cross dated A/I ratios from nine *Rabdotus* sp. snails collected from Fort Hood (Ellis and Goodfriend 1994:199), yielded a radiocarbon equivalent age of about 300 years BP. Although the full range of variables affecting the precise conversion of snail epimerization A/I ratios to radiocarbon dates, experimental data suggests that a 4% measurement error may exist. Thus, the *minimum* range reflected by the A/I ratio from the *Rabdotus* sp. snail from the Medicine Wheel feature is approximately 275 to 350 years BP (radiocarbon equivalent of A.D. 1675 to 1600). If this snail had experienced chemical and/or heating alterations (undetected on this specimen) either alteration would have caused the A/I ratio to dramatically increase and reflect an age considerably older than the actual age. Therefore, the obtained A/I ratio is considered a minimum age. More precise age estimates from this one snail may become available in the future when better control and understanding of the variables affecting epimerization dating is obtained on *Rabdotus* sp. analyses from Fort Hood (Abbott and Ellis 1994).

8.4.5 Lichen Studies

Lichens were noted on 68% of the recorded Medicine Wheel rocks (Table 8.3). However, considerable deviation in frequency of lichen occurrence was noticed between the rocks forming the inner and outer rings and the spokes.

Table 8.2 Radiocarbon Dating, 41CV1505.

Beta No.	Sample Type	Location Units/Depth	Wood Type	Measured C14 Age (BP)	C13/C12 Ratio (‰)	Conventional C14 Age (BP)	Calibrated Age
B73351 CAMS 14051	Charcoal	TP 5 4-8 cm	LO	520 ± 60	-26.9	490 ± 60	A.D. 1320 to 1340 ¹ A.D. 1390 to 1500 ² , 1430 ³
B73352 CAMS 14051	Charcoal	TP 21 5-15 cm	J	104.4 ± 0.7%	-28.1	105 ± 0.7%	Modern (A.D. 1950 to 1960)
B73297 CAMS 13921	Charcoal	TP 1 12-17 cm	H	210 ± 60	-28.2	160 ± 60	A.D. 1670 to 1950 ¹ A.D. 1650 to 1950 ² A.D. 1680, 1750, 1810/ 1930 ³

1 = 1 Sigma range, 68% probability

2 = 2 Sigma range, 95% probability

3 = Intercept point with calibrated curve

Wood Type: LO = Live Oak, J = Juniper, H = Hardwood

Table 8.3 Selected Attributes of a Sample of Rocks Comprising the Medicine Wheel.

Location	Number in Situ	Size Range (kg)	Mean Weight (kg)	Depth Range (cm)	Mean Depth (cm)	Lichen Covered	Calcium Carbonate
Inner Ring	64	<.25-11	2.8	1-9	3.9	42 = 56%	0
Outer Ring	77	<.25-6	1.9	1-27	8.7	35 = 44%	0
Spokes	95	<.25-2	0.9	1-10	5.4	83 = 87%	0

The highest frequency of lichen (87%) was observed on the rocks incorporated in the spokes, while the lowest frequency (44%) was on the rocks forming the outer ring. The inner ring has about 56% of the rocks with lichen. The apparent low frequency of lichen for rocks in the outer ring may be due to the high incidence of displaced rocks or their position under the tree canopy.

An examination of the rocks by lichen specialist Dr. Thomas Nash found that several rocks have more than one species of lichen (personal communication 1994). The lichen flora of limestone is very poorly known in North America and would require considerable microscopic examination and chemical tests to gain some understanding of the growth rates and species involved. The lichen are small and imbedded and, as a rule, grow very slowly, but no specific lichenometric studies have been conducted with the species present. He provisionally identified

Aspicilia calcarea sensu lato, an olive-green with white spots (apothecia); *Caloplaca*, an orange apothecia; *Lecanora dispersa*, a pale yellow apothecia; *Lecidea* s.l., and genus *Verrucaria*.

Consequently, although lichen are present on most of the rocks examined from the Wheel, they contribute little to our present understanding of when these rocks were placed at this location.

8.4.6 Rock Characteristics

The sample of recorded rocks from the inner and outer rings and the spokes yielded a wide range of results. Table 8.3 provides a general summary of the number of rocks documented, their size range, mean weight, the depth range and mean, the number of rocks with lichen and calcium carbonate. The recorded data indicate that the rocks incorporated in the spokes appear to be generally smaller and buried about half as deep as

those in the outer ring but comparable to depths of the inner ring. This might suggest different construction episodes with the spokes and inner ring occurring more recently than the outer ring. However, the spoke rocks have the highest percentage of lichen. The largest rocks were used to construct the inner ring, but on the average were not buried as deeply as those in the outer ring. Test Pit 2 documented the presence of a 4- to 5-cm-thick layer of crushed fossil oyster shell gravel in between the two rock lines forming Spoke F (Figures 8.10 and 8.11). Visual inspection of all other spokes revealed that Spoke G had the same crushed gravel lining.

Some rocks in the feature are discolored red or pink, and several buried rocks appeared to be fractured in place. The discoloring is attributed to grass or range fires that either thermally altered the limestone rocks prior to their selection for use in the Medicine Wheel feature, or after the construction of the rock alignment feature. The in situ breakage of rocks is dependant upon the forces that fracture the stones (incipient fractures in the cobbles along with expansion-contraction forces due to thermal heating from range fires, or freeze-thaw of moisture in cracks). The occurrence and frequency of in situ rock breakage is not a good reflection of antiquity.

8.4.7 Dendrochronology Results

Following the results of the radiocarbon dating, the aerial photography interpretations showing tree succession, and the geomorphic interpretations, the planned tree ring analyses of the smaller oak tree slabs collected in 1994 from the Medicine Wheel did not appear to be warranted.

It was anticipated that the dendrochronology results would not contribute significant data to our understanding of when the Medicine Wheel feature was constructed. Previous investigations of three live trees present at the Medicine Wheel provides the age of the largest oak trees on 41CV1505 (Jurney 1992). If a single ring equates to one year's growth, then that the obtained ages indicate

these three oak trees began their growth in A.D. 1872, 1895, and 1899. Since tree roots grow under, around, and over rocks, it is impossible to discern whether the Medicine Wheel rocks, or the trees, are older. In general, the oak forest appears to have begun no earlier than the early 1870s and continued to spread over the site through time. The initial development of this oak forest is significant if the Medicine Wheel had to be constructed in an open grass-covered area because of its size and or complexity. It is apparent from the aerial photographs that a gradual expansion of the trees around the projected location of the Wheel has occurred and young trees, mostly Juniper now encroach the outer edges of the Wheel.

8.4.8 Summary of Archeological Results

The geophysical results indicate some buried rocks on the eastern side of the Medicine Wheel, but the buried rocks detected through excavations did not appear to be part of the Wheel configuration. Therefore, the geophysical and subsequent archeological excavations did not demonstrate any direct evidence of the Wheel being buried on the eastern side.

The pattern of rocks on the western part of this very large Wheel reveal a definite and precise geometric pattern projected over a 60 m area. The detected configuration implies considerable planning must have occurred to have accomplished construction of such a large, precise geometric design. The construction may have occurred with some form of measuring device. The rocks which form this Wheel are definitely partially buried and exhibit lichen growth; several appear to be fractured in place. Those rocks laying on the modern surface are obviously displaced. The depth of burial, the presence of lichen, and perhaps the existence of in situ fractured rocks may imply considerable age for this surface structure.

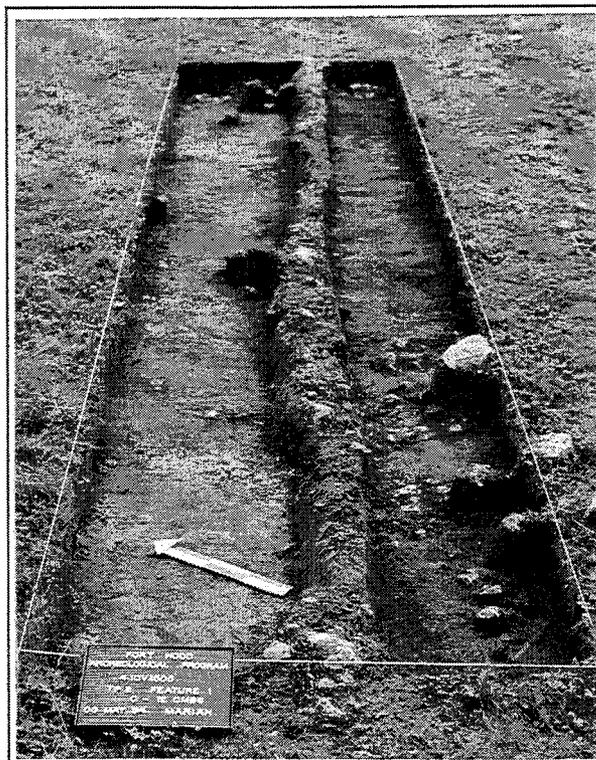


Figure 8.10 Test Pit 2 Along Inside and Outside of Spoke F.

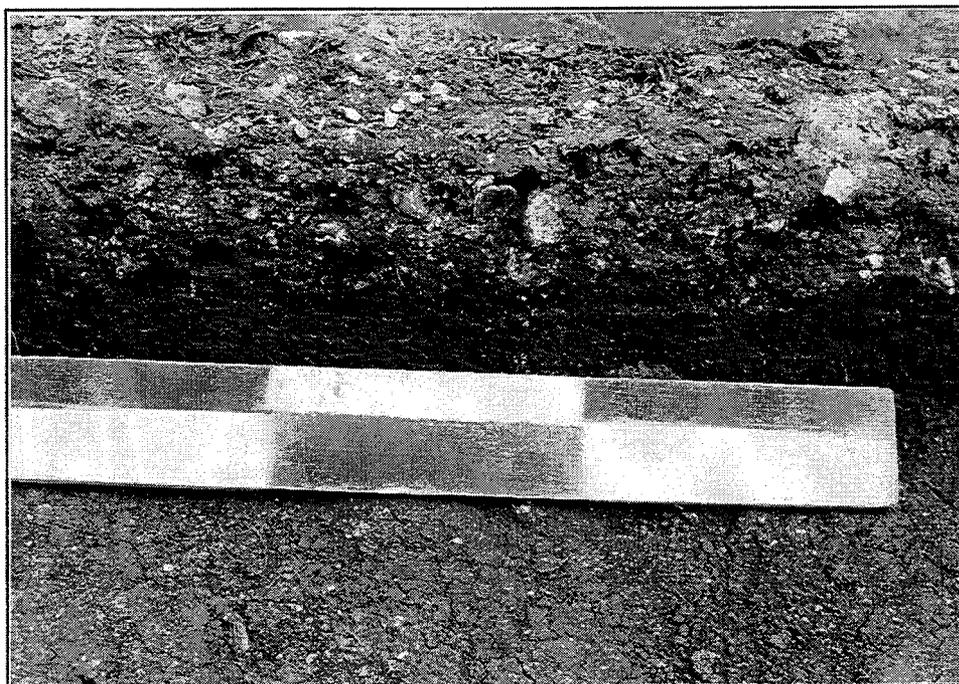


Figure 8.11 Close-up of Vertical Profile of Test Pit 2 on Inside of Spoke F Showing Fossil Oyster Shell in Top 5 cmbs.

The archeological investigations recovered a few buried and surface stone tools, metal and glass items, charcoal, land snails, but the surface occurrence of some items on this shallow solum may indicate potential mixing and/or displacement. Therefore, there is questionable association between the artifactual materials and the Wheel rocks. The stone tools recovered from the Wheel area, those from the surface outside the Wheel, and the burned rock Fs 2, 3, 4, and 8 demonstrate that this location was prehistorically occupied by Native groups. This antiquity may be partially supported by at least one radiocarbon age of 490 ± 60 BP (A.D. 1320-1340, Beta 73351, CAMS 14057), although the cultural association of this early date is not good. The historic items such as the glass fragments, the roof tack, M-16 shells, and metal cans appear to represent occupations during the last 50 years. This latter period is supported by one radiocarbon age of modern times, roughly A.D. 1940. Feature 5, the burned rock concentration with metal cans and M-16 shells, and F 7, with the glass fragments and the roofing tack, also support recent occupations/events of less than 50 year old. Feature 6, along the western edge of the outer ring, contained partially burned wood which must reflect a recent fire; however, the fresh charcoal might reflect the recent reuse of an older rock hearth feature. Clearly, multiple events occurred across 41CV1505 and the association between the Medicine Wheel rocks and various ages represented by the identified cultural items can not be precisely determined. The context of the cultural material is not sufficiently clear or good to separate the multiple events. For the same reasons, the association of the radiocarbon and epimerization dates to the Medicine Wheel feature is not certain.

8.5 GEOARCHEOLOGICAL RESULTS

Charles Frederick

The site is situated upon a gently northeastward sloping surface that appears to be a strath terrace of the Leon River. A few, relatively isolated,

pebble- and granule-size siliceous clasts are present across the site surface, and off site to the north a significant siliceous gravel lag is present on the same surface. No significant deposits of Leon River sediment, however, were observed within the boundaries of the site. The aerial photographs presented previously demonstrate that portions of the site were either cultivated or grazed prior to the Army acquisition of the land. In specific, the area upslope and west of the Medicine Wheel, and a small patch of land to the south of the feature were affected by these processes, whereas the surface in the vicinity of the feature appears to have escaped cultivation (see Figure 8.1).

The soil mantle across much of 41CV1505 is thin (less than 30 cm) and patchy. Bedrock is exposed in numerous places, most frequently adjacent to the scarp that overlooks the drainage to the east. Profiles observed across the site exhibit a range of development from O-A-R profiles, to O-A-B-R profiles. In the immediate vicinity of the Medicine Wheel the solum is thin and generally exhibits and O-A-R or simply an A-R profile. The O horizon is most common beneath stands of live oaks and other trees. The fact that the solum is strongly calcareous throughout suggests it may be relatively young, or at least, minimally weathered. A representative profile of the soil present on the site in the immediate vicinity of F 1 is provided in Table 8.4.

8.5.1 Process Investigations

The geoarcheological evaluation of the site focused on identifying the processes currently active on the site and those responsible for the visible surface attributes, in addition to identifying the processes that have affected the site in general during the late Holocene. Most of the investigations centered on the immediate vicinity of the Medicine Wheel feature and several working hypotheses were employed. We initially presumed that the absence on the surface of the eastern half of the feature was due to shallow burial by overland flow, bioturbation, or incremental additions of organic material by trees.

Table 8.4 Profile Description of Monolith M3, Southeastern Side of Outer Circle, 41CV1505, Leon River Medicine Wheel.

Depth	Description
0-1 cm	Loose organic matter, no structure, many fine vertical roots, O horizon.
1-10 cm	Brown (10YR 4.5/3), silty clay loam to silt loam; weak to moderate, very fine to fine, granular to subangular blocky; very strongly calcareous; very hard to hard; 10% limestone granules; few large rocks associated with Medicine Wheel; many fine vertical roots; many worm casts; A horizon.
10-20 cm	Dark grayish brown (10YR 4/2) silty clay loam to silt loam; moderate, very fine to fine, granular structure; very strongly calcareous; very hard to hard; 5-10% limestone granules; common, fine, vertical roots; few, medium, horizontal roots; many worm casts; A horizon.
20+ cm	Limestone bedrock, R horizon.

One means by which this hypothesis was tested was by using a 2.54 cm (1 in) diameter soil probe to core across the site on the 4 m grid established by the geophysical crew. The soil thickness data was subsequently gridded and a contour map generated (Figure 8.12). Inspection of this map illustrates that the solum varies in thickness from less than 5 cm to more than 35 cm and that a pronounced thinning of the solum occurs on the eastern half of the site where the average solum thickness is about 7 cm. The fact that the solum is thinnest where we had previously assumed it to be the thickest demonstrates that the Medicine Wheel was not buried in this area, but simply absent. The results of the EMI survey (see Appendix A: Figures 4 and 5) bear a remarkable correspondence to the solum thickness as is expected. The organic, clay-rich residual soil is highly conductive with respect to the limestone bedrock, and should, in principal, yield positive anomalies where the solum is the thickest. Comparison of the EMI and solum thickness maps (Appendix A: Figures 4 and 5 with 8.12) demonstrates such a correlation and reinforces the results of the coring work. Hence, the two lines of evidence, taken together with the archeological excavation results in the eastern portion of the feature, demonstrate that the eastern half of the Medicine Wheel is not buried, but rather is not present.

8.5.2 Relationship Between Microtopography and Process Geomorphology

Subsequently, the surface in the vicinity of the feature was inspected for evidence of geomorphic processes influential in modifying the surface and therefore capable of providing clues to the age of the feature. Three processes stand out: (1) in situ organic enrichment and solum construction by addition of tree litter, (2) overland flow, and (3) earthworm and ant bioturbation. Excluding cultural modification of the site, these three processes are believed to encompass the major factors influencing soil thickness and mobility currently and in the recent past.

Arboreal Organic Matter Additions

Much of the subtle micro-relief on the Medicine Wheel appeared to be explainable by the root masses and accumulation of leaf litter and organic matter beneath stands of trees, especially live oaks. The very subdued mounds (5-10 cm elevation) stand slightly above the areas not covered by arboreal vegetation. However, it was not clear if this microtopography was due to a thicker soil, the existence of the tree root plate, or differential erosion of soil from areas outside and away from tree canopies. To explore this issue, observations of the occurrence of leaf litter were made on a 4 m grid, and plotted at the same scale

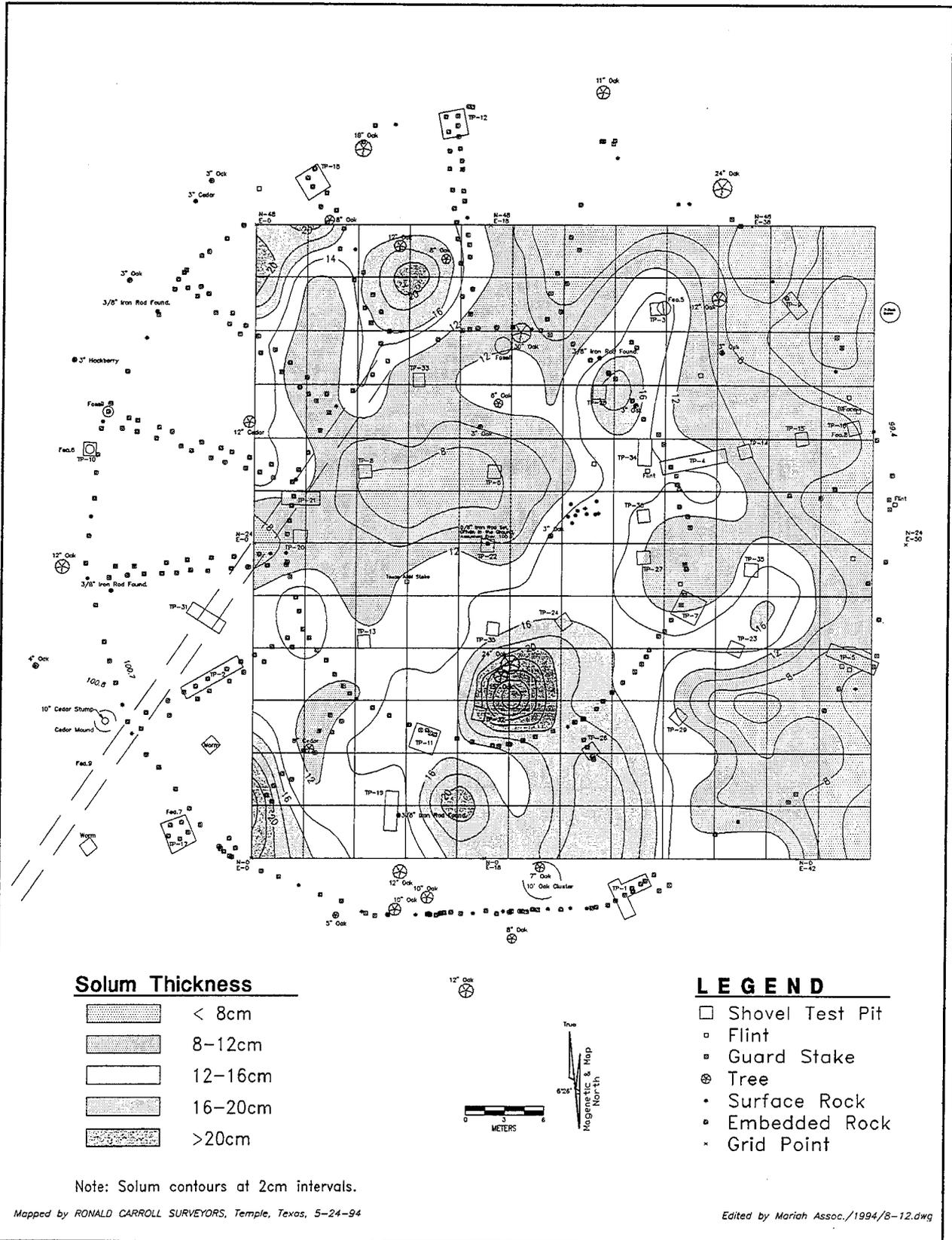


Figure 8.12 Soil Thickness Contour Map.

as the solum thickness map in order to evaluate the hypothesis that the solum is thicker beneath trees, and that the accumulation of organic material beneath the trees could explain the observed amount of rock burial. Figure 8.13 illustrates the occurrence of leaf litter and open grassy vegetation on the site during our field work, and Figure 1.1 illustrates the relative location of the tree canopy prior to clearing the feature. On a broad scale, there is little correspondence between the location of thick soil and the location of tree canopy. The thickest solums we observed were located in tree covered portions of the site, but so were some of the thinnest solum observations. It is probable that the thickest soil cover on the site is associated with very localized depressions or solution pits in the top of the limestone bedrock rather than a direct function of the location of arboreal vegetation.

It is true that leaf litter is an effective agent in terms of obscuring the visibility of some elements of the feature, most notably along the southern rim where one segment of the outer wheel was completely buried by leaf litter. But the occurrence of arboreal vegetation and the concomitant additions of organic material associated with it does not fully explain the observed degree of rock burial.

Overland Flow

Overland flow across the feature was easily documented by examination of leaf litter dams left by such flows after several intense rains that occurred during the period of the excavation. The intensity and preferred paths of overland flow were mapped across the geophysical grid (eastern two-thirds of the feature). The dominant direction and intensity of overland flow was mapped on the 4 m grid by making observations on the orientation (flow orientation inferred to be normal to long axis of debris dams) and size of debris dams present at each grid intersection (every 4 m). The location of the major flows axes was also mapped in a qualitative sense as well (Figure 8.14). In general terms, concentrated flow occurs on the site in areas between stands of trees,

whereas the high porosity and infiltration capacity of the litter buildup beneath trees, together with the micro-relief of the root masses and litter, results in little concentrated flow in these areas. An exception to this generalization is the two major northeast-trending flow lines that are present on the northern half of the geophysical grid which cut across a major oak grove. The major flow lines observed in the field on the northern and western portion of the feature partially overlap the areas where the soil is thinnest in those portions of the site. However, the wide zone of thin soil on the eastern half of the grid is not uniformly swept by overland flow, nor is it dominated by major axes of preferential flow. Observation of the site surface away from the Medicine Wheel suggested that channelized overland flow most often occurs between the canopies of trees, especially junipers. This concentration of flow and erosive energy results in the junipers being preserved on slightly higher surfaces and the intervening areas between the canopies preferentially erodes. Larger, more erect trees do not elicit this response to the same degree as the compact, shrub-like young junipers which occur widely across the site. The relationship between solum thickness and major vectors of overland flow is not direct, but clearly the two are related, probably in part due to the increased infiltration that occurs in zones of leaf litter beneath trees.

No significant sediment transportation associated with overland flow was observed on the Medicine Wheel proper. However, significant erosion and sedimentation was observed on the steeper slopes west of (up hill from) the Medicine Wheel. Erosion and sedimentation in this system appeared to involve a form of alluvial fan process whereby erosion occurs in areas of concentrated overland flow on steeper slopes and deposition coincides with localized decreases in slope. In the immediate vicinity of the Medicine Wheel, the only material being transported by this process was leaf litter and other organic detritus. Even worm casts which were in abundance were not obviously mobilized by this process. Based on these observations, widespread burial of surface

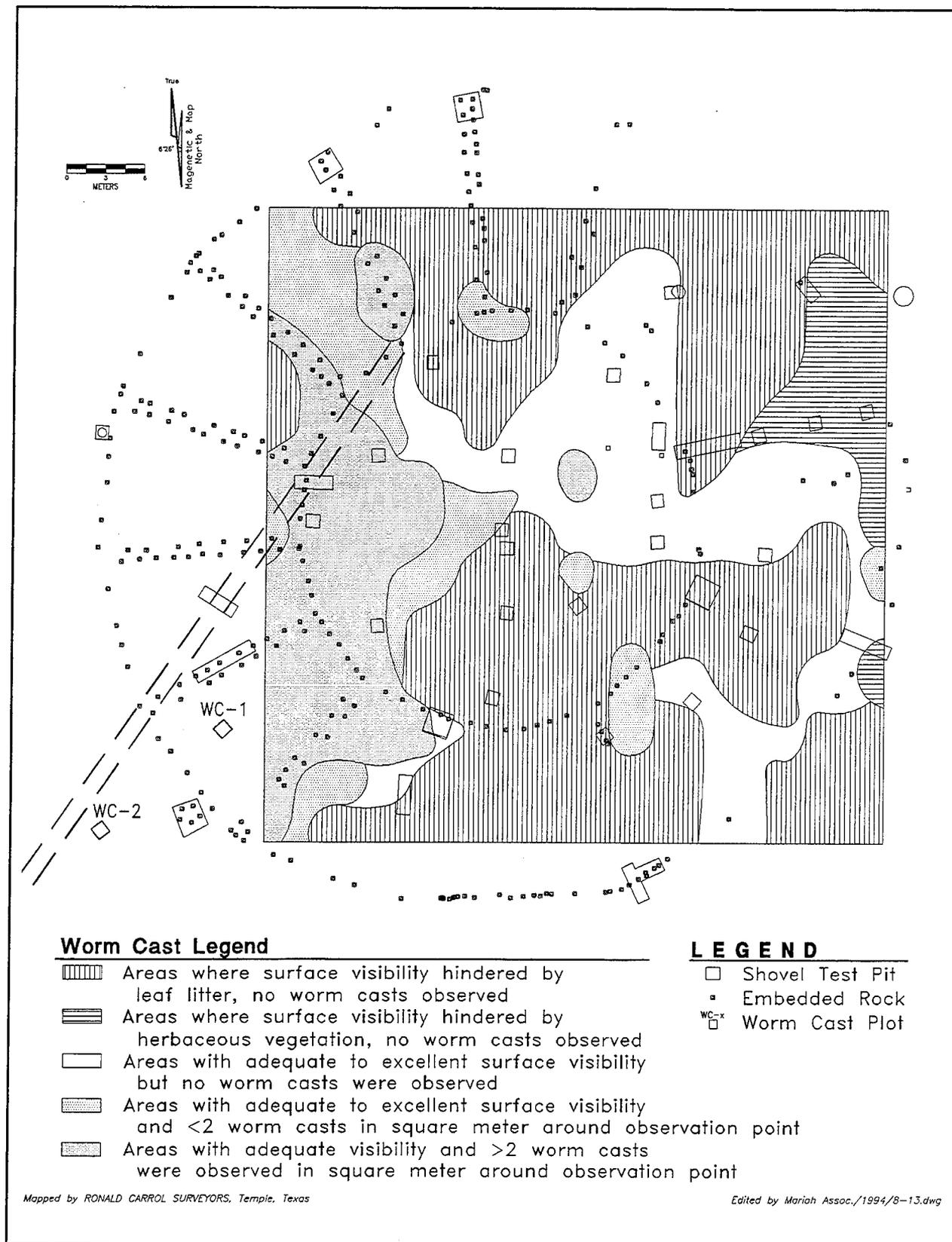


Figure 8.13 The Distribution of Leaf Litter and the Frequency of Worm Bioturbation.

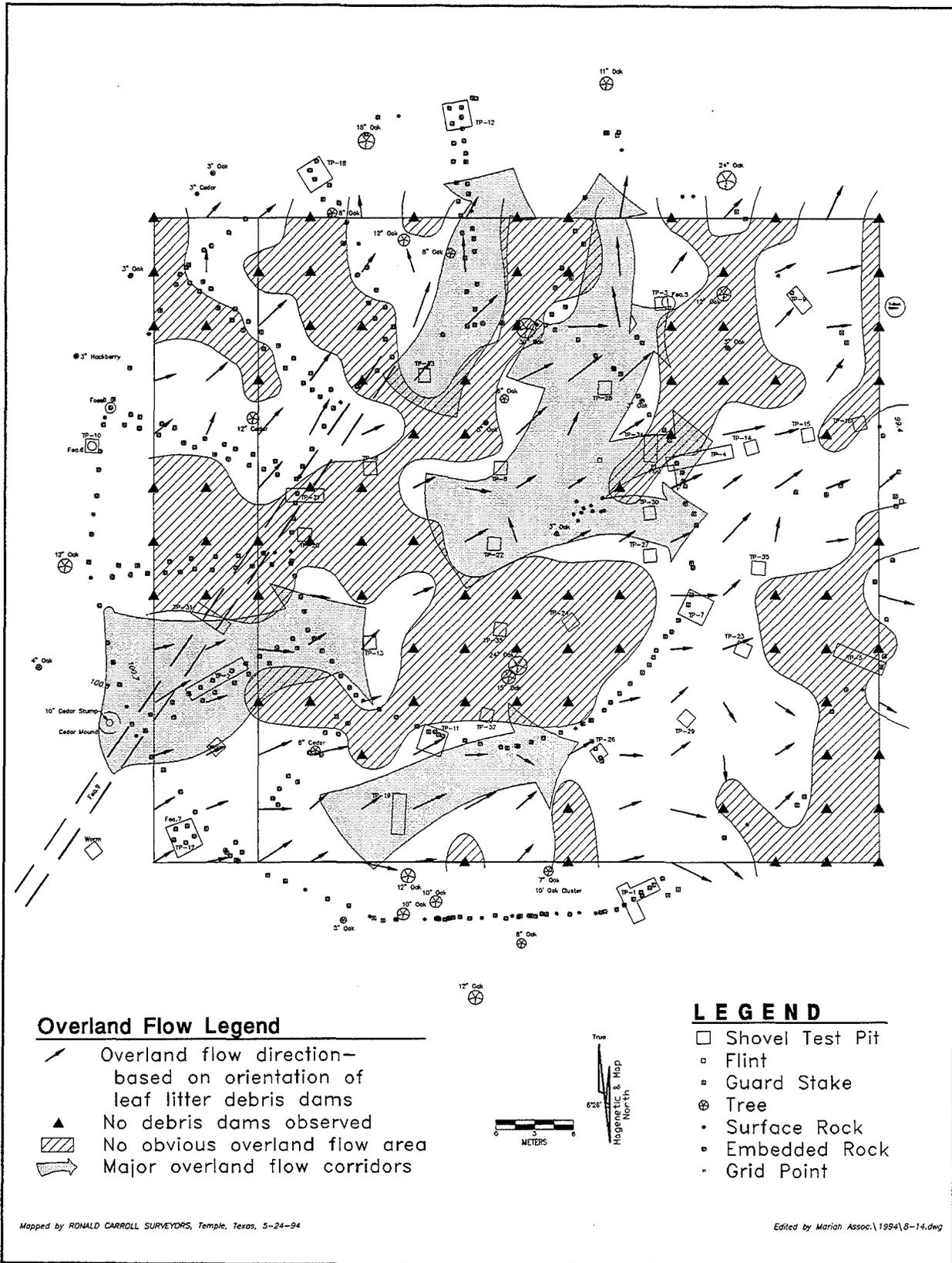


Figure 8.14 Overland Flow.

features with fine earth materials in the vicinity of F 1 by overland flow seems unlikely. Accumulations of this type are expected to occur west of F 1, where a break in slope occurs between the more gentle surface upon which the Medicine Wheel rests, and the slightly steeper slopes presently covered by juniper.

Earthworm Bioturbation

Although overland flow and addition of organic matter by arboreal vegetation have influenced the form and appearance of the site surface, the only process observed to be transporting significant quantities of fine earth materials (as opposed to organic debris), and therefore be capable of burying surface features, was bioturbation by annelids (earthworms) and insects such as ants. The magnitude of earthworm bioturbation was noteworthy and an experiment designed to provide basic information on the rate of fine earth translocation involved in this process was performed. This information was gathered through monitoring and collecting of worm casts expelled by worms to the surface of two 1 m² test plots over two 24-hour periods and one 72-hour period. Each plot consisted of a 1 m² surface stripped of vegetation that was swept clean with a whisk broom at the start of each monitoring period. After a specific period had elapsed, all of the earthworm casts on the surface within the block were collected. An effort was made to collect individual casting events separately. Surface casting earthworms apparently operate from one or more surface openings (burrows), from which they disgorge regularly. The worm casts around these burrows were collected with a trowel and small dust pan and then sealed inside of a manilla envelope. They were subsequently oven dried and weighed. The bulk density for each casting event was determined by immersing the casts into water at room temperature contained within a graduated cylinder. The volume of water displaced was measured and the maximum bulk density calculated as the dry weight divided by the volume of water displaced. This value of bulk density is a maximum value since it fails to

compensate for void spaces. Normally, soil bulk density values are calculated by dividing the dry weight of a soil clod by its weight in water after it has been sealed with paraffin or other impervious material. The inclusion of voids in the bulk density determination generally results in lower bulk density values than simply immersing the soil clod in water and measuring the volume of water displaced by the mineral matter of the soil. The calculation of bulk density values for the worm casts allow conversion of these weight values (g/m²/day) into an volume (cm³/m²/day), and therefore permits an estimate of the amount of time that has elapsed since the rocks were placed on the surface.

The two 1 m² plots were each collected twice after 24 hour periods and once after a 72 hour period. In all cases rainfall occurred around the beginning of the measured time period (late afternoon or early evening). The results of this study indicate that surface casting earthworms on or near the feature moved between 28.09 and 49.43 g of dry sediment to the surface per day per square meter. The raw data for these experiments are presented in Appendix D. The average bulk density for the four 24-hour plots ranged between 1.94 and 2.11 g/cm³. For calculation of this model we will use the average observed bulk density, which is 2.00 g/cm³ (Table 8.5). This is a conservative value considering the manner in which it was obtained, and that most surface soils have bulk densities that range between 1.0 and 2.0 g/cm³ (Brady 1990). In terms of the model, a high value of bulk density translates to a smaller volume for any given mass. We will also assume that the worms on the site cast the observed amounts onto the surface only after 1.27 cm (0.5 in) rains and that rains of this magnitude occur 64 times a year.

We arrive at this number by multiplying the total annual rainfall of 81.28 cm (32 in) per year (Larkin and Bomar 1983) times a factor of 2 (32 in/yr x 0.5 in/interval = 64 times).

Table 8.5 Statistical Overview of Bulk Density Values for 72 Worm Cast Samples Examined from Collection Episodes A and B.

Mean	2.003
Standard Deviation	0.243
Minimum	1.08
Maximum	2.8
Range	1.72
Mode	2.08

Clearly, the rain at Fort Hood does not fall in 1.27 cm (0.5 in) increments an even number of times of the year, but likewise, we know from our observations of earthworm behavior that they do not simply cast onto the surface only after rain storms. Hence, these two assumptions together may cancel out and result in a conservative estimate of casting frequency per year.

Using these assumptions then, we can calculate the range of sediment volume cast onto the surface by earthworms per day after rainfall (14.04 to 24.72 cm³), and extrapolate those values to estimates of annual volume of surface casts which ranges between 898.56 and 1,582.086 cm³ (Table 8.6 for the calculations employed). Using these numbers it is clear that the observed values of earthworm activity may result in the upward displacement on the surface of 3.6 to 6.3 cm of sediment per square meter in a period of 40 years. This range compares favorably to the observed depths of rock burial on the Medicine Wheel, which average 3.86 cm for the inner ring, 5.41 cm for spokes, and 8.68 cm for the outer ring (Table 8.7). Put another way, the amount of time necessary to account for the observed degree of rock burial using the maximum and minimum rates of bioturbation are 24 to 43 years for the inner ring rocks, between 34 and 60 years for the spoke rocks and between 55 and 97 years for the outer ring rocks.

If one assumes modest amounts of sediment removal by overland flow and excessively rapid burial by other agents such as ants and leaf litter, the observed burial values could be easily achieved by processes actively occurring on site today. Before leaving this subject, a note of caution is worthwhile. Given that these estimates employ a very short period of observation, they should be used with a considerable deal of caution. They are, however, consistent with a few of the observations described in the literature on annelid bioturbation (see Wicksten 1989:189).

8.5.3 Boulderflow Investigations

One technique used as a relative age dating method for stone alignments and tipi rings on the High Plains involves the progressive chemical transformation of soil beneath boulders, a process known as boulderflow. This process relies upon the concentration of water by a boulder on the soil beneath it to generate significantly different weathering profiles beneath rocks that have been sitting on the surface for substantial and variable periods of time (Dormaar 1976; Abbott 1988). The field application of this test measures the downward deflection of the calcic soil horizon by application of dilute hydrochloric acid to the profile beneath a boulder and then compares it to the soil adjacent to the rock or the profile beneath another boulder. If the boulder has been in place for a substantial period of time, then the depth of leaching should be greater beneath the boulder and should be deeper than it is in the adjacent soil not influenced by the boulder's ability to focus water. This technique is predicated upon the presence of a calcic soil horizon, an attribute not present on this site, and sufficient time since placement of the rock upon the ground surface for the concentrated infiltration of water beneath the rocks to have dissolved calcium carbonate in the upper portion of the solum. The process of boulderflow is not entirely consistent and Abbott (1987, 1988) demonstrated that the reliability of the method is questionable.

Table 8.6 Calculations for Extrapolation of the Rate and Volume of Earthworm Surface Casts from Observed Daily Values per Square Meter to Volume Estimates for a 40-Year Period.

$W \div R = V$	<p>W = weight of worm casts onto the surface per m² R = estimated bulk density of the soil (ca. 2.0 g/cm³) V = volume of casts per m² per day</p>
Minimum observed value	28.09 g \div 2 g/cm ³ = 14.04 cm ³ /m ² /day following rain
Maximum observed value	49.43 g \div 2 g/cm ³ = 24.72 cm ³ /m ² /day following rain
$V \times N = J$	<p>V = volume of casts per m² per day N = assumed number of annual events (N=64, based on 32" of rain, falling in 0.5" increments in 64 days) J = annual volume of casts to the surface per m²</p>
Minimum observed value	14.04 cm ³ x 64 days = 898.56 cm ³ /m ² /year
Maximum observed value	24.72 cm ³ x 64 days = 1,582.08 cm ³ /m ² /year
$J_{40} =$ volume of casts translocated to the surface in 40 yrs	
Minimum observed value	898.56 cm ³ /m ² x 40 years = 35,942.4 cm ³
Maximum observed value	1,582.08 cm ³ /m ² x 40 years = 63,283.2 cm ³
$J_{40} \div 10,000 =$ depth of burial per m ² in 40 years	
Minimum observed value	35,942.4 cm ³ \div 10,000 cm ² = 3.59 cm/m ² in 40 years
Maximum observed value	63,270.4 cm ³ \div 10,000 cm ² = 6.32 cm/m ² in 40 years

Note: A layer of sediment 1 cm thick covering a square meter is equal to 10,000 cm³, so to get the potential depth of burial in a single square meter divide J_{40} by 10,000.

Table 8.7 Extrapolated Times for Burial of Medicine Wheel Section by Bioturbation.

Location	Average depth of rock burial	Years for burial at 0.09 cm/m ² /yr	Years for depth at 0.16 cm/m ² /yr
Inner Ring	3.86	43	24
Spokes	5.41	60	34
Outer Ring	8.68	96	54

Prior to starting fieldwork, we anticipated that the process of boulderflow might provide evidence supporting the relative antiquity of the Medicine Wheel. This analysis was structured as a testable hypothesis stating that the boulders comprising the Medicine Wheel have been on the surface long enough to allow differential pedogenesis beneath component boulders. The null hypothesis states that the boulders comprising the Medicine Wheel have been on the surface an insufficient period of time to allow noticeable differential pedogenesis to occur. To test this hypothesis we examined eight paired soil profiles. Each pair consisted of a soil probe beneath a boulder element of the wheel, and a control probe located at least 50 cm away from the rock. These probes were tested with dilute HCl in the field, and samples of each probe were collected in about 5 cm increments in order to perform quantitative carbonate analysis, if warranted, at a later date. Because of the positive correlation between boulder size and degree of carbonate deflection observed by Abbott (1987, 1988), we collected profiles from beneath the larger boulders comprising various elements of the Medicine Wheel. Differential deflection of the calcic horizon, or alternatively, lesser effervescence beneath the boulder than the control would indicate that the profiles beneath the boulders were more weathered than the control and support the hypothesis that the Medicine Wheel could have been constructed in antiquity. The absence of obvious differences in effervescence would fail to reject the null hypothesis and imply that insufficient time has passed to allow differential pedogenesis to occur.

In all eight cases, no difference in effervescence was observed between the profile beneath the boulder and the adjacent control profile. Therefore, at the qualitative level, the null hypothesis cannot be rejected. Dr. Dormaar (1990) notes that "under highly calcareous conditions, the transformation process due to leaching will be retarded" (Dormaar 1990:205) and that may be the case in this situation. The field results clearly suggest that (1) the solum has not been very weathered and is calcareous

throughout, and (2) the rocks have not been in place very long.

Since the results of the qualitative boulderflow investigations were unsatisfactory, four profiles were selected for quantitative determination of calcium carbonate. The methods used in this analysis are similar to the qualitative test. Pairs of soil cores taken from beneath a boulder belonging to an element of F 1 (inner or outer wheel) and a control point located less than 1 m distant were divided into roughly 5 cm increments and the calcium carbonate percentage of each sample was determined by the Soils and Physical Geography Lab at the University of Wisconsin at Milwaukee by means of a chittick apparatus according to the procedures outlined by Machette (1986). Samples were first oven dried, then crushed and passed through an 80-mesh (0.18 mm) sieve. The portion of the sample passing the screen was then split, placed into decomposition flasks, and reacted with hydrochloric acid. The volume of gas resulting from this reaction was measured and used to calculate the percentage of calcium and magnesium carbonate present. The values for dolomite obtained from the chittick analysis are not used in the interpretation of these results but are listed on Table 8.8 with the other data obtained. A plot of the calcium carbonate content as a function of depth for each boulder-control pair is illustrated on Figure 8.15.

Examination of Figure 8.15 illustrates that in each case there is a significant difference in the carbonate depth profiles between the boulder and control cores. In specific, the profiled beneath the boulders are complacent (show little change with depth), or alternatively minor increases or decreases with increasing depth. Each of the control samples, however, exhibit an increase in carbonate content with depth, and then often decrease again, displaying a prominent bulge around 10 to 15 cm depth. The presence of a systematic difference between the control and boulder samples at first glance appears to favor rejection of the null hypothesis, but examination of the nature of this discrepancy suggests that there

Table 8.8 Four Paired Boulder Flow Data Results, 41CV1505.

Pair Number	Boulder/Control (cm)	Depth	Sample ID (PNUM)	% Calcite	% Dolomite	Total Carbonate
D1	Under Boulder	0-5	58	26.0	6.4	32.4
		5-10	60	26.9	7.7	34.6
		10-15	59	27.2	9.0	36.2
	Control	0-5	61	21.5	7.3	28.8
		5-10	62	26.0	7.0	33.0
		10-15	63	36.1	2.5	38.6
		15-20	64	25.1	6.5	31.6
D3	Under Boulder	0-5	409	28.6	10.4	39.0
		5-10	410	26.9	7.0	33.9
		10-15	411	24.2	7.1	31.3
		15-20	412	18.8	9.2	28.0
		20-22	413	20.3	8.9	29.2
	Control	0-5	414	20.1	8.0	28.1
		5-10	415	12.3	7.8	20.1
		10-15	416	30.6	7.7	38.3
		15-20	417	25.6	8.4	34.0
		20-24	418	25.1	7.7	32.8
D5	Under Boulder	0-5	426	25.5	6.1	31.6
		5-10	427	27.7	8.0	35.7
		10-13	428	24.3	11.1	35.4
	Control	0-5	429	23.4	6.7	30.1
		5-10	430	25.1	12.1	37.2
		10-15	431	34.2	6.3	40.5
		15-17	432	31.2	8.0	39.2
D8	Under Boulder	0-5	446	18.0	10.0	28.0
		5-10	447	18.4	10.3	28.7
		10-13	448	20.0	10.6	30.6
	Control	0-5	449	17.2	5.9	23.1
		5-10	450	26.9	8.0	34.9
		10-15	451	19.2	6.4	25.6
		15-17	452	25.2	6.7	31.9

may be a reasonable explanation for this phenomenon that does support the hypothesis that the boulders comprising the Medicine Wheel have been on the surface long enough to allow differential pedogenesis beneath component boulders.

The shape of the carbonate-depth profile exhibited by the control samples is similar to that exhibited

by soils which have experienced significant weathering resulting in the leaching of carbonate near the top of the profile and reprecipitation at depth. However, if this were the case here, some secondary carbonate morphology (e.g., mycelial/filamentous, nodular, or soft segregations) would be expected in the 10 to 15 cm zone where the elevated levels of carbonate appear to be present. Instead there is no apparent

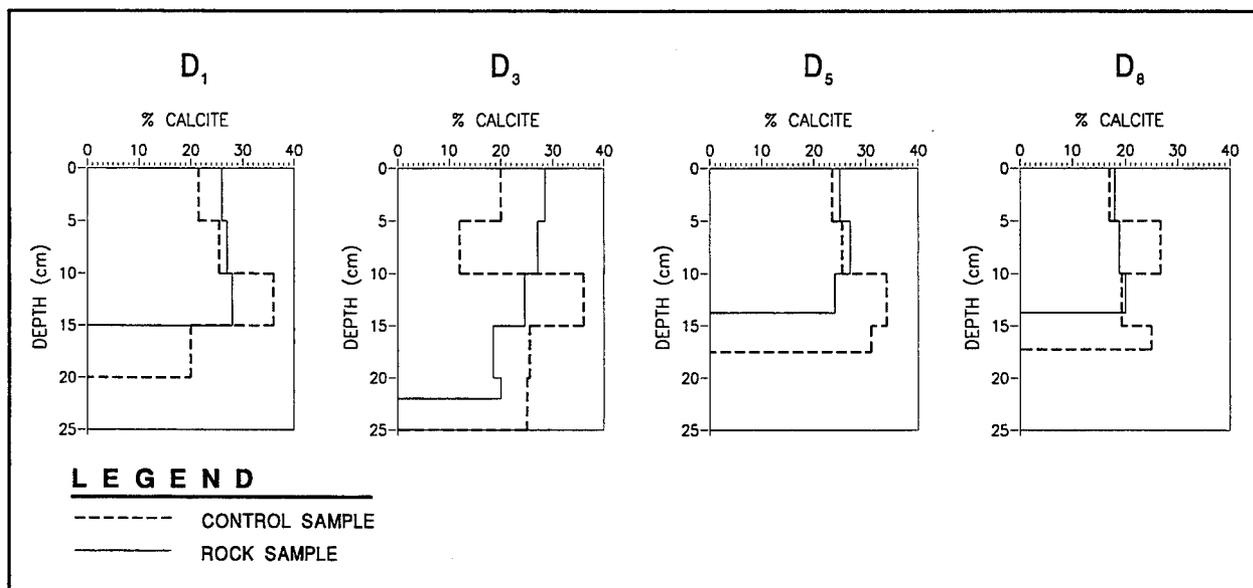


Figure 8.15 Calcite Percentages by Depth for Four Paired Boulderflow Samples.

secondary carbonate present (refer to Table 8.4 for typical description of the solum at this site). Hence, an alternative interpretation is necessary to explain the apparent decrease in calcium carbonate present in the upper 5 to 10 cm of the control cores.

One possible explanation is that the upper portions of the control cores have a low apparent carbonate content owing to a relatively greater proportion of organic matter from leaf litter, whereas the cores from beneath the boulders exhibit less organic matter in the same zone due to decomposition of this material in the period since the rocks were placed upon the surface. Although the coarse leaf litter duff was removed from the ground surface prior to taking the control cores, this process did not remove all of the organic enriched soil from the epipedon of the soil. This was indicated in the field by the color of the top 5 cm of these cores (very dark brown) and the apparent bulk density (very light), which together suggest that the organic matter content of the soil epipedon in the control cores considerably exceeded that of the boulder cores. As a result, removal of leaf litter from the surface of the control cores was not

sufficient to make the boulder and control samples directly comparable.

Owing to its organic origins, leaf litter and its decomposition products are noncalcareous. Significant quantities of recent organic matter in the top of the control cores would result in a lower proportions of calcium carbonate in this part of the profile, as had been observed. Since this result was not anticipated when the chittick samples were submitted for assay, no corresponding values of organic carbon were requested and direct demonstration of the validity of this explanation is not possible here. A decrease in organic carbon beneath boulders has been observed previously by Dormaar (1976). Abbott (1987:176) speculates that this phenomenon is due to the fact that the boulder replaces the vegetative source of this nutrient, rather than an increase in soil moisture beneath the boulder, which is apparently responsible for the majority of the attributes of the boulderflow phenomenon listed by Dormaar (1976).

There is another reason why these results do not support rejection of the null hypothesis. The

effects of the boulderflow phenomenon appear to result from an apparent increase in the weathering of the profile beneath the boulder due to concentration of soil moisture. The carbonate profiles obtained in this experiment clearly suggest that the profiles beneath the boulders are less weathered rather than more weathered, and that the direction of change in the soil beneath the boulders is opposite that which might be expected if the boulders had been in place for a significant period of time. Indeed, the carbonate-depth profiles for the control samples is more in line with what was expected of the boulder cores, assuming the rocks to be part of an ancient stone alignment. If the interpretation of quantitative calcium carbonate determinations posited above is correct then the data suggest that the boulders have been in place long enough for leaf litter material that was present on the ground surface prior to placements of the rocks to decompose. No precise figures for this process are available, but it is probable that it could occur in as little as one year, and certainly after several decades.

8.5.4 Stratigraphy of Feature 9 and its Relevance to the Age of the Medicine Wheel

While investigating the geomorphic processes influential in modifying the site surface, a long, linear, subdued relief ridge that is present on the western half of the site was also investigated. This ridge, also known as F 9, is about 32 m long beneath the Medicine Wheel, and exhibits relief on the order of 5 to 10 cm, which is most prominent on the eastern (or downslope) side. This feature shows up clearly on photographs taken of the Medicine Wheel in 1990 (Jack Jackson personal collection, frames 2, 3, 4, 6, 13, and 15) because of a distinct lithologic contrast between the ridge and the surrounding soil (Figure 8.16). It is visible on vertical aerial photographs of the site as early as 1941 (see Figure 8.1) and may have been present in 1937.

The ridge underlies all of the basic components along the western half of the wheel (inner and outer wheels, and two spokes, E and F) and rocks

comprising these elements of the wheel, especially the inner wheel, clearly rest on top of this ridge. According to the fundamental stratigraphic principal of superposition, this relationship suggests that the Medicine Wheel should post-date the existence of F 9. Excavation of F 9 revealed that it is the only part of the Medicine Wheel exhibiting any significant stratigraphic variation. The majority of the test units excavated at the site exhibited deposits lacking stratigraphic variation. Minimal horizonation associated with soil development was observed, but in general terms, the fine-grained weathering mantle upon which the Medicine Wheel rests is quite homogeneous. The strata associated with F 9 stand in stark contrast due to their variable composition and distinctive stratification.

Two excavation units were used to investigate F 9. The first one, a 1 x 3 m test unit designated TP 21, was excavated where F 9 intersects the inner portion of the Medicine Wheel (see Figure 7.5). The unit was excavated as a single level by means of a shovel. All of the removed fill was dry screened through 1/4-inch hardware cloth, but little cultural material was recovered from this unit. To be precise, a single piece of glass, and a small burnt limestone clast were recovered from this excavation. One charcoal fragment, later determined by Phil Dering (Texas A&M University) to be juniper, was recovered from the screen, and its provenience can be placed around the middle portion of the unit within zone 1 (Figure 8.17). This charcoal fragment was submitted for AMS radiocarbon dating and assayed out at 105% of modern. The rocks comprising the inner wheel were left as a balk that was later removed to aid in description of the north wall profile. Examination of this profile (Figure 8.17) reveals that the feature initially began as a rill or rill-like feature cut into the ground surface or soil from above (zone 6 of Figure 8.17). This erosional cut was about 140 cm wide and subsequently filled with a complex series of deposits. The first of these deposits is material (dark brown clay loam) reworked from the natural soil (zone 5) and was soon followed by a semi-

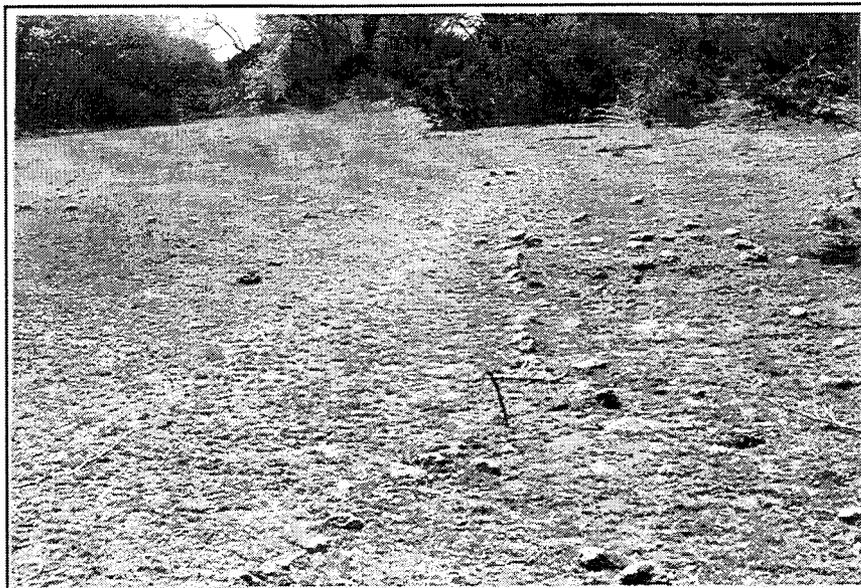


Figure 8.16 Low Fossil Oyster Shell Ridge Crossing Under Inner Ring on West Side of Wheel, View to Southwest (January 1990).

lenticular body of clean, medium light brown-colored sand (zone 4). This sand exhibited laminations and platy structure in some places. It is present about 10 cm beneath the bottoms of the rocks forming the inner wheel, and removal of the balk surrounding these rocks indicated that this deposit was very linear in nature and oriented north 40° east. A darker brown sandy clay loam (zone 3) rests upon this sand, and is in turn overlaid by 10 cm of oyster shell gravel (zone 1) which, away from the center of the feature (the ridge), becomes increasingly mixed with the natural soil upon which it rests (zone 2).

The presence of oyster shell, especially in significant amounts, on top of the natural soil is anomalous at this location. Oyster shell is a common component of the limestone immediately below the soil and a few fragments were observed in the solum across the site, especially where the solum is thin, but extensive amounts on top of the soil demonstrate that this material is out of its normal stratigraphic position for this part of the site. It is highly probable that these shells have as their source a bed that crops out above the surface of the site we examined, upslope and to the west,

and were put in place by some process, probably anthropic in origin. Consideration of the out-of-condition state of the oyster shell in light of the linear nature and sharp edges of the sand deposit beneath it (zone 4), led us to excavate another unit (TP 31) that emphasized examination of the plan geometry of the deposits, and prospection for additional datable material which could date the emplacement of the fossil shell.

This second test unit was 70 cm wide by 300 cm long, about 11 m southwest of TP 21, and was initially excavated by shovel to a depth of 9 to 14 cm below the datum (see Figure 7.5). This surface was subsequently cleaned with a trowel and broom and drawn as the level 1 floor (Figure 8.18). Bedrock was beginning to show in the southeastern end, but two soil anomalies characterized the level 1 floor: (1) a pair of narrow (4-6 cm) roughly parallel linear soil anomalies filled with slightly different material, one of which, was dark brown sandy clay loam, and the other of which was a light brown sandy clay loam; and (2) a prominent, ca. 40-cm-wide oyster shell deposit that was situated about 80 to 100 cm from the west end of the test unit. The

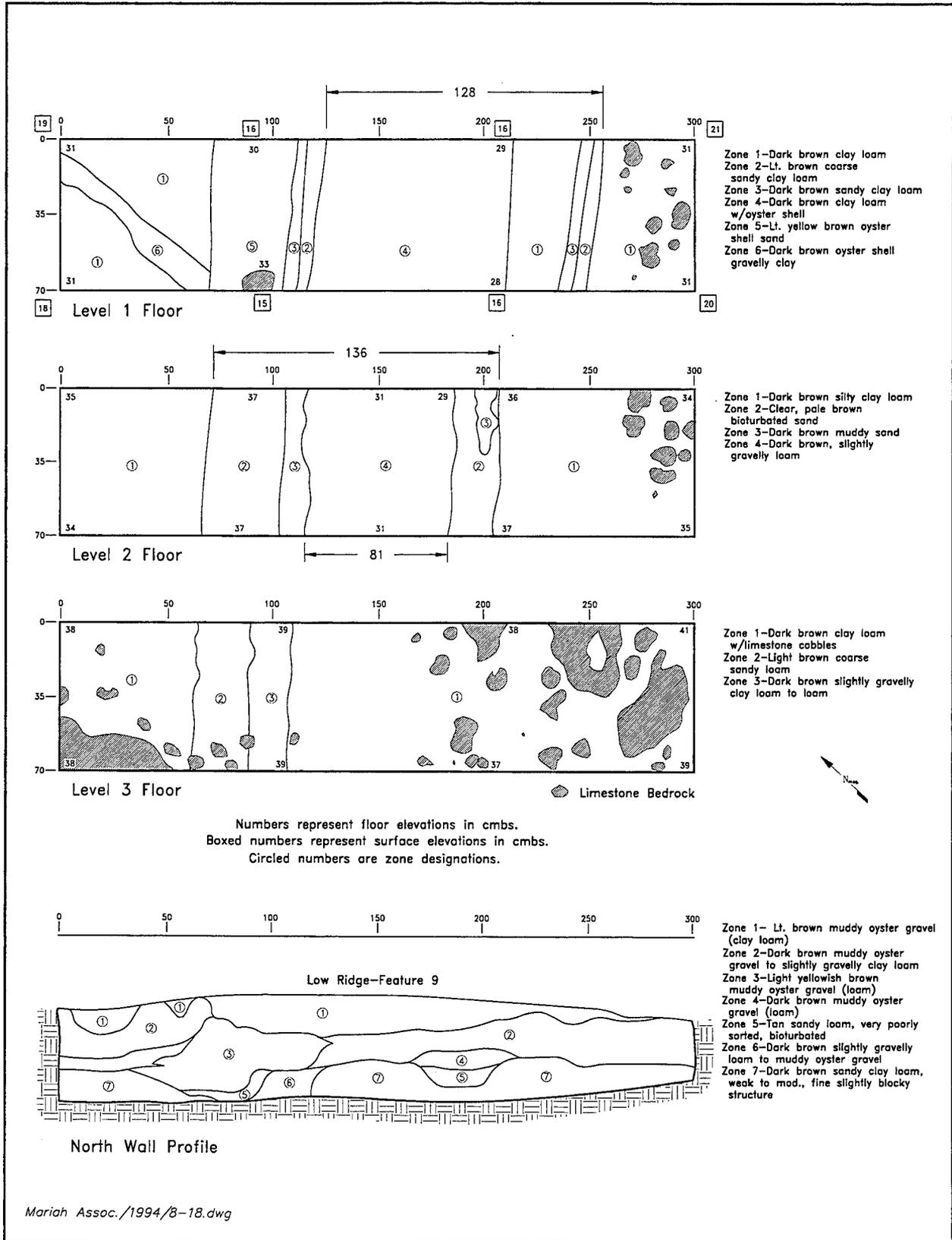


Figure 8.18 Plan and Profile of Test Pit 31.

components of the first anomaly, the two parallel cuts, were between 126 and 128 cm apart, oriented about north 50° east, and in both sets the darker colored deposit was situated to the west of the lighter color one. The narrow, linear nature of these anomalies led us to believe that they were vehicle tracks, possibly wagon or stage coach tracks. The other anomaly appeared to represent oyster shell filling a linear depression. After excavation of about 5 cm, the unit floor was cleaned and another plan drawn and photographed. This surface, the level 2 floor, revealed a pair of linear soil anomalies composed of light brown sand which were identical in composition to zone 4 of TP 21 (Figures 8.18 and 8.19). These features were about 136 cm apart (outside edge to outside edge) and had a dark brown muddy sand deposit either parallel to, or inside of, the lighter colored sand deposit. The sand was clearly deeper and thicker in the westernmost anomaly. Another 5 cm was excavated from the floor of the unit with a trowel and a final plan drawn. This surface, the level 3 floor, retained only the westernmost linear soil anomalies, a light brown sand deposit 25 to 30 cm wide, and a dark brown, slightly gravelly loam which were parallel and adjacent to each another. Bedrock formed a significant part of the eastern end of the unit floor at this point (Figure 8.19).

Like TP 21, the north wall profile indicated that the soil anomaly (the ridge, designated F 9) started out as a long linear depression characterized by two rill-like cuts into the natural soil. These excavations were initially filled in by clean sand (a deposit presumably formed by flowing water) and subsequently by multiple generations of clean (yellow brown colored) oyster shell gravel. The linear depression became a low relief ridge due to the addition of the oyster shell, and eventually these oyster shell deposits became mixed with the natural dark brown soil away from the center of the ridge.

Seven samples from the north wall profile of TP 31 were submitted to the Soils and Physical Geography Lab at the University of Wisconsin at Milwaukee for particle size analysis, as well as

determination of organic carbon and carbonate content in order to document the variations in the physical properties of these deposits. The results of these analyses are presented in Table 8.9 and are graphically depicted in Figure 8.20; refer to Figure 8.18 for the distribution of these deposits in the TP 31 north wall profile. As is clear in Figure 8.20, the soil into which F 1 was initially cut is the finest textured deposit in the profile, with a mean grain size of 6.7 phi (medium to fine silt) and a gravel content less than 1%. All of the subsequent deposits, however, contain significant quantities of oyster shell gravel (between 5 and 16%). The coarsest textured zones (3, 4, 5, and 6) are all associated with the initial phases of filling of the linear depressions, and the texture reflects the significant proportion of oyster shell gravel. The exception to this general statement are the sandy deposits of zone 3, the field appearance of which was consistent with deposition by flowing water. Textural analysis of these sediments revealed that zone 3 contains 20% more sand and 10% less gravel than the bounding units. The decrease in mean grain size of zones 1 and 2 clearly reflects the mixing of soil and oyster shell gravel near the top of the profile.

Interpretation of these anomalies is problematic but appear to be best explained as a historic-age road, probably the same road which appears on the 1951 aerial photograph running through the Wheel. At the most basic level, three aspects of the field observations must be explained: (1) the linear nature of F 9, (2) the creation of the rill-like trenches in the same place as and beneath the ridge, and (3) the subsequent appearance of the oyster shell which is stratigraphically out of place in this location. Similar relief features (long, linear depressions) on and near 41CV1505 appear to form by differential soil erosion by concentrated overland flow between the tree canopies, especially junipers. Inspection of the steeper slopes west of the Medicine Wheel found some linear ridges formed by this process, but none were in excess of 5 m long. Secondly, this process would best explain the relief, but not the stratigraphic units, comprising the ridge, in



Figure 8.19 View of Excavation (Test Pit 31) Level 2 of Feature 9 Showing Non-natural, Parallel Depressions.

Table 8.9 Particle Size Analysis from Matrix Column at TP 31, 41CV1505.

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
	Clay Loam	Clay Loam	Loam	Loam	Sandy Loam	Loam	Clay Loam
Sample ID	104	105	106	107	108	109	110
Gravel (<1φ)	10%	5%	14%	16%	6%	15%	1%
Sand (-1 to 4φ)	35%	30%	39%	42%	58%	42%	28%
Silt (4 to 9φ)	36%	40%	35%	33%	22%	32%	37%
Clay (>9φ)	27%	29%	26%	25%	19%	26%	35%
Mean Grain Size	4.9φ	6.1φ	4.4φ	4.1φ	4.5φ	4.2φ	6.7φ
Median Grain Size	5.1φ	6.0φ	4.3φ	3.8φ	3.5φ	3.9φ	6.9φ
Std. Dev. Grain Size	4.3φ	3.5φ	4.5φ	4.6φ	3.8φ	4.6φ	3.1φ
Percentage, Very Coarse (0φ) Sand	5.9%	3.5%	6.4%	7.1%	5.7%	6.0%	3.1%
Percentage, Coarse (1φ) Sand	6.7%	4.4%	6.9%	8.1%	1.1%	7.2%	5.0%
Percentage, Medium (2φ) Sand	7.2%	6.1%	7.7%	8.0%	18.2%	8.6%	5.8%
Percentage, Fine (3φ) Sand	7.4%	8.2%	8.3%	7.3%	15.3%	9.0%	7.8%
Percentage, Very Fine (4φ) Sand	4.7%	6.7%	4.7%	4.5%	4.7%	5.2%	6.3%

Note: Grain size is expressed as phi (φ), ranging from coarse sand at <1φ to clay at >9φ.

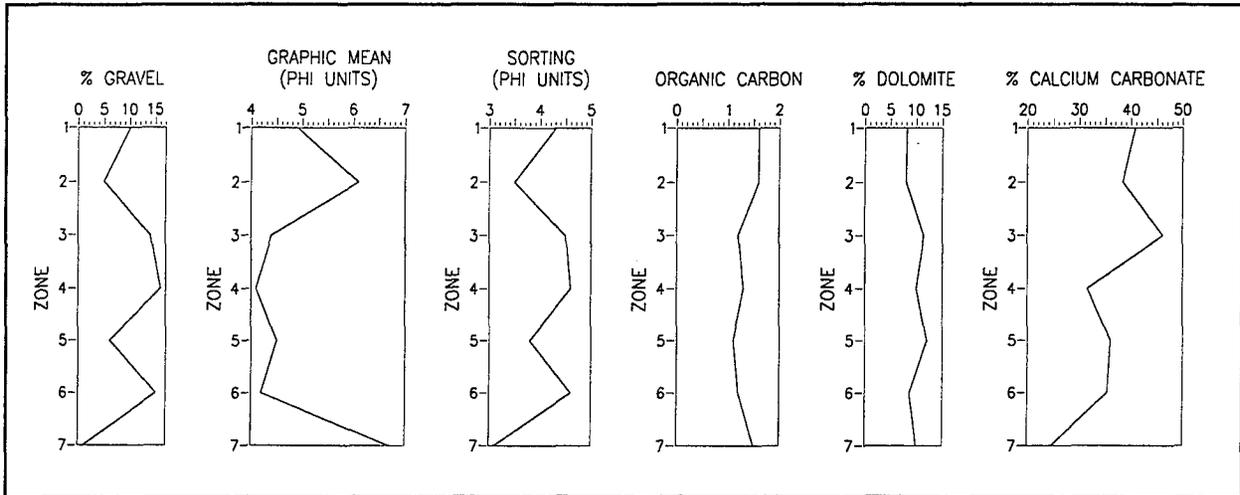


Figure 8.20 Physical Property Diagrams of Seven Samples from Profile of TP 31, 41CV1505.

particular the oyster shell. To evoke this model of formation for F 9 (the rill model) would require first creation of a rill and filling of the rill with channelized flow deposits, followed by deposition of significant quantities of oyster gravel (unlikely on the gentle slope the feature occupies) and a subsequent inversion of relief, making the former depression a ridge by means of differential erosion. This sequence of events is considered highly unlikely, especially since the size of the oyster shell comprising the upper portions of the feature appears to be beyond the transport capacity of overland flow, even on the steeper slopes west of the Medicine Wheel. A cursory inspection of Hjulstrom's diagram (cf. Blatt et al. 1972:93) suggests that the critical velocity necessary to entrain 2 mm particle ranges in a flow 1 m deep would be between 30 and 150 cm/s; the velocity necessary to achieve the same goal in unconfined flows less than 10 cm deep would be greater. Likewise, much of the material comprising the shell ridge is in excess of 2 mm in diameter, often greater than 5 to 10 mm, and these particles would require yet greater transport velocities (certainly in excess of 100 cm/s). Therefore we believe that the slope in the vicinity of the Medicine Wheel is too low to generate overland flow velocities necessary to permit mobilization, let alone significant accumulations of the oyster shell gravel

composing this ridge. Moreover, the pronounced linear nature of this feature is unlike most rills, which on surfaces as gentle as this tend to meander slightly, whereas F 9 does not.

The sequence of events deduced from the deposits and the linear nature of the soil anomalies within the ridge conform well to a model that considers the feature a road that started as a dirt trail, experienced some erosion, and subsequently was improved by addition of coarser material, specifically fossil oyster shell. Dirt roads on gentle slopes and muddy (clayey) substrates commonly form ruts which, in cross section, appear as rill-like linear depressions. Likewise, road ruts, if left exposed for some time, frequently fill with deposits generated by concentrated or channelized overland flow which may be either sandy or silty in character, and are often laminated. The presence of the oyster shell is easily explained by this model since rutted roads are often improved by the addition of coarse sediment, which at Fort Hood in particular, is commonly Cretaceous oyster shell. In addition, improvement of roads in this fashion generally changes the rutted road from a linear, concave feature (a shallow, symmetrical, rutted, negative topographic expression feature according to classification of Nials 1983; Figure 6-9) to a

positive relief, convex feature (low, symmetrical, parabolic, positive topographic expression according to the classification listed by Nials 1983:Figure 6-11) such as we have observed. Both of the cross-sectional forms comprising F 9 are common attributes of historic roads (Nials 1983:6-6 to 6-7). The fact that the orientation of this feature coincides with an oyster shell borrow pit located at the margin of 41CV1505 strengthens the association suggested by this interpretation (see Figure 8.2).

There is little information available in the archeological literature useful in distinguishing roads of historic age from other features. Although not completely applicable to this discussion, in a paper examining Chacoan roads, Nials (1983:5-26 to 5-27) lists 11 attributes of modern and prehistoric roads which provide at least one point of comparison for F 9. Five of these attributes do not apply to F 9 (runoff concentration, road course, terminations, valley bottoms, and modern features) whereas six do (color, road margins, vegetation, width, profile, and relationship to historic features). Of these six, F 9 possesses five attributes consistent with modern roads. In particular, it is a lighter color than the surrounding surface; it has sharp, well defined edges; it exhibits evidence of former rutting; and it is associated (albeit tenuously) with a historic feature (the borrow pits). Arguably, F 9 and the Medicine Wheel are unrelated given that the Medicine Wheel is constructed on top of F 9. The width of F 9 is consistent with modern roads, being slightly wider than 3 m. Individual tracks within the F 9 (e.g., on TP 31 plans) are, of course, narrower than 3 m, as is the width of nearly all modern vehicles. Nials notes that the width of unmaintained two-track roads as 2 to 3 m or less. Given that the addition of oyster shell would place F 9 into the realm of a maintained road, the width is consistent with a modern road. The occurrence of isolated water-laid deposits within F 9 (TP 21 north wall profile, zone 4; TP 31 north wall profile, zone 5) is also consistent with the interpretation of F 9 as a road. Nials (1983:6-47) notes that many roads, and Chacoan

roads in particular, are associated with water-laid deposits and that these deposits are most often a lighter color and sandier than the surface sediments outside the roadway. Both of the deposits inferred to be water-laid sediments observed in profiles through F 9 fit this description.

If one accepts the hypothesis that F 9 is the vestige of a road, at least two sizes of vehicle are indicated by the field evidence, one which has very narrow tracks (4-6 cm wide) and bear a remarkable resemblance to wagon or stage coach wheels, and a larger vehicle that has a wheel width on the order of 20 cm or wider (Table 8.10). The relative stratigraphic position of the different "tracks" indicates that the smaller tracks post-date (occur above) the initial formation of the rill-like depressions by the larger wheel width "vehicle." The size of the "vehicle" responsible for the narrow "tracks" may be a wagon such as a stage coach. Tracks of similar spacing (130 cm) have been recently described by Wood (1993:555) as "reliably identified as stage roads" although previously the same feature had been considered a "travois trail."

A travois trail model has been suggested for F 9 as well, but this scenario seems unlikely. At first glance, this model is an attractive alternative because the width of the narrow tracks within F 9 are not too different from those reported by Henderson (1994:149) for the width of a dog travois frame (115 cm). No measurements for a horse travois could be found, but the width of such a travois would probably approach 4 m and be too wide to explain the portions of F 9 believed to be ruts. So, the narrow tracks observed within F 9 are consistent with the size range of a prehistoric dog travois. The point at which this model becomes untenable is in accounting for the other tracks observed in F 9, the transformation of the trail from a negative to a positive relief feature, the addition of the gravel, and the lack of any documented archeological evidence of undisputed travois trails elsewhere on the Plains. To our knowledge, there are no undisputed examples of

Table 8.10 Selected Widths for Various Historic Vehicles.

Vehicle	Tire Size (cm)	Track Size (cm)	Comments
Briggs Lighting Dump Wagon ¹	10	142-157.5	-
Worthington Handy Wagons ¹	10-12.7	96.5-104	-
Empire Steel Wheels	5-20	-	-
Oak Wood Tires ¹	1.9-10	-	-
Warner Wheels ¹	3.8-11.4	-	-
Sarven Wheels ¹	3-10	-	-
Sears Roebuck Vehicle ²	-	142-157.5	wheel to wheel
Abingdon, Ill. Farm Wagon ²	-	137-152.4	center to center
Buggies ²	-	142-157.5	-
Michigan Surry ²	-	142-157.5	-
Columbus Carriages ²	-	142-157.5	-
1937 Ford Pickup ³	25	160	outside to outside
		134.6	inside to inside
Model A (1927-1932) ³	-	152.4	widest, outside to outside
Model T (1915-1927) ³	-	157.5	widest, outside to outside

¹ = Spivey 1979

² = Sears, Roebuck Catalog

³ = Personal communication, Pat O'Neill

travois trails that have been observed in archeological excavations elsewhere on the Great Plains, which alone makes acceptance of the travois model problematic. If travois trails did exhibit the attributes of F 9, they must have been exceptionally uncommon. In the most general sense, it is difficult to envision how many passes of a dog travois would be necessary to initiate the rutting observed in the profiles of TP 21 and TP 31. Furthermore, no discussion of rutting, or evidence of maintenance of rutted travois trails, have been recorded in either the archeological literature or ethnohistoric literature. There are references to Native American trails in the ethnohistoric literature, but archeological examination of such features, other than more formal items such as Chacoan Roads, are lacking. While the travois model cannot be completely ruled out, its ability to explain the observed phenomena is less than comprehensive.

Although the stratigraphic relationship of the Medicine Wheel to the oyster shell which comprises F 9 suggests that the two are either unrelated, or that the Medicine Wheel was constructed after the oyster shell was placed on top of the rutted negative relief portion of F 9, the use of the oyster shell on both the ridge and the Medicine Wheel implies that the two are of similar age. Two of the spokes of the Medicine Wheel, spokes F and G, exhibit a thin (less than 5 cm) layer of oyster shell on top of the natural soil between the linear arrangement of rocks that form the spokes (see Figure 8.11). This occurrence is undoubtedly deliberate. As mentioned previously, the stratigraphic occurrence of this oyster shell on the surface in this location is anomalous. The identical stratigraphic occurrence on the Medicine Wheel and forming F 9 suggests to us that the two maybe temporally linked. Likewise, given that the creation of the Medicine Wheel is undoubtedly

ascribed to human agency, then, the occurrence of the oyster shell comprising F 9 is also probably due to some form of human agency as well.

8.5.5 Summary of Geoaicheology

The results of the geoaicheological field work provide information on the character of the soil mantle at the site, the geomorphic processes influential in the creation of this soil, and the age of the Medicine Wheel. Regardless of who constructed this stone alignment, all of the data bearing on the age of the feature obtained during the geoaicheological investigations converge to suggest that it is recent, perhaps less than 50 years old. The soil beneath the Medicine Wheel is minimally weathered and horizonated, and generally less than 35 cm thick. The lack of significant horizonation implies that the soil at this site has not been weathering for a prolonged period of time. The negative results of the boulderflow investigations suggest that the rocks comprising the Medicine Wheel have been on the surface an insufficient period of time to result in substantially advanced stage of pedogenesis beneath the rocks. Processes currently affecting the surface include overland flow and bioturbation by a variety of agents. Measurement of the rate at which one of these agents is adding fine grained soil material to the surface, specifically surface casting earthworms, and a conservative extrapolation of this rate, suggests that bioturbation of this nature alone could account for the observed degree of rock burial in a period between 24 and 96 years. Full consideration of other processes such as constant addition of leaf litter, redeposition of sediment by overland flow, and bioturbation by other agents, specifically ants, could account for the variation observed in the degree of rock burial and imply that recent burial of the rocks is highly plausible. Likewise, the recovery of juniper charcoal from the oyster shell deposits comprising F 9, and the subsequent modern radiocarbon age of this charcoal, also suggest that the Medicine Wheel is effectively modern, since the rock alignment is stratigraphically superimposed on top of the strata

from which the charcoal was derived. Inspection of the 1937 aerial photographs suggest that juniper was not a major component at that time, and Jurney (1992:18-20) notes that junipers that were cut during the Texas A & M University field school mapping project contained between 15 and 30 growth rings. Hence, the radiocarbon age and the dendrochronological work undertaken by Texas A&M and Jurney (1983) support a young age for the feature.

Furthermore, the occurrence of the Medicine Wheel on top of F 9, which is interpreted as a historic road, also suggests that the age of this stone alignment is effectively modern. Detailed examination of F 9 indicates that it formed first as one or two narrow trenches worn into the natural soil, and these were subsequently partially filled with sandy sediment deposited by running water. Sometime thereafter, these rill-like or rut-like features were filled with and/or buried by Cretaceous-age oyster shell gravel. The very straight morphology, and the existence of pairs of rill-like features and other linear soil anomalies within this ridge, suggest that this ridge is a road. The orientation of this feature leads to an oyster shell borrow pit that lies just to the southwest of the Medicine Wheel. The morphology and interpretation of this feature imply that it is of historic age, and this is corroborated by the radiocarbon date obtained from this feature. Furthermore, interpretation of F 9 as a road fully accounts for all of the observed soil anomalies, and also explains the anomalous presence of oyster shell on the surface above the natural soil. That F 9 and the Medicine Wheel are of similar age is implied by similar out-of-condition occurrence of oyster shell on top of the natural soil on two spokes of the Medicine Wheel and F 9.

Given the convergence of multiple lines of evidence, a historic age for the Medicine Wheel seems most probable. Clearly however, none of the observations made during the geoaicheological investigations provide information on the identity or ethnicity of the people who constructed this stone alignment.

9.0 EVALUATION

J. Michael Quigg

The following evaluation of significance is derived from a multi-disciplinary set of archeological and geoaicheological data, various physical and chemical assessments, aerial photograph interpretation, historic literature review, and ethnographic interviews. In this chapter, this information is used to individually assess the research potential and cultural significance of the lithic scatter and the of Leon River Medicine Wheel at 41CV1505.

9.1 THE LITHIC SCATTER

The low density cultural chert debris, the three scattered and disturbed burned rock concentrations (Fs 2, 3 and 4), and the low frequency of formed stone tools (n=16) distributed across the 66,000 m² surface of 41CV1505 indicates limited and dispersed prehistoric activities at 41CV1505. The majority (about 80-85%) of the site area was cultivated at least between A.D. 1920 and 1940 (except at the Medicine Wheel) as revealed in the 1937 through 1941 aerial photographs and also as reported by informant Mrs. Troy Hunt. Years of cultivation into the shallow upland soils has left minimal, if any, intact areas outside the non-cultivated area of the Medicine Wheel. The contextless, vertically disturbed and shallow sediments, which at one time apparently contained multiple occupations from broad temporal spans (about 6000 to 1000 BP) as indicated by the recovered Angostura and Scallorn projectile points, can not now if indeed, such was ever possible) yield sufficient scientific data to address detailed research questions pertaining to the prehistory of Fort Hood (Ellis et al. 1994).

9.2 THE LEON RIVER MEDICINE WHEEL

Early investigations of medicine wheel features on the Northern Plains thought these unique features represented religious/spiritual sites. To date, a single function has not been identified to account

for all the different geometries of known Medicine Wheels. Nonetheless, most ethnographic and archeological researchers refer to Medicine Wheels, as religious sites, as "sacred sites," or as traditional cultural properties. As such, the Leon River Medicine Wheel can not be viewed solely as a secular archeological site which provides information only concerning past events nor can it be judged solely on archeological merit. The Leon River Medicine Wheel has current cultural meaning as well, and must be viewed from several perspectives which include religious concerns. Sacred sites often contain minimal archeological evidence to indicate their sacred use, so their significance can only be ascertained through interviews with knowledgeable users (Parker and King 1990:2). Although one or more of these perspectives may not be relevant or show significance, the federal law only requires importance in one area to require designation and protection. Section 101(d) of the National Historic Preservation Act as Amended in 1992 (16 U.S.C. 470), states that properties "with traditional religious and cultural importance to Indian Tribes" may be determined eligible for inclusion on the National Register. The passage of American Indian Religious Freedom Act of 1978 guarantees access to sacred sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.

9.2.1 Archeological Significance

The stone artifacts recovered during excavation and collection from the surface of the Leon River Medicine Wheel indicate a range of activities such as cooking, hide scraping, hunting or hunting assemblage replacement, and stone tool maintenance. The sites' shallow soils (less than 30 cm) coupled with the turbation activities (roots, animals, insects, and worms) contribute to questionable context for the stone tools and the Wheel itself. However, stone tools, burned rocks, and lithic debitage from the excavations were principally recovered from below the rocks of the

Medicine Wheel, therefore these stone objects appear to have been mostly present at this location prior to the construction of the stone alignment. The two oldest radiocarbon dates of 490 BP (A.D. 1430) and 160 BP (A.D. 1810) may indicate ages of the several occupations or may represent natural range fires. The oldest date was obtained from charcoal collected from higher in the profile than the younger of the two samples (Table 8.2) and therefore may indicate turbation activity or mixing of deposits. Consequently, it is impossible to state with certainty that the obtained radiocarbon assays relate to the Medicine Wheel itself. The charcoal sample recovered from below the inner ring rocks in TP 21 yielded a modern age on juniper charcoal. It is not certain if this charcoal sample has been displaced through turbation activities.

The recent historic artifacts such as the glass, roofing tacks, M-16 shell casings, and the C-ration cans were mostly on the surface and document use of this location since about A.D. 1940. Feature 5, the small burned rock hearth, also appears to represent recent army activity. This recognizable recent historic material assemblage on the surface or slightly buried but mixed with the stone tools, lithic debitage, and the rock alignments, is interpreted to be not originally associated with the stone alignment. The modern charcoal assay may be associated with these recent Army events.

9.2.2 Ethnohistoric Significance

Apparently the Leon River Medicine Wheel was unknown, both to archeologists and to Native Americans, prior to its first reported documentation in 1990. The existence of the Leon River Medicine Wheel in Central Texas is presently far outside the known or expected geographical range of Medicine Wheels identified across the Northern Plains region (Quigg 1984; Brumley 1988). Of the 67 known features classified as Medicine Wheels studied by Quigg (1984) and Brumley (1988) from across the Northern Plains, only two are known south of the Montana-Wyoming border.

The physical characteristics of the Leon River Medicine Wheel differ from the 67 medicine wheels documented in the Northern Plains. These characteristics include straight line segments forming the inner and outer rings, relative precision in construction, presence of two rings of rocks, the Wheel's very large diameter, the double row of spokes which radiate from the inner circle rather than a central feature, and other construction details. Both the interior and exterior rings of the Leon River Medicine Wheel were constructed using straight line segments with openings at each spoke. Referring to the shape of this feature as a circle does not adequately describe its real shape, which, in reality, is a 16 sided polygon (projected reconstructed form from the known western third of the structure, see Figure 6.3). None of the 67 known Northern Plains features exhibits a straight polygon shape/pattern, or two concentric rock rings connected by spokes.

The polygon segments for the inner ring range from 5.4 m to 5.0 m long and connect one spoke opening to the next. The opening between the straight segments range between 60 to 107 cm wide. Although somewhat disturbed, the outer straight line segments of the polygon appear to be in lengths about 11.25 m between spokes. The distance between the inner and outer polygons vary between 15.3 and 15.4 m on the western side, while along the northern edge at Spoke A, the distance increases to 16.4 m long, and the southern side at Spoke H which decreases to 14.6 m long. The western edge reveals extremely consistent measurements for the intact Medicine Wheel segments, but these measurements deviate at the northern and southern boundaries where the outer ring encounters the tree line. The May 1994 detection of the straight line of rocks along the southern side of the outer polygon is inconsistent with the rest of the construction details. This straight line segment was possibly an attempt to alter the planned Wheel size to accommodate the tree line, or for some other reason, which began an apparent change in the overall Wheel shape.

The projected reconstruction of the Leon River Medicine Wheel would be nearly 60 m in diameter. Presently, the largest circular Medicine Wheel in the Northern Plains are about 30 m in diameter (Roy Rivers, British Block Cairn, Majorville; Quigg 1984). The latter wheels are in Brumleys' (1988) Subgroups 5 and 6 and contain single lines of rocks or spokes that stop at the outer ring.

Only two known Medicine Wheels (both in Brumleys' Subgroup 6), the Big Horn Medicine Wheel in northern Wyoming and the Majorville Cairn in southern Alberta (Calder 1977), contain more than four spokes that stop at an outer ring. The 28 spokes at each site represent a significant number to Natives Americans that, among other things, refers to the number of days between new moons and the number of ribs in a bison. The spokes at these two sites are composed of single lines of rocks nearly equally spaced apart, that originate at a central cairn and terminate at an outer circle of rocks. Neither of these northern features reveal purposeful openings in the outer ring as is evident at the Leon River feature. Only about six of the Northern Plains Medicine Wheels exhibit an opening to the central area from the outer circle, although the Leon River feature would have had 16 openings or pathways to the outside. Brumley's Subgroup 2 structures have one prominent opening in the outer ring, but these structures have central cairns and do not exhibit spokes. None of the known northern Medicine Wheels exhibit multiple pairs of spokes like those of the Leon River Medicine Wheel. Only one feature, the Sundial Hill Medicine Wheel, exhibits two concentric stone circles and it also has a central cairn with no radiating spokes. Nearly all the medicine wheels known on the Northern Plains contain some type of central feature, such as hearth, large or small cairn, or small diameter circle which is absent from the Leon River feature.

In summary, the Leon River Medicine Wheel has no known counterpart on the northern Plains. The 16 spokes and 32 individual rows of rocks which

radiate out from the inner wheel to create walkways with openings in the inner and outer rings is a unique pattern, as is the absence of any central feature. Similar Medicine Wheels may yet be discovered or may have been destroyed. In addition, some variation from the northern forms might be expected this far south.

9.2.3 Native Cultural and Religious Significance

The evidence of religious significance is far less ambiguous than that for archeological or ethnohistoric significance. All Traditional Elders interviewed recognized the Leon River Medicine Wheel as a sacred structure. Haman Wise stated "the Wheel is a temple, an altar, a shrine, a place for our ceremonial way, our spirituality, our prayers, to obtain knowledge of how to go about life for all tribes and people."

The Traditional Elders stated those people who come to the Wheel should leave offerings (food or tobacco), the more people that come the faster the power will grow. People should come and pray in their own way and leave offerings or sacrifices. Removing rocks from the Wheel would remove its power, whereas adding rocks would strengthen its power.

The Traditional Elders interviewed believe that this is a traditional place and none had trouble with the fact that apparently no one knew of its existence prior to 1990 or had oral traditions that referred to this feature. The Traditional Elders observed that since the Wheel was not used over a long period of time (the previous Indians in Texas were removed or killed by 1875), it lost power; now that people are using it again, it will regain power. The Wheel was given to the Indian people by God and there are no tribal restrictions.

William Tallbull thought the rock concentration (F 7) just outside the outer ring along the southwest side was an altar. This location would be appropriate if one believed that they could not enter into the middle of the Wheel for prayer. No

substantial archeological data exists to suggest otherwise, since the historic material recovered from this altar may have possibly worked downward through turbation activities.

9.3 NATIONAL REGISTER ELIGIBILITY

9.3.1 Medicine Wheel Characteristics

To meet the federal guidelines for National Register of Historic Places eligibility, a site or district must meet one or more of the following criteria:

"The quality of significance in American history, architecture, archeology, *and culture* (emphasis added) is present in districts, sites, building, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association and: (a) that are associated with events that have made a significant contribution to the broad patterns of history; or (b) that are associated with the lives of persons significant in our past; or (c) that embodies the distinctive characteristics of a type, period, or method of construction that represents the work of a master, or that possesses high artistic values or that represents a significant and distinguishable entity whose components may lack individual distinction; or (d) that yield or are likely to yield information important in prehistory or history.

"Ordinarily cemeteries, birthplaces, or graves of historical figures, properties moved by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance in the last 50 year shall not be considered eligible for the National Register (36 CFR 60.6).

Neither the overall site 41CV1505, nor the Medicine Wheel feature at this site, appear to contain sufficient scientific information or potential information to contribute to our understanding of the cultural region to meet criteria (a) through (d) of the National Register. If the Wheel is not over 50 years old, then it is generally not of sufficient age to be considered for inclusion on the National Register. However, under circumstances where the site possesses "exceptional importance," or if it is an integral part of a district that is eligible, then sites less than 50 year old may be considered (Sherfy and Luce n.d.). Since this Wheel is not in the previously known geographic range of medicine wheels, has a polygon shape, and differs in other construction attributes from those documented Medicine Wheels in the Northern Plains, these physical lines of evidence combined with the stratigraphic information imply that the feature may be ineligible for inclusion to the National Register on the basis of historical, architectural, or archeological grounds. The National Register does not include properties important solely for their contemporary impact and visibility.

9.3.2 Traditional Cultural Properties

Regardless of age, sites may be regarded as important on the basis of their cultural significance and thus may be eligible for inclusion in the National Register as a *traditional cultural property*. These are properties, or places, associated with cultural practices and the beliefs of a living community that (1) are rooted in that community's history, and (2) are important to maintaining the continuing cultural identity of the community (Parker and King 1990:1).

Under a broad interpretation of "Traditional Cultural Properties" as delineated in National Register Bulletin 38, the Leon River Medicine Wheel may qualify as eligible for inclusion to the NRHP. However, some potential problems appear even for this type of listing. No historical continuity of use is apparent with contemporary Native American traditions for the Leon River

Medicine Wheel. The Comanche, one of the last groups to historically enter the region from the Northern Plains, apparently do not have an oral tradition for the use of medicine wheels in general, nor for this particular feature (in-depth interviews were not undertaken with Comanche Elders on this particular subject). However, the nineteenth-century Texan policy of systematically removing Indians, including Comanches, from the State, may underlie the absence of oral history about this site. It is not uncommon for a displaced people, such as the Indians of Texas, to lose continuity with specific sacred sites. The extent of the loss of cultural continuity by the southern Plains Native Americans might be reflected by need for northern Plains Indians to come to Fort Hood to conduct the renewal ceremony for the Medicine Wheel and teach the southern Plains groups about the significance, rituals, and maintenance of the Medicine Wheel.

9.3.3 Solicited Opinions

Advice and opinions were solicited from several knowledgeable cultural resource managers concerning the potential of the Leon River Medicine Wheel to be included on the NRHP and/or to be designated as a National Historic Landmark (a class of exceptional properties within the National Register listings). They include Dr. Pat Parker (National Park Service [NPS], Washington D.C.), Dr. William Butler (NPS Rocky Mountain Regional Office, Denver), Ms. Carol Gleichman (Advisory Council on Historic Preservation, Denver), Dr. Lynne Sebastian (New Mexico State Historic Preservation Officer and near the forefront for traditional cultural properties assessments), and Dr. Ruth Ann Knudson (head Coordinator for the NPS Legacy Program). Most of these individuals indicated that the Traditional Cultural Properties category listings to the National Register is very recent, and no specific guidelines have been established for nominating these types of sites. They generally stress that some flexibility must be used in designating Traditional Cultural Properties. In general, they offered limited support to the position that the

Leon River Medicine Wheel would be accepted to the National Register program since it may be less than 50 years old. Several individuals thought it would require considerable effort to elevate this feature to the National Register status, much less the National Historic Landmark position, without solid age determination. If the National Register/Landmark status were to be pursued, then the context for the site must be documented, including elaborating on the background beyond this immediate region to establish relationships with other known sites and conducting additional interviews with spiritual leaders from various tribes on the significance of this location.

Based on a brief description of the archeological results, Dr. Butler and Ms. Gleichman stated that attempts to list the Medicine Wheel on the National Register would probably not be successful and the site should be adequately protected under the present PA between the U.S. Army, the Texas SHPO, and the Advisory Council on Historic Preservation, as well as the MOU agreement between Fort Hood, the Comanche Nation, and AIREC. Dr. Sebastian thought the evidence should be presented to the Army and SHPO for determination of eligibility or forwarded to the Keeper of the Register in Washington, D.C., for determination. If the Leon River Medicine Wheel was determined to be eligible, formal completion of the NRHP forms may not be necessary for protection. Ms. Parker (who wrote Bulletin 38 "Guidelines for Evaluating and Documenting Traditional Cultural Properties") indicated that if the site was determined eligible by the agency (Fort Hood) and the SHPO, that determination would be sufficient to provide as much protection as the submission and acceptance of the formal National Register document by the Keeper of the Register. In her opinion, the site appears to meet the criteria of a Traditional Cultural Property, since it is now important to the Native Americans even though the site may not have continuity in the oral traditions of the southern Plains tribes.

No explicit statutory protection is provided under the American Indian Religious Freedom Act (AIRFA) of 1978 (PL95-341), which allows access to lands essential in the conduct of their traditional religion. Under the present Fort Hood/Comanche Nation/AIREC MOU, Native Americans have access to both the Leon River Medicine Wheel for religious ceremonies and to the adjacent Comanche National Indian Cemetery. Site 41CV1505, including the Medicine Wheel and cemetery, is currently fenced with a locked gate, and the Native Americans have access to the land. No military maneuvers or training activities currently occur or are planned at 41CV1505. In summary, the present land status coupled with the operating MOU appear sufficient to generally protect this significant religious feature.

10.0 RECOMMENDATIONS

J. Michael Quigg

Mariah recommends no further scientific investigation at the lithic scatter or at the Medicine Wheel. If the Medicine Wheel is indeed less than 50 years old and has only achieved recent cultural significance, it would appear best to protect this religious feature under the present MOU. Another means of protection (i.e., the formal determination of National Register eligibility) involves primarily a consultation process if there is potential for adverse effects or impacts to the site. The National Landmark status may help protect this feature, but at present there is limited chance to successfully elevate the feature to that status. Since the feature has been rededicated as a Medicine Wheel by Native Americans from at least six tribes, it can be considered a contemporary religious feature under AIRFA which has no age or continuous use criteria. Statutory or other requirements and guidelines for protecting contemporary use sites do not exist. Protection of a Traditional Cultural Property or Sacred Site is possible but must be done on a case-by-case basis in consultation with tribal members and traditional practitioners wherein religious beliefs and practices are individual rights and freedoms. As for other protection measures, it may be best to simply maintain some kind of minimal information for the general area in the Fort Hood planning files to assist planners and range control on areas to avoid. Therefore, information concerning this religious feature would be provided to the fewest people, and then only on a need-to-know basis for planning purposes. This policy would ensure a low profile to the sacred site and deter curious outside people from visiting the location.

The physical protection currently consists of a four-strand barb wire fence and a locked gate across the only dirt access road. The Medicine Wheel is out of sight to the passer by, but visible to the air traffic above. To fully secure the area encompassing the Medicine Wheel, an electronic

perimeter security system is recommended. State-of-the-art sensor systems would provide a reliable and cost-effective physical security system that would allow monitoring of any vehicles or individuals through the gate from an off site facility, such as Range Control. Such monitoring systems would eliminate the need for a full time, on site security guard.

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APPENDIX A

Geophysical Investigations

by

William C. Brennan and Timothy M. Deignan

1.0 SITE DESCRIPTION

1.1 SITE LOCATION

The Leon River Medicine Wheel (LRMW) site is approximately 3,000 m² in size and is situated within the boundaries of the Fort Hood Military Reservation. There are no military facilities at the LRMW site. However, the site may have been used as a campsite during military training exercises in the past. The topography within the site area gently slopes to the east. The soils in the area are comprised of clays, silts, and organic material that were deposited over limestone bedrock. Vegetation near the site includes a variety of hardwood trees, shrubs, and grasses.

2.0 SCOPE OF WORK

The objective of the geophysical program was to detect geometrically arranged limestone rocks that result in the configuration of a feature commonly referred to as a medicine wheel. A medicine wheel can be visualized as an inner "ring" and "spokes" emanating from the inner ring (Figure A.1). GPR and electromagnetic induction (EMI) geophysical techniques were applied over portions of the LRMW Site to provide information related to the potential location of the inner ring and spokes. Mariah Associates, Inc. will use the data from the geophysical survey to determine the most probable locations of the components of the medicine wheel. Knowledge of the location of the components of the medicine wheel may facilitate the understanding of the time period in which the medicine wheel may have been constructed.

3.0 GEOPHYSICAL METHODOLOGY

3.1 ELECTROMAGNETIC INDUCTION (EMI)

The EMI technique is a geophysical method in which a time-varying electrical current is induced into the ground with a transmitter coil, and the resultant magnetic fields are measured with a receiver coil. The flow of electrical current in the ground can be interpreted in terms of the apparent ground conductivity.

The transmitter coil located at one end of the instrument induces small amplitude currents (eddy currents) in the earth. Most EMI techniques employ frequencies from a few hundred to several thousand hertz (Hz). These eddy currents produce a magnetic field that is measured by a receiver coil located a fixed distance from the transmitter coil. The quantity actually measured at the receiver coil is the voltage of the signal, and is expressed in millivolts (mv), or equivalently in parts per thousand (ppt).

The electromagnetic instrument response at the receiver coil can be divided into two distinct components differing in phase by 90 degrees. The in-phase response tends to emphasize the presence of metallic materials. The quadrature (i.e., "out-of-phase") response characterizes the apparent ground conductivity. The measured signal amplitude for the apparent ground conductivity and in-phase response are dependent upon the transmitter frequency, transmitter/receiver separation distance, and the conductivity of the ground. Under certain constraints, the quadrature response is linearly related to the ground conductivity.

Conductivity contrasts in the earth can be caused by natural phenomena such as lithologic changes, or by manmade phenomena such as disturbed ground, buried materials, or variations in the salinity of the soil or groundwater. Generally, manmade materials that are metallic can produce large contrasts in conductivity with the surrounding geologic material, whereas non-metallic features such as historic foundations, roads, and fire pits produce more subtle contrasts in conductivity .

The maximum depth sensitivity of the EMI instrumentation used at the LRMW Site is approximately 1.5 meters (m). The EMI quadrature phase data are most useful for determining lateral changes in conductivity that may be related to manmade features and/or natural geologic conditions. The factors that primarily affect the ground conductivity are the moisture content, conductivity of the moisture (fluid), and type of geologic material in the vicinity of the instrument.

3.3 GROUND PENETRATING RADAR (GPR)

GPR is a geophysical technique that propagates short wavelength (high frequency) electromagnetic waves into the subsurface and records those waves reflected back by mediums that possess contrasts in electrical properties. The GPR record is often displayed as a distance (horizontal) versus time (vertical) plot and can be recorded digitally to allow for post acquisition processing. Although a GPR record is a complex composition of interference patterns, loss mechanisms (geometric, mechanical, and chemical) and reflections, its picture-like character can make it a very useful tool to delineate subsurface features. The depth of investigation of radar is generally quite shallow due to the high frequencies utilized, however, this disadvantage is partially offset by the increased resolution it offers over other geophysical techniques.

The GPR system consists of a signal recording device, such as a graphic recorder and/or tape recorder, an antenna, and associated electronics and system cables. The antenna(s) selected for a particular investigation depend upon the material properties of the anticipated targets, their depth, and the presence of cultural features at the site. Some antennas are unshielded (i.e., radiate some energy above the ground surface) and can produce reflections from objects above the ground surface. Caution should be exercised when interpreting data acquired with an unshielded antenna.

Antennas also possess an inherent signal wavelength. Over a material of a defined conductivity, higher frequency antennas will exhibit a shorter signal wavelength than lower frequency antennas. The signal wavelength can be thought of as the ability of the antenna to resolve a subsurface feature; in general, a higher frequency antenna (shorter signal wavelength) can resolve smaller features than a lower frequency antenna (longer signal wavelength). As a very general rule, a feature that is 1/4 to 1/3 the size of the signal wavelength can be resolved by the antenna and GPR electronics. Therefore, antenna selection for a project should somewhat be based on the smallest feature of interest that one wishes to detect. The primary criteria for antenna selection is the anticipated depth of the target. The maximum depth of investigation of the antenna is dependent upon the frequency of the antenna used, and as discussed above, the conductivity of subsurface materials. In general, a low frequency antenna will provide a greater depth of penetration but have lower resolution than a high frequency antenna.

The "picture-like" character of GPR can make it a very useful tool to delineate many subsurface features. The detection of an object or feature by the GPR system depends primarily upon the electrical properties of the host (i.e., natural site conditions, or "background") and target (i.e., foundation, rocks, etc.) materials. The subsurface parameters that dominate the propagation of the radar wave are the dielectric permittivity and conductivity. The dielectric permittivity controls the velocity of the radar wave, and the

conductivity controls the attenuation of the radar wave. Accordingly, subsurface materials or objects characterized by higher conductivities (i.e., metallic objects, moist or wet clays, saline water, and other conductive materials) attenuate the radar signal more readily.

4.0 FIELD DATA ACQUISITION

The geophysical program consisted of one field session that was performed from May 2nd through May 4th, 1994. The work performed during the field session included establishing a reference survey grid to accurately locate the geophysical measurement locations.

4.1 FIELD SESSION

Mariah Associates, Inc. designated a specific area of interest for the geophysical survey. The survey area encompassed approximately 2,500 m² within the site location. A reference survey grid with a 2 to 4 m line spacing was erected prior to the geophysical survey by the subcontractor. The grid was referenced to the position of the total station survey instrument located near the center of the LRMW Site. The southwestern extremity of the geophysical grid was designated as 0 North (0 N) and 0 East (0 E) by the subcontractor. The subcontractor measured each survey baseline with fiberglass measuring tapes and placed non-metallic pin flags within the reference survey grid.

4.2 ELECTROMAGNETIC INDUCTION (EMI)

Approximately 10,000 EMI station locations were acquired during the field session. The EMI data were acquired at 1 m line spacings in both east-west and north-south directions (Figure A.2). The EMI data were acquired continuously at 0.5 second (s) intervals, which translates to a sampling interval on the ground of approximately 0.25 m. A digital polycorder was used to acquire the EMI data.

The EMI instrument used for this survey was the Geonics Limited EM-38. The EM-38 uses a 20 kilohertz (kHz) dipole transmitter, dipole receiver, and associated electronics to measure the quadrature phase and in-phase components of the secondary magnetic field. The intercoil spacing is fixed at 1.0 m, which provides a maximum depth sensitivity of approximately 1.5 m when the coils are oriented in the horizontal coplanar (vertical dipole) mode.

An EMI test area was selected within the boundaries of the LRMW Site for the field session. The test site was located in an area where the ground conductivity was uniform (i.e., independent of the orientation of the EMI instrument). This procedure was used to confirm the proper functioning of the instrument. In addition to the test site, certain data acquisition lines were repeated at regular intervals to monitor the drift of the EMI system which can occur as a result of changes in the ambient air temperature and soil moisture throughout the day.

4.3 GROUND PENETRATING RADAR (GPR)

GPR data were acquired along specific data acquisition lines near the eastern and southern boundaries of the geophysical survey grid (Figure A.3). The GPR system has the ability to scan (i.e., acquire data) at extremely dense surface intervals. For this investigation the GPR system was configured to acquire

data at 25 scans per second (sps), which translates to a sampling interval on the ground of approximately 0.03 m.

A Geophysical Survey Systems Incorporated (GSSI) Subsurface Interface Radar (SIR) 8 with a 500 megahertz (Mhz) antenna was used to collect the radar data. The GPR data were recorded in the field by an analog recorder and signal processor. The signal processor unit was configured to record data at time ranges of 15 or 20 nanoseconds (ns), the time range selected for a particular acquisition area being dependent upon a visual review of the analog records in the field. The filter settings, signal gain, signal polarity, sps, and antenna transmit rate were selected after completion of several test lines on the eastern portion of the site.

5.0 DATA PROCESSING

This section outlines the general procedures that were followed during the processing of the EMI data collected at the LRMW Site. The EMI data were processed in accordance with acceptable procedures developed by the geophysical community. In addition to these standard data processing procedures, supplementary data processing procedures have been implemented to validate and ensure the integrity of the data.

5.1 ELECTROMAGNETIC INDUCTION (EMI)

The EMI data were electronically collected with a digital data logger attached to the EMI instrument. The EMI processing sequence consisted of transferring the data from the digital data logger into the Geonics Limited DAT 38 computer software program. The DAT 38 software package is capable of converting the raw EMI field data measured in ppt into corresponding values that more readily characterize the conductive properties of the subsurface. The original quadrature phase data, which are recorded in ppt, are converted to ground conductivity values in millimhos per meter (mmhos/m).

An additional processing routine was performed on the EMI data. In this step, a correction is applied to the data that effectively eliminates changes in the EMI signal due to instrument drift, the cause of which is described in Section 4.2. This processing step is similar to the correction of the magnetic data for diurnal changes in the geomagnetic field.

Each data location was referenced to the geophysical survey grid and assigned a discrete survey grid location. The data were output in ASCII text format and transcribed into computer software programs that assigned coordinates to the survey grid locations. After this preliminary processing sequence, the EMI and coordinate data were transferred into the Geosoft Mapping System, a computer program that performs basic and advanced mapping and contouring, and specialized data processing. In general, the Geosoft processing sequence for the EMI data consisted of gridding and subsequent contouring of the EMI conductivity data to provide a representative graphical image. The resultant contour maps were color coded in terms of the intensity of the of the geophysical response at each EMI survey location. These maps are presented as color coded contour grid images in this report. Shadow maps of the EMI geophysical data were also generated. Shadow maps implement a user-defined lateral sun angle (declination) and inclination to provide the interpreter with parameters that can be adjusted to enhance subtle trends and anomalies in the data set.

The EMI data exhibited in this report are the result of a signal enhancement processing sequence. In general, the sequence was designed to minimize the effects of the instrument and site "noise" (minor tilting of the instrument and small variations of the instrument height above the ground surface). The processing sequence resulted in graphical images in which linear trends within the data may be more easily recognized. The EMI data were also edited to include conductivity values between 10 and 24 mmhos/m. This procedure was performed to minimize the effect of responses within the data that were caused by metallic objects.

5.2 GROUND PENETRATING RADAR (GPR)

No post-acquisition processing of the GPR data was performed, as the data were acquired in analog form in the field. However, the GPR control unit acts as a real time processor in the field, and the quality of the data recorded are a function of the control unit settings. As previously mentioned in Section 4.3, these control unit settings were optimally selected after the completion of several test lines.

6.0 DATA ANALYSIS

6.1 INTRODUCTION

The EMI data collected at LRMW Site characterize changes in ground conductivity that may be related to both metallic and non-metallic features, including natural changes in near-surface (less than 1.5 m) geologic conditions at the site. The east-west and north-south EMI data are presented as separate color coded contour images in this report.

Several GPR sections are presented in Figures A.8, A.9, and A.10 that exhibit the response of the GPR system to the shallow soils and limestone bedrock present at the site. Line 34 N was acquired across the weed eater cleared area where the proposed location of the inner ring exists. The data presented for Line 34 E were acquired from Station 32 N to Station 24 N, and traverse an area where a spoke from the inner ring is potentially located. GPR data for Line 46 E were acquired from Station 36 N to Station 8 N. These data were acquired to provide information on the response of the limestone bedrock, which is known to be shallow in this area.

A map of the solum thickness at the site was provided by Mariah Associates, Inc., and these data were subsequently color coded and contoured by the subcontractor. The solum thickness data are directly comparable to the EMI data, as the solum is more conductive than the limestone bedrock.

The objective of the EMI and GPR interpretation was to identify signal responses within the data that might be related to geometrically arranged limestone rocks associated with the construction of the medicine wheel. The interpretation was based on the following assumptions:

- the target (limestone rocks) are less conductive than the surrounding host media (clay and organic soils (solum),
- the target exhibits limited lateral and vertical extent (i.e., its signal amplitude is minimal),
- the spatial density of the target material (# of rocks per m²) may be very low

-the limestone bedrock may possess small scale heterogeneities (i.e., cracks and undulations)

6.2 ELECTROMAGNETIC INDUCTION (EMI)

The EMI conductivity data are represented as a color coded contour image in Figures A.4 (east-west data acquisition lines) and A.5 (north-south data acquisition lines). The conductivity data exhibit numerous linear features, although very few of these features commence at and extend from the proposed location of the medicine wheel inner ring. Most of the linear features exhibit a northeast-southwest trend. The data also indicate that the conductivity decreases toward the eastern portion of the site, however, there are isolated areas within the site that are characterized by lower conductivities.

6.2.1 Inner Ring

The EMI instrument may have responded to limestone rocks in some areas, especially where the data acquisition lines crossed the features of interest in a perpendicular fashion. However, the inner ring area was cleared with a weed eater, exposing conductive clay and organic material at the surface. The signal response of the instrument in these cleared areas exhibits elevated conductivities, which may partially or entirely be the result of this exposed clay "ring." It is our professional opinion that the EMI signature of the limestone rock target should be recognizable in the data as linear areas that exhibit lower conductivities than the surrounding soil media.

The east-west lines EMI map exhibits lower conductivities on both sides of the exposed conductive clay ring on the east portion of the map. This character is in part due to the inherent signal response of the instrument over a moderately conductive target. However, the lower conductivity envelope surrounding the elevated conductivities may be related to the limestone rocks. However, the signal amplitude is minimal, therefore, the rocks may not be present in sufficient amount (i.e., adequate spatial density) to be reliably detected with the EMI instrumentation.

The east-west lines EMI map also indicates a lower conductivity linear feature trending approximately southwest-northeast in the region of Line 5 E, Station 28 N. If excavation here reveals limestone rocks related to the inner ring, some general conclusions can be stated concerning the target:

-in other areas where the soil sequence is similar in thickness and composition, the target should be exhibited as a very similar EMI signal response

-if this EMI signal response is not evident in other areas, the target is not present or its abundance is not sufficient to measure with the EMI system.

It is possible that this feature may have been caused by a historical roadbed at the site (Mariah Associates, Inc., phone conversation, 5-16-94). The trend may continue northeast and terminate near Line 10 E, Station 40 N.

6.2.2 Spokes

A linear configuration of limestone rocks deposited in this shallow geologic environment should have a characteristic and easily recognizable EMI response when crossed perpendicularly with the instrument.

Therefore, on the east side of the site, the north-south EMI data acquisition lines were used in an attempt to define linear trends in the data that might be related to the spokes emanating from the inner ring.

There are no linear trends in the north-south lines EMI data that suggest well-defined spokes emanating from the inner ring on the east portion of the site. A complicating factor in attempting to identify these trends occurs because the limestone bedrock is closer to the surface in this area, creating a situation where the material contrast between the target and host material is minimal.

The east-west lines EMI data exhibit one linear trend located in the northern portion of the site that is less conductive than the surrounding material. If excavation here reveals the target, then the general conclusions stated above concerning the target may prove accurate.

6.3 GROUND PENETRATING RADAR (GPR)

Three GPR sections (Lines 34 N, 34 E, and 46 E) are presented in Figures A.8, A.9, and A.10. The GPR data are indicative of different subsurface conditions at the site. Line 46 E exhibits an abundance of hyperbolic reflectors that are most likely caused by tree roots and inhomogeneities in the limestone bedrock which is very shallow in the area. Line 34 N exhibits a subtle signal response at the proposed location of the inner ring, which is located at approximately Station 32-33 E. However, this type of signal response is minimal in amplitude and indistinct when compared to the remainder of GPR data acquired at the site, particularly the GPR data from Line 46 E. Line 34 E exhibits a signature near Station 31 N that may be related to the feature of interest. This signature was also identified on several other GPR profiles.

6.3.1 Inner Ring

A GPR profile was acquired across the area cleared by the weed eater (Line 34 N, Stations 28 E to 38 E). It is believed that the target resides in the area between Stations 32 E and 34 E. The response of the GPR system to the anticipated target does not appear to be significant, although a small change in character occurs near Station 32-33 E. This small amplitude response in comparison to other GPR data at the site suggests that the feature of interest might be characterized with respect to the following considerations:

- target has inadequate lateral and vertical extent
- target not in abundance in this specific area
- geologic media surrounding the target produce higher amplitude signatures than the target itself (limestone bedrock commonly contains small scale inhomogeneities, such as "micro-fissures", that can create characteristic reflections on the GPR record.

6.3.2 Spokes

During GPR field operations, profile records were interpreted and pin flags positioned in linear arrangements in areas that were thought to be related to the target. This field interpretation was influenced by the potential locations of the spokes identified by wooden stakes located on the inner ring.

After a detailed integrated analysis of the GPR and EMI data in the office, the potential response from the target does not appear to be conclusively defined on many of the GPR profiles. Optimally, it would be advantageous to interpret a reflector with definitive characteristics on sequences of adjacent GPR records. However, these definitive reflectors do not appear to exist on adjacent profiles and form an intelligible geometric arrangement that could be identified by positioning pin flags at their respective surface locations. Signatures interpreted on each GPR profile are most likely the result of reflections from inhomogeneities in the limestone bedrock, tree roots, and undulations in the limestone bedrock that have been filled in with more conductive clastic material.

6.4 SOLUM THICKNESS

The solum thickness at the LRMW Site was measured on a 4 m by 4 m grid pattern over the geophysical survey grid by Mariah Associates, Inc. personnel. These data are presented as a color coded contour image in Figure A.6. The data exhibit thicknesses in the solum that range from a few centimeters to several tens of centimeters. The areas of increased solum thickness exhibit several linear features that are characterized by a general southwest-northeast trend. These directional trends are most likely related to the shallow depositional history at the site.

The EMI and solum thickness data are presented together in Figure A.7. The solum thickness data are presented as a contour image that has been overlaid on a color coded grid of the EMI data. The similarity in the general trends between the EMI and solum thickness data suggest that the EMI data acquired at the site are most representative of the shallow depositional environment.

7.0 QUALITY CONTROL/QUALITY ASSURANCE

The purpose of quality control and quality assurance is to plan and implement a comprehensive set of controls and systematic procedures to ensure that the data acquired is of a quantity and quality necessary to meet the program objectives.

In order to satisfy quality assurance procedures, each piece of geophysical equipment utilized during the LRMW geophysical survey was listed according to make, model and serial number. EMI equipment tests and calibrations were digitally recorded and are retained in the project files. In addition, calibration and testing procedures were stored on magnetic media (computer disks). Instrument-specific calibration and testing procedures are outlined in detail in the respective instrument manuals and are summarized in Sections 7.1 and 7.2.

Geophysical instruments are very precise and accurate measuring devices. However, geophysical techniques depend on the detection of contrasting physical parameters of the subsurface materials. Based on our previous EMI and GPR investigations at other archeological sites, there appears to exist a sufficient contrast in electrical properties to detect the features of interest at the LRMW Site provided they have not been destroyed or significantly altered by subsequent occupation.

7.1 GEONICS LIMITED EM-38 INSTRUMENT

In order to ensure optimal accuracy and performance, the Geonics Limited EM-38 Non-Contacting Terrain Conductivity Meter was tested a minimum of one time daily at the calibration site. Manufacturer-

recommended testing procedures are outlined in the respective manuals, which accompanied the instrument in the field at all times. Specifically, daily testing procedures included a battery check, a zero or null check, a phasing check, and a sensitivity check at the calibration site.

No phase adjustments were made to the instrument since it was inspected, calibrated, and tested prior to leaving the vendor. However, specific data acquisition lines were repeated during the survey to delineate instrument drift. Finally, caution was exercised to avoid excessive noise from electrical static or "spherics" caused by electromagnetic radiation from local or distant thunderstorms. Surveying operations would have ceased if severe spherics were in the immediate area.

7.2 GEOPHYSICAL SURVEY SYSTEMS, INC. GPR

No calibration adjustments were made to the instrument since it was inspected and tested prior to leaving the vendor. The GPR system was tested in the field at the commencement of the survey to ensure the antenna frequency and range gains, time scale, and proper operation of the signal processing system.

8.0 SOURCES OF ERROR

All geophysical techniques are based on detecting contrasts in material properties. The target object or geological feature under investigation is examined with instrumentation, and the resulting measurement analyzed in an attempt to characterize the object or geological feature. The data acquired from the instrumentation are ambiguous in nature, (i.e., they represent a remote measurement of the object or feature's characteristics, not a direct measurement of the object under controlled conditions). Therefore, in any geophysical investigation a certain amount of error is inherent. The error that is associated with a geophysical investigation can be minimized or reduced to acceptable levels by the proper choice of equipment and personnel, and by judicious planning of the field program.

The most common sources of error in geophysical investigations involve geophysical instrumentation, navigation or location equipment, and human error. Geophysical instruments are very accurate measuring devices; however, the precision and accuracy of any measurement are dependent upon the instrument's manufacture. The human error associated with geophysical data acquisition can be minimized by using personnel who are experienced in the operation of geophysical instrumentation and are familiar with the capabilities and limitations of that instrumentation.

Some of the error associated with geophysical surveys depends upon site specific variables. Detection of objects or geologic features by EMI and GPR methods requires contrasts in the conductivity and electrical properties between the target material and the surrounding host material. EMI surveys measure contrasts in conductivity. If the conductivity of the target object is similar to that of the surrounding material, very little EMI contrast will be observed. A large response will be measured if the conductivity contrasts are large. Similarly, large contrasts in the electrical properties of materials (i.e., dielectric permittivity, conductivity, and magnetic permittivity) will be easily detected by most GPR instruments whereas small contrasts will be more difficult to detect.

The size, depth, and orientation of target objects may require a larger areal survey to define, whereas smaller target objects (i.e., narrow foundations) may be detectable only with a small line and station spacing. In general, the maximum distance between data acquisition lines should be no greater than 50%

of the smallest anticipated target size. Objects small enough to fit between data acquisition lines may not be detected depending on their material properties contrast with the surrounding medium. Targets that are linear, such as foundations or roads, can in some cases be more accurately mapped if the data acquisition lines cross them perpendicularly.

Some of the error in geophysical surveys can arise during data processing and interpretation. Most of this error can be reduced significantly if the survey is conducted by experienced personnel who are familiar with the processes involved. These personnel should have the ability to select proper routines for data manipulation and assure that the data is presented in its most useful form.

The science of geophysics requires that in order to properly utilize geophysical data, a logical sequence of events is followed from data collection through data processing and interpretation. Foremost, the data must be acquired in sufficient amount and precision to characterize the relative contrasts in the properties between target and host materials. The data must then be corrected for bias to the extent possible, and a preliminary inspection conducted to locate specific signal responses (i.e., anomalies) pertinent to the objectives of the program. These anomalies are characterized to the extent possible, and anomalies that require further investigation are isolated. In an attempt to further resolve and characterize these anomalies, additional data analysis techniques are applied that attempt to separate the useful signal from the noise. Noise can degrade the quality of the data, thus making the interpretation more difficult.

The data analysis sequence is an iterative process, and it is often difficult to quantify the effect of data analysis. The final step of the process is to characterize the anomalies with respect to their most probable sources and if possible, their depths, while adhering to physical laws that govern the science of geophysics. The above outlined sequence is necessary so that a user of the data in the future can easily reconstruct the sequence of events that lead to the final interpretation.

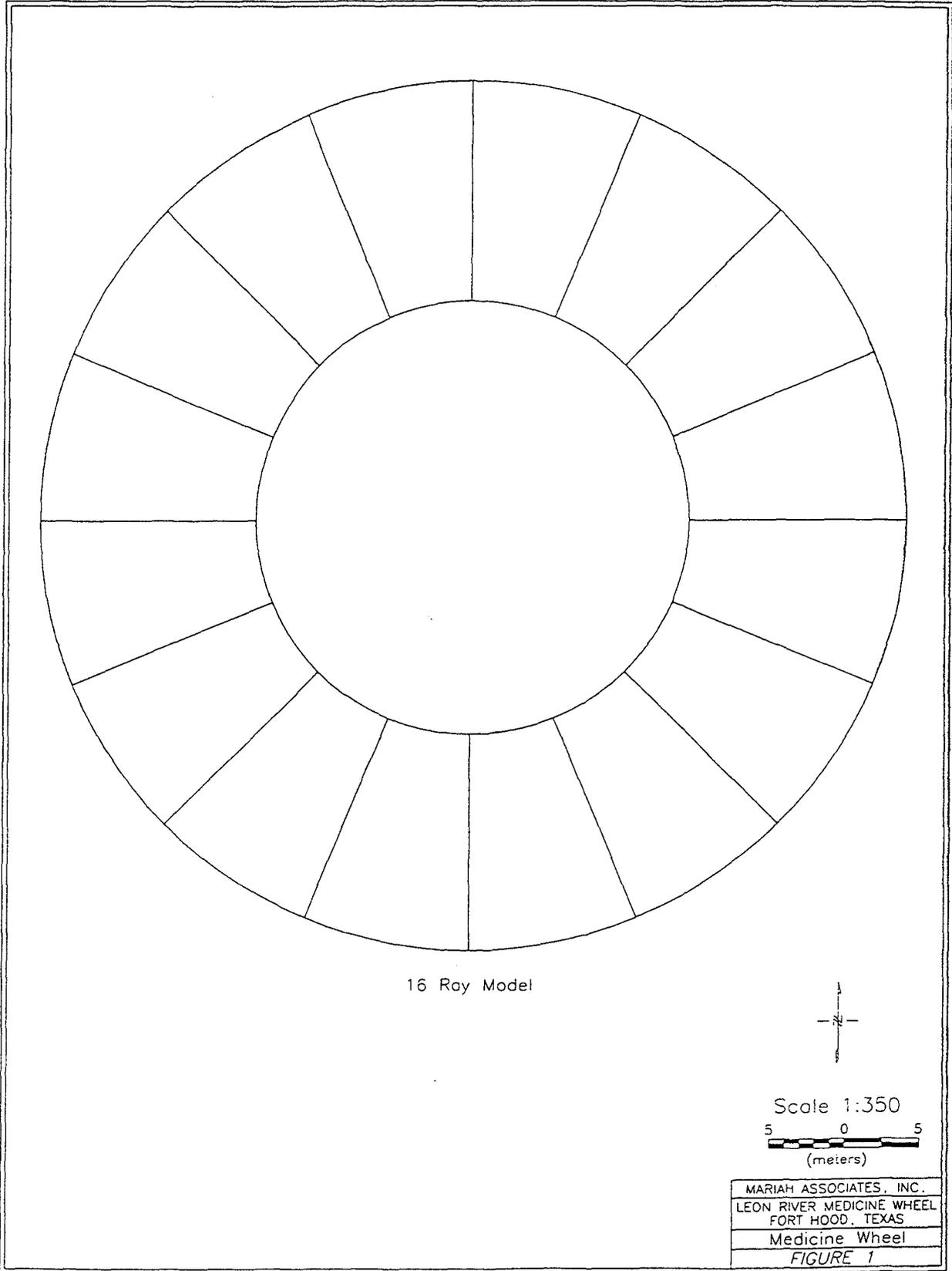
9.0 CONCLUSIONS AND RECOMMENDATIONS

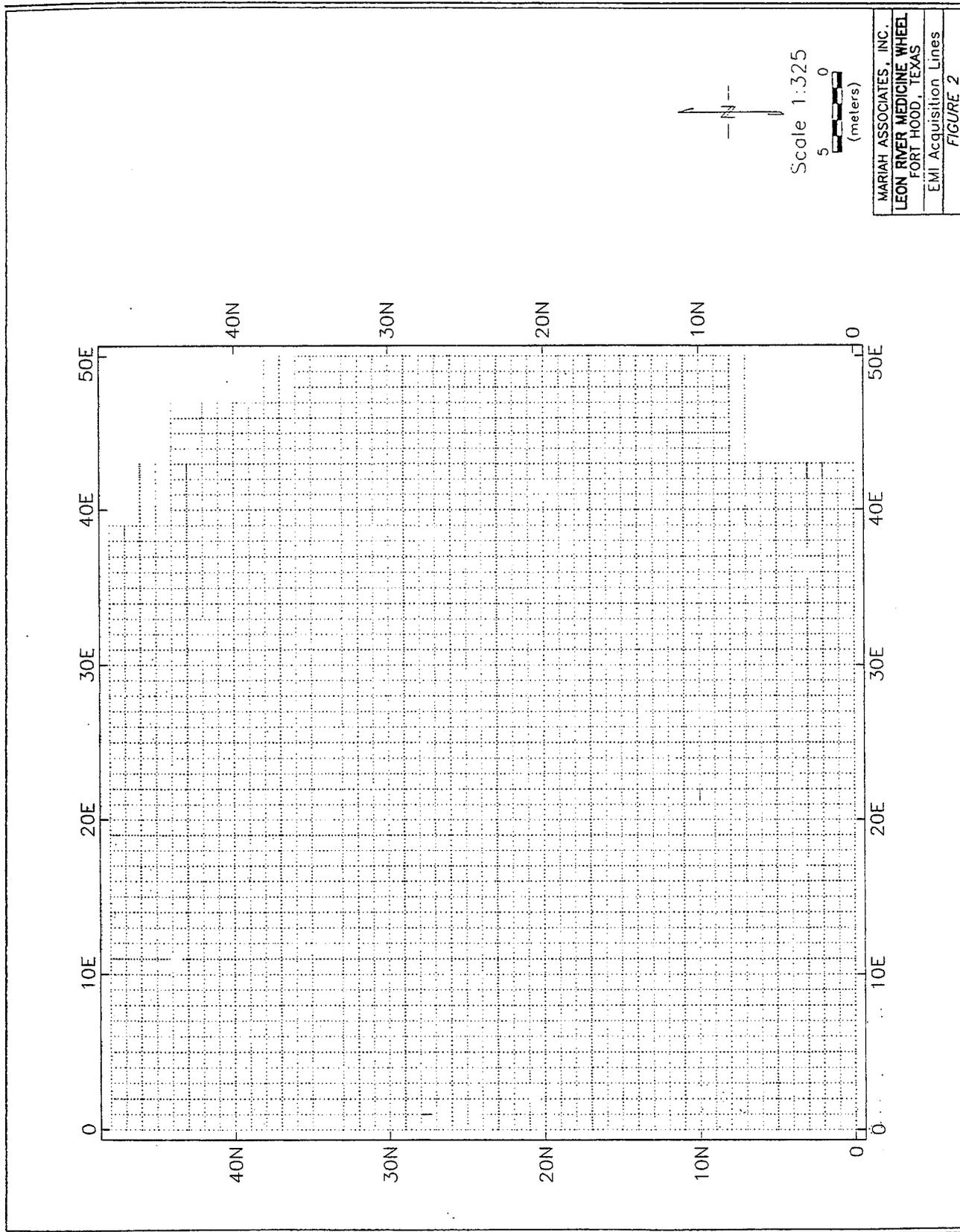
In general, the EMI and GPR data acquired and analyzed at the LRMW Site do not support the conclusive evidence of a geometric arrangement of limestone rocks that result in the configuration of a medicine wheel. The most logical explanations for this conclusion are that the medicine wheel constituents (limestone rocks) are not present within the survey area with adequate spatial density and/or the constituents have been destroyed or significantly altered by subsequent occupation.

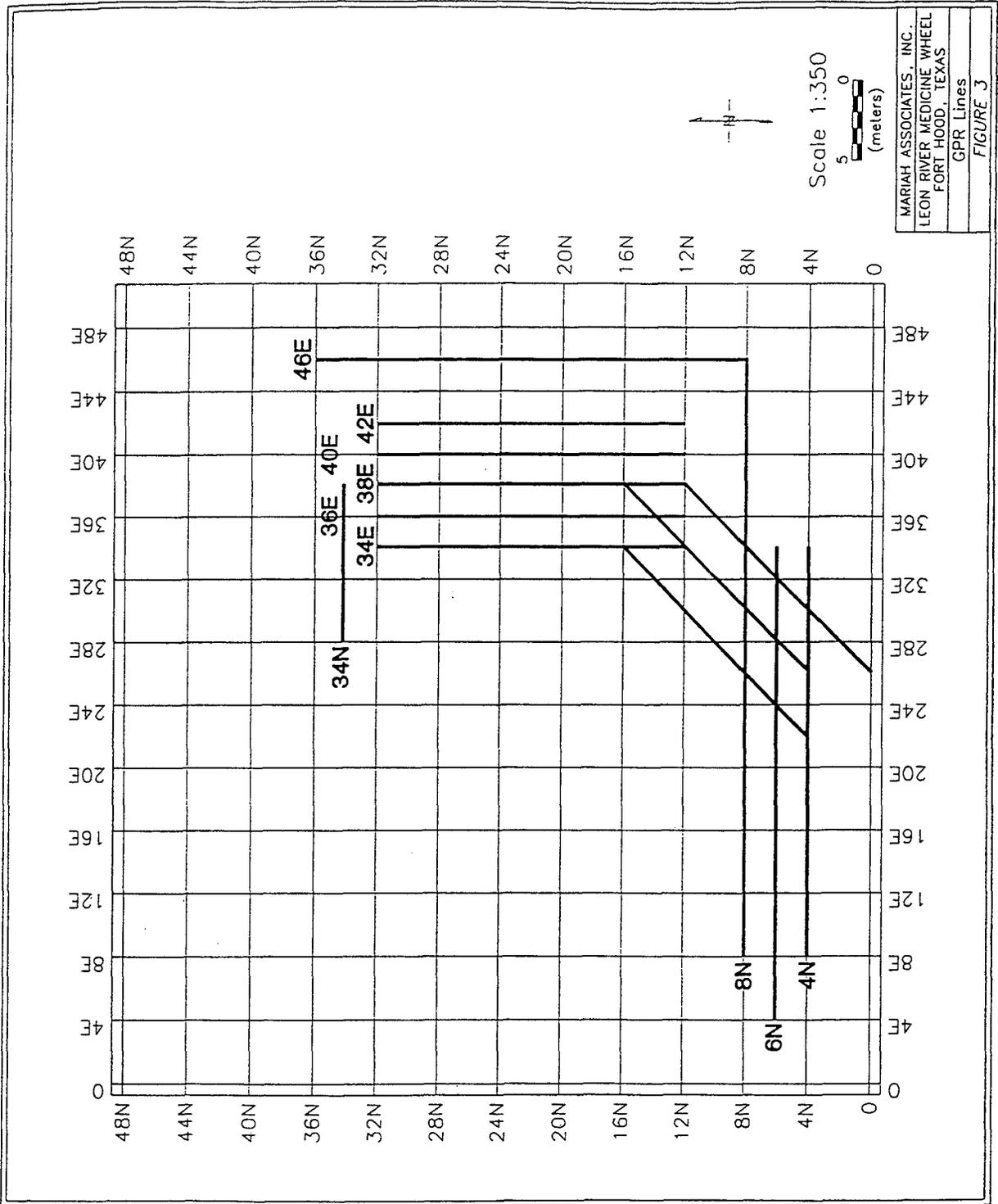
The geophysical features delineated by the EMI instrument are most likely representative of variations in the thickness and directional trends of the solum material. The prominent northeast-southwest trends apparent in the EMI data coincide favorably with the Mariah Associates, Inc. solum thickness and flow direction maps.

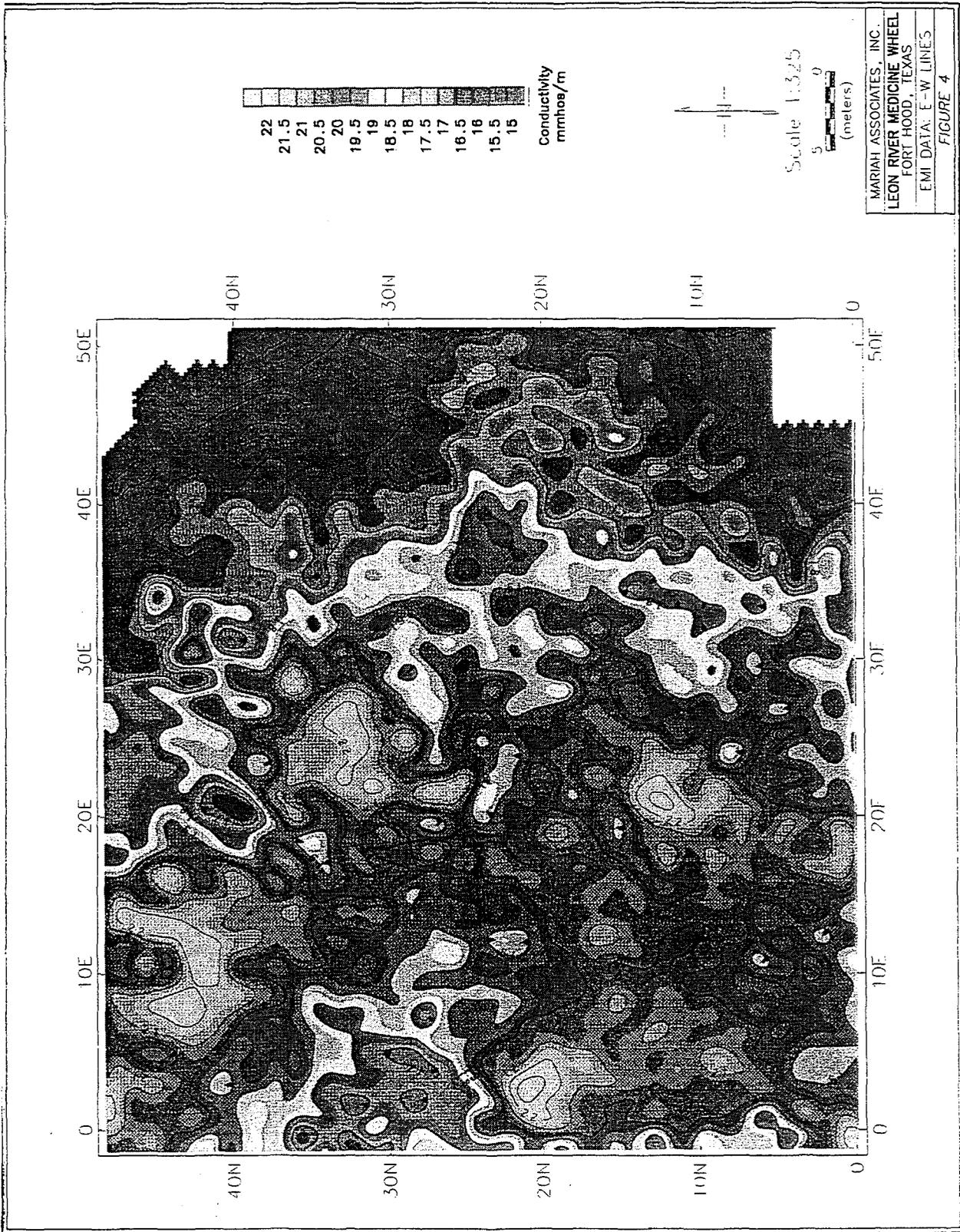
The GPR data acquired at the site primarily exhibit reflections from the solum/bedrock interface, tree roots, and inhomogeneities within the limestone bedrock. The GPR signal responses cannot be reliably interpreted in terms of a characteristic reflector on adjacent profiles that form an intelligible linear trend. The GPR data defined some anomalous areas within the site; these areas may be locations of isolated limestone rocks that may be related to the construction of the medicine wheel.

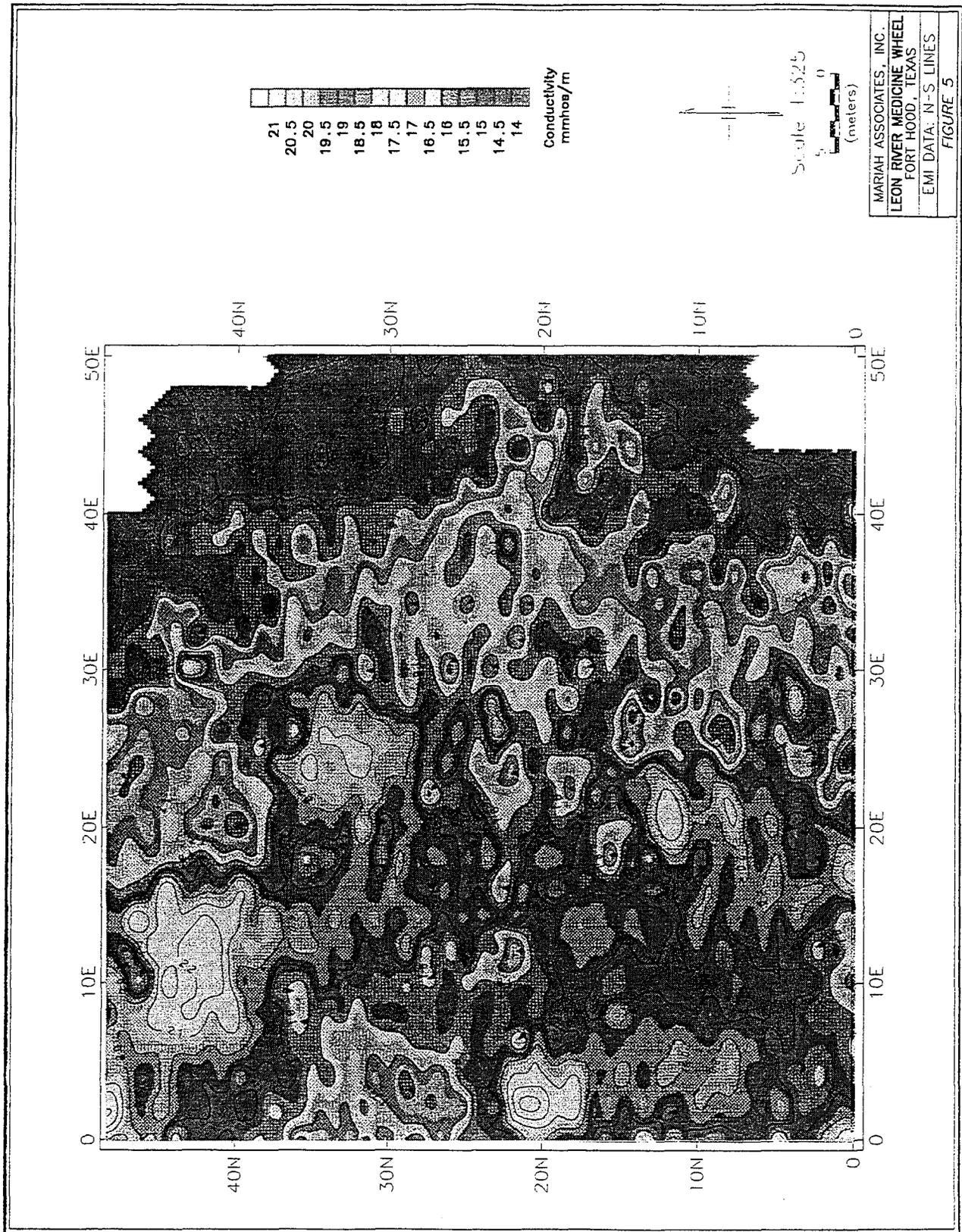
In future applications, if manmade metallic objects are suspected to exist at a potential archeological site where the feature(s) of interest are non-metallic in origin, a resourceful approach might be to include a metal detection survey concurrent with other geophysical methodologies. In this manner, the archeological program can proceed in a more time and cost-effective fashion by excluding these areas when selecting potential excavation sites.

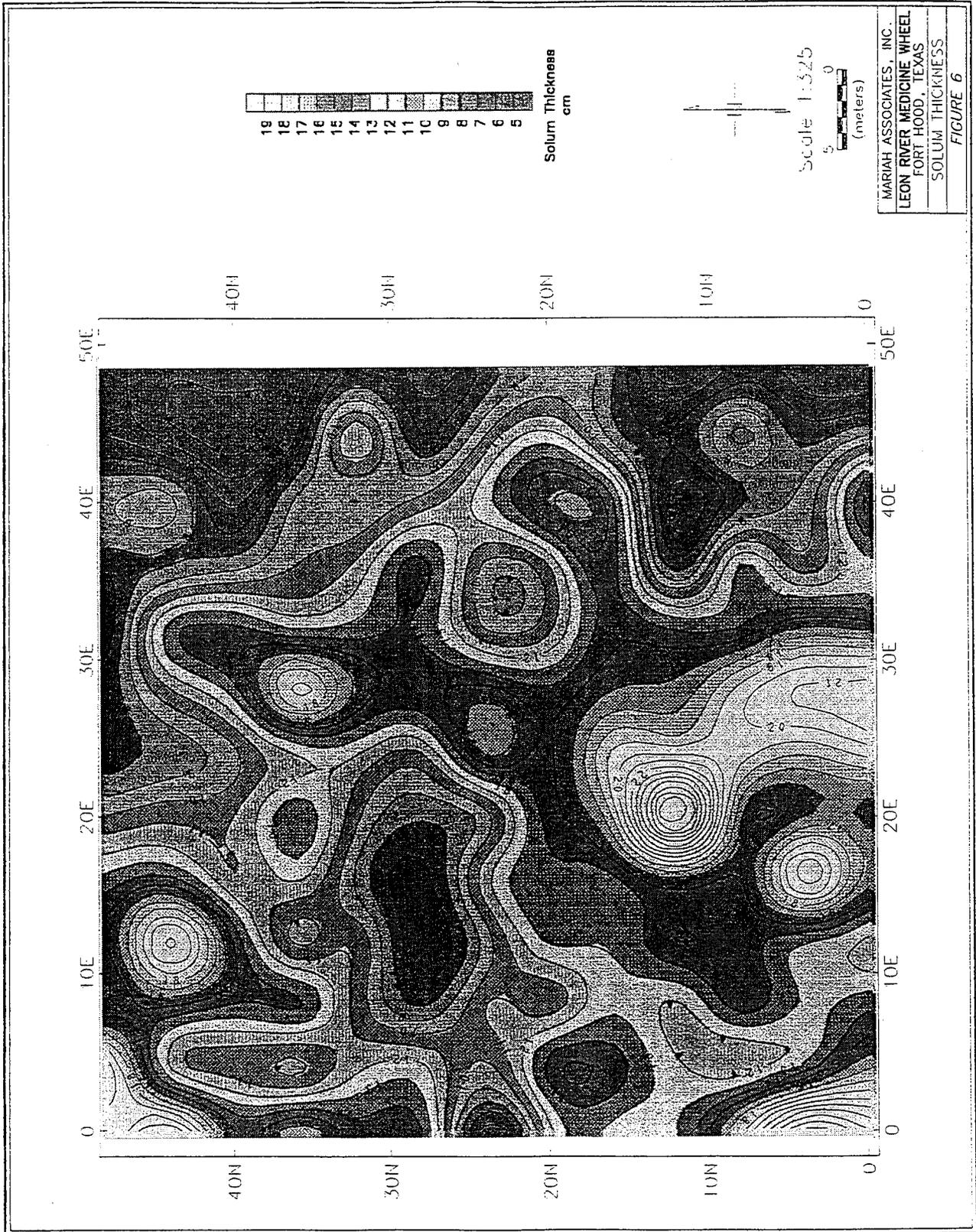


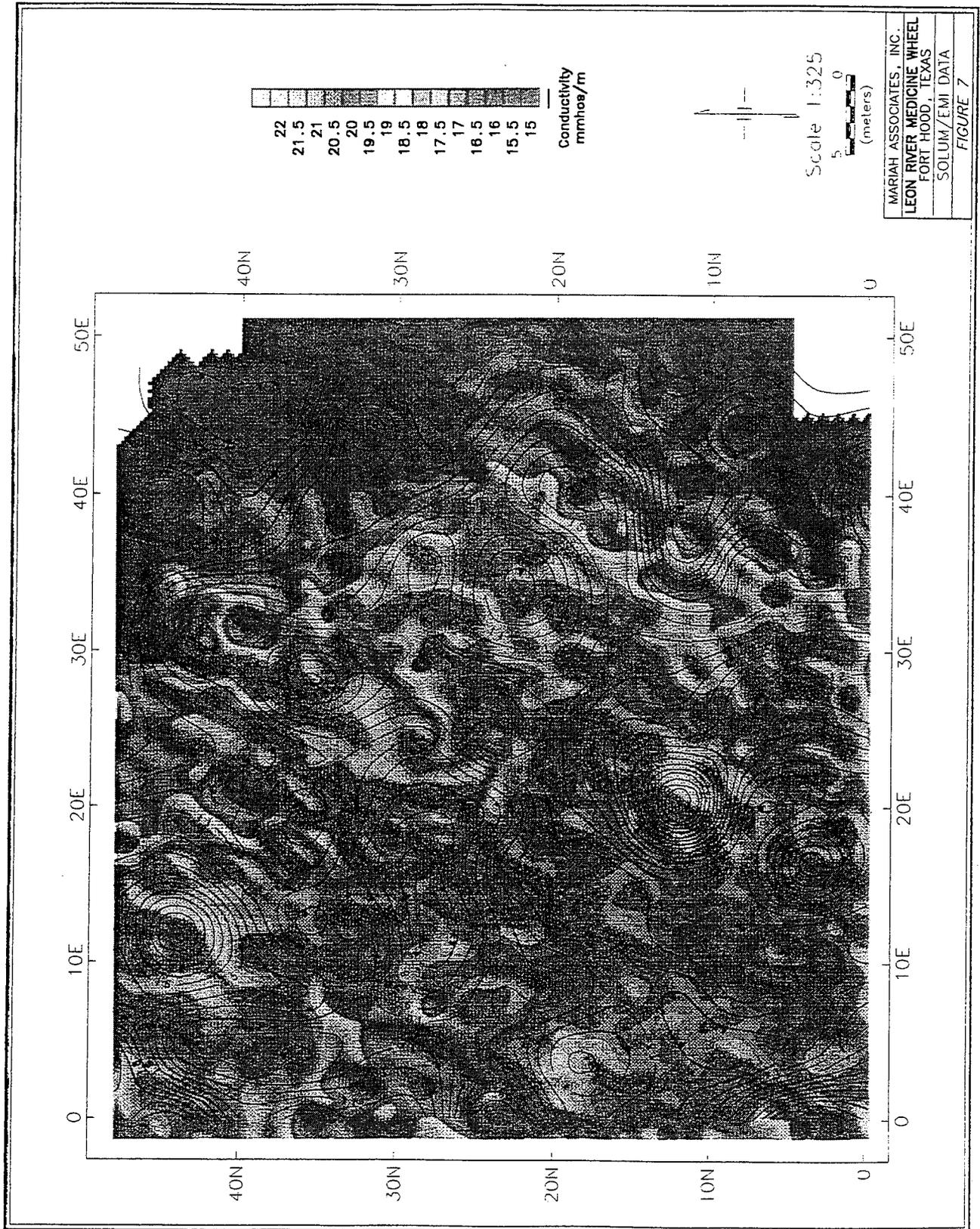




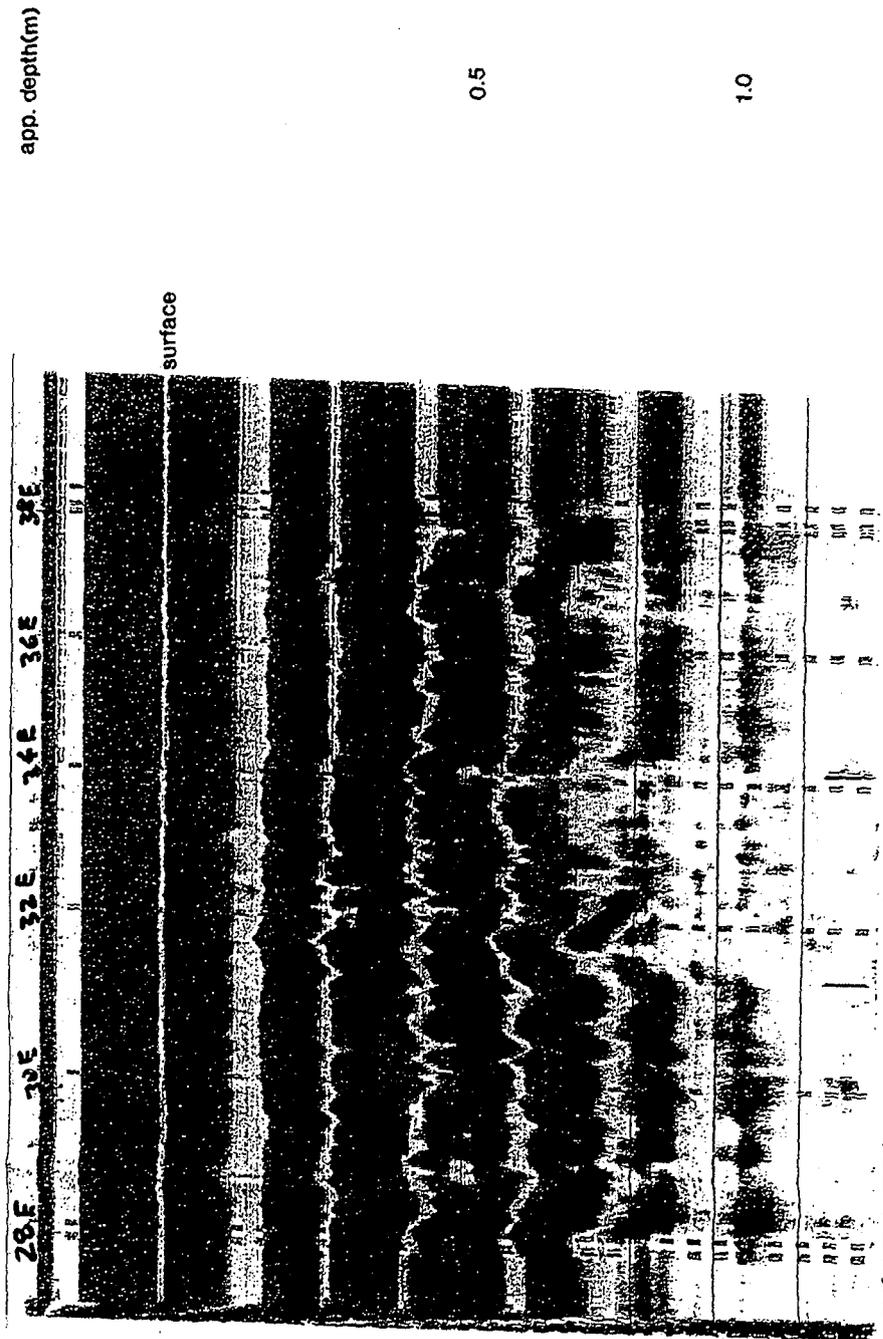


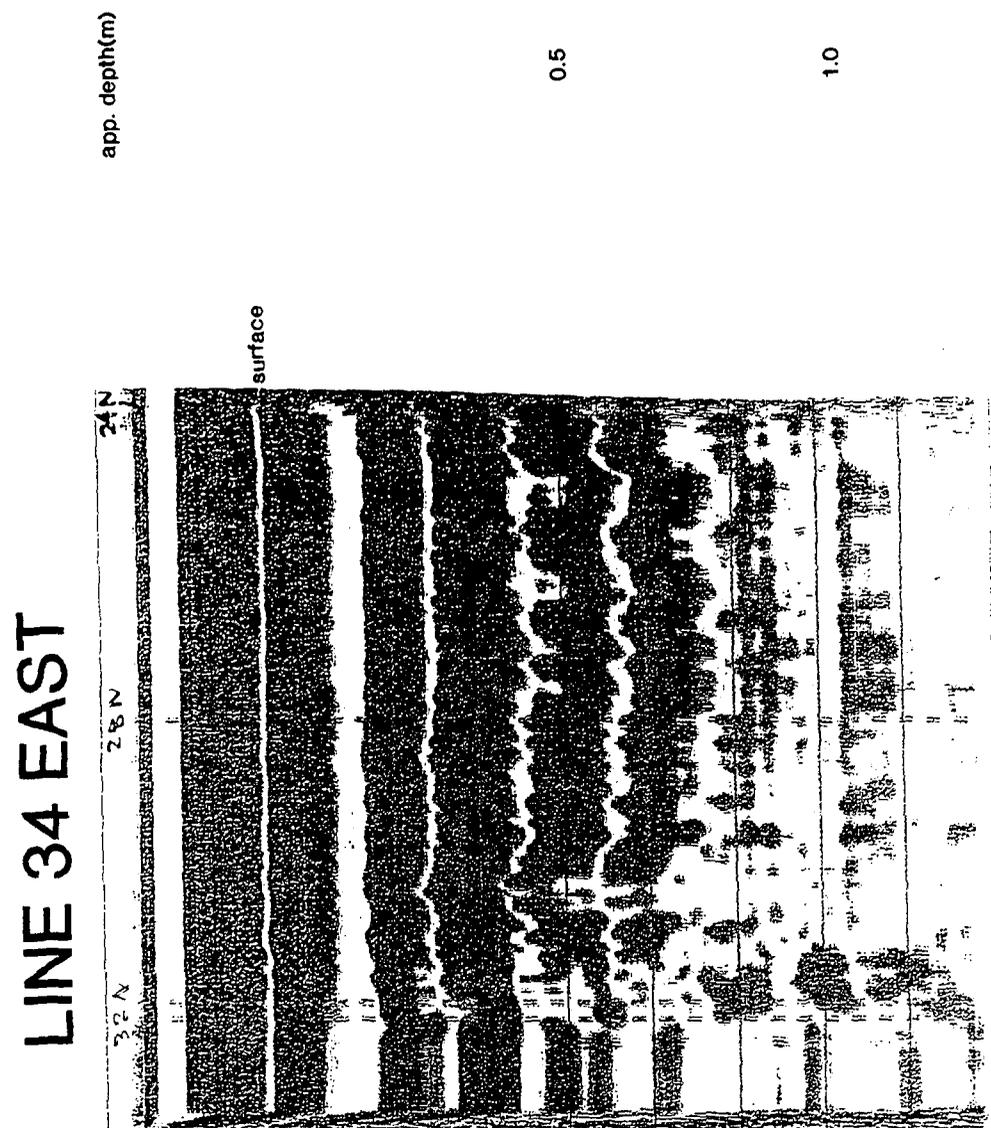




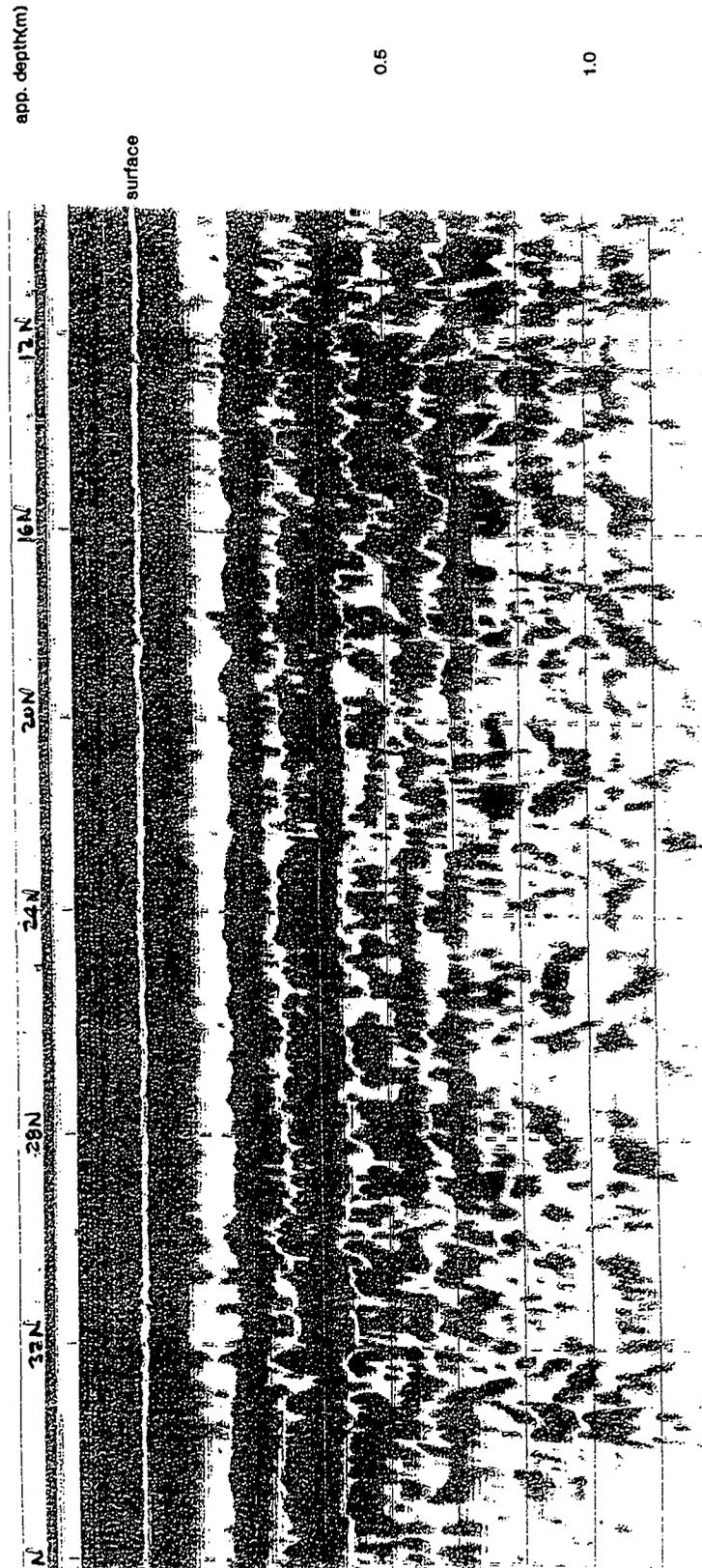


LINE 34 NORTH





LINE 46 EAST



APPENDIX B

**Radiocarbon Data
Beta Analytical, Inc.**

BETA ANALYTIC INC.

RADIOCARBON DATING SERVICES

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CHRISTOPHER PATRICK
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Associate Managers

July 5, 1994

Ms. Kathleen Callister
Mariah Associates, Inc.
3939 Bee Caves Road
Suite C-100
Austin, TX 78746

RE: C14 Sample CV1505 P#4

Dear Ms. Callister:

Please find enclosed the result on the charcoal sample submitted on June 9, 1994 for AMS radiocarbon dating, with C13/C12 correction. It was a good sample, providing plenty of carbon for a reliable measurement. Dr. Stipp and myself have reviewed the analysis and are confident in the accuracy of the measurement.

Along with the sample result, the report includes the individual analysis method and delivery basis, material, and the chemical pretreatment summary. The "Conventional C14 Age (*)" is the result after applying C13/C12 corrections to the measured age and is the age to use (the "*" is discussed at the bottom of the report sheet). Applicable calendar calibration (results less than 7200 BP) is reported separately with the original report copy. The calibration most appropriately represents the age of the material analyzed (see the calibration explanation sheets).

Pretreatment consisted of mechanical cleaning with gentle crushing, followed by washings in de-ionized water and removal of any rootlets. "Acid/alkali/acid" refers to complete chemical pretreatments with HCl acid washes for carbonate removal, alkali washes (NaOH) to remove secondary organic acids, and ending with a final acid wash. After drying, sample carbon was reduced to graphite, along with reference standards and backgrounds, and then measured by AMS at the Lawrence Livermore National Laboratory (CAMS) in California.

Our invoice is enclosed charging PO# 662-21. Would you please forward it to purchasing for payment. As always, if you have any questions, don't hesitate to contact us.

Sincerely,



4985 S.W. 74 COURT, MIAMI, FL, 33155 U.S.A.
TELEPHONE: 305-667-5167 / FAX: 305-663-0964 / E-MAIL: XNRBET22@SERVAX

**BETA ANALYTIC INC.**

DR. J.J. STIPP and DR. M.A. TAMERS

 UNIVERSITY BRANCH
 4985 S.W. 74 COURT
 MIAMI, FLORIDA, USA 33155
 PH: 305/667-5167 FAX: 305/663-0964
 E-mail: beta@analytic.win.net
REPORT OF RADIOCARBON DATING ANALYSES
 FOR: Ms. Kathleen Callister
 Mariah Associates, Inc.

DATE RECEIVED: June 10, 1994

DATE REPORTED: July 13, 1994

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-73351 CAMS-14051 SAMPLE #: CV1505 P#15 ANALYSIS: AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid	520 +/- 60 BP	-26.9 o/oo	490 +/- 60 BP
Beta-73352 CAMS-14052 SAMPLE #: CV1505 P#79 ANALYSIS: AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid COMMENT: reported result indicates an age of post AD 1950	104.4 +/- 0.7 % modern	-28.1 o/oo	105.0 +/- 0.7 % modern

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -26.9; lab mult. = 1)

Laboratory Number: Beta-73351

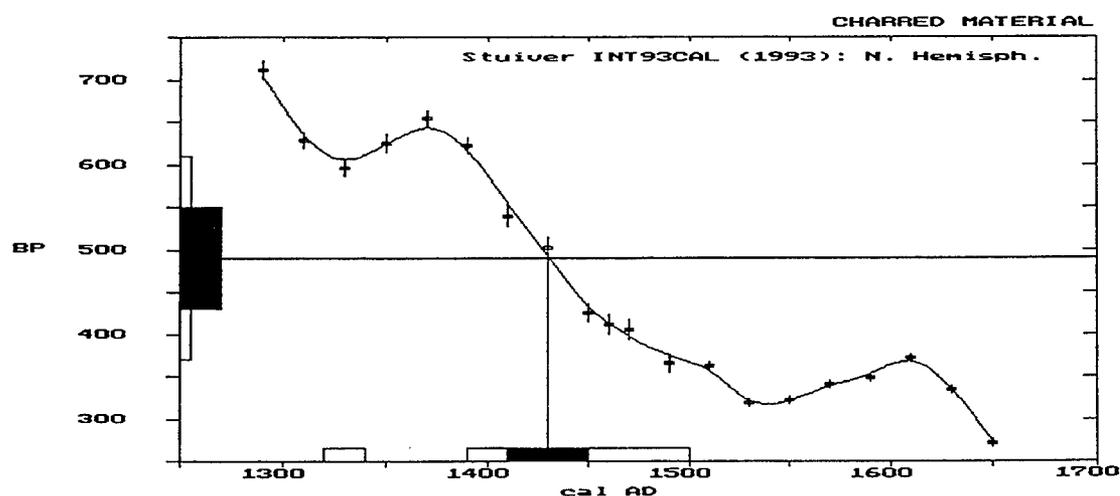
Conventional radiocarbon age: 490 +/- 60 BP

Calibrated result: cal AD 1320 to 1340 and
(2 sigma, 95% probability) cal AD 1390 to 1500

Intercept data:

Intercept of radiocarbon age
with calibration curve: cal AD 1430

1 sigma calibrated result: cal AD 1410 to 1450
(68% probability)

References:

- Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86
 Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322
 Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Results prepared by:

Beta Analytic, Inc., 4985 SW 74th Court, Miami, Florida, 33155

**BETA ANALYTIC INC.**

DR. J.J. STIPP and DR. M.A. TAMERS

 UNIVERSITY BRANCH
 4985 S.W. 74 COURT
 MIAMI, FLORIDA, USA 33155
 PH: 305/667-5167 FAX: 305/663-0964
 E-mail: beta@analytic.win.net
REPORT OF RADIOCARBON DATING ANALYSES
 FOR: Ms. Kathleen Callister
 Mariah Associates, Inc.

 DATE RECEIVED: June 9, 1994
 DATE REPORTED: July 5, 1994

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-73297 CAMS-13921 SAMPLE #: CV1505 P#4 ANALYSIS: AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid	210 +/- 60 BP	-28.2 ‰	160 +/- 60 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -28.2; lab mult. = 1)

Laboratory Number: Beta-73297

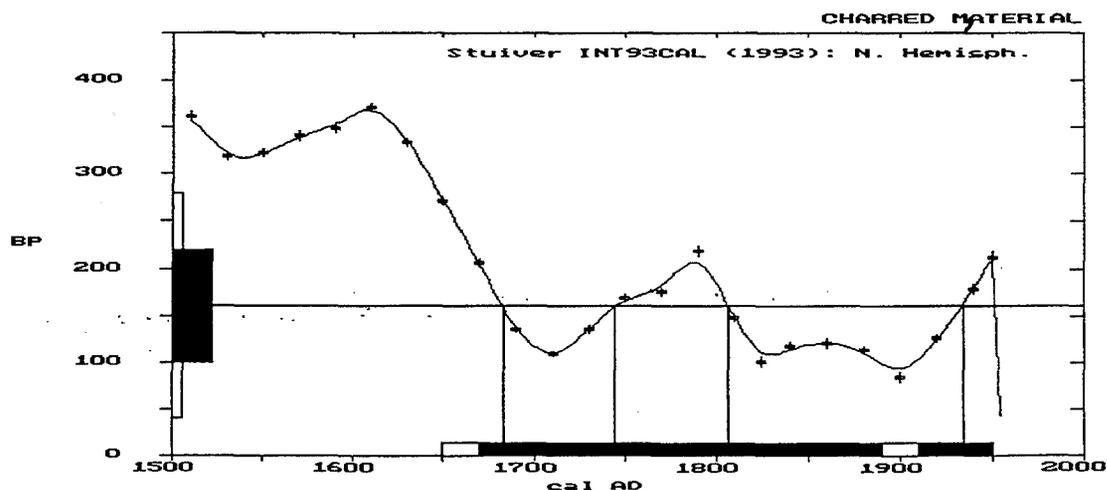
Conventional radiocarbon age: 160 +/- 60 BP

Calibrated result: cal AD 1650 to 1950
(2 sigma, 95% probability)

Intercept data:

Intercepts of radiocarbon age
with calibration curve: cal AD 1680 and
cal AD 1750 and
cal AD 1810 and
cal AD 1930

1 sigma calibrated results:
(68% probability) cal AD 1670 to 1890 and
cal AD 1910 to 1950



References:

- Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86
 Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322
 Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

Results prepared by:

Beta Analytic, Inc., 4985 SW 74th Court, Miami, Florida, 33155

APPENDIX C

Spoke and Ring Metric Data

Table C.1 Leon River Medicine Wheel Metric Attributes.

Spoke	Length ¹	Width ³	Completeness	Inner Opening ³	Outer Opening ³
A	16.4(53.8) ²	80(2.6) ²	50%	107(3.5) ²	65(2.1) ²
B	15.5(50.8)	85(2.8)	75-80%	85(2.8)	65(2.1)
C	15.4(50.5)	80(2.6)	80-85%	65(2.1)	65(2.1)
D	15.3(50.2)	75(2.5)	40-50%	60(2.0)	70(2.3)
E	15.4(50.5)	80(2.6)	80-85%	85(2.8)	70(2.3)
F	15.3(50.2)	85(2.8)	95%	80(2.6)	UC
G	15.4(50.5)	85(2.8)	10-20%	75(2.5)	100(3.3)
H	14.6(47.9)	80(2.6)	5-10%	85(2.8)	UC
I	12.8(42.0)	UC	NP	87(2.9)	UC
J	NP	NP	5% buried	77(2.5)	NP
K	NP	NP	NP	NP	NP
L	NP	NP	NP	NP	NP
M	NP	NP	NP	NP	NP
N	NP	NP	NP	NP	NP
O	NP	NP	Scattered	NP	NP
P	15.5(50.8)	NP	Scattered	NP	NP
Average	15.4	81.30		80.6	72.5

1 = Measurements in meters

2 = Measurements in parentheses are in feet

3 = Measurements in centimeters

UC = Unclear

NP = Not present

Table C.2 Leon River Medicine Wheel Metric Attributes.

Ring Segment	Inner Segment Length ³	Outer Segment Length ³
A-B	5.4(17.7) ²	10.8(35.4) ²
B-C	5.4(17.7)	11.9(39)
C-D	5.0(16.4)	11.3(37.1)
D-E	5.4(17.7)	11.3(37.1)
E-F	5.4(17.7)	11.4(37.4)
F-G	5.4(17.7)	11.4(37.4)
G-H	5.4(17.7)	11.1(36.4)
H-I	5.4(17.7)	UC
I-J	5.4(17.7)	UC
J-K	UC	NP
K-L	UC	NP
L-M	UC	NP
M-N	UC	NP
N-O	UC	NP
O-P	UC	NP
P-A	5.0(16.4)	NP
Average	5.4	11.3

1 = Measurements in meters

2 = Measurements in parentheses are in feet

3 = Measurements in centimeters

UC = Unclear

NP = Not present

APPENDIX D

Surface Worm Cast Data

Table D.1 Raw Data Regarding the Weight, Density, and Volume of Surface Worm Casts for Collection Episode A, a 24-Hour Period.

Sample	Dry Weight	Volume Displaced	Calculated Maximum Density	Sample	Dry Weight	Volume Displaced	Calculated Maximum Density
WP1A-1	3.29	1.7	1.94	WP2A-1	2.01	--	--
WP1A-2	2.98	1.4	2.13	WP2A-2	1.44	0.8	1.80
WP1A-3	0.32	--	--	WP2A-3	0.47	--	--
WP1A-4	3.51	1.6	2.19	WP2A-4	1.21	0.6	2.02
WP1A-5	0.84	0.3	2.80	WP2A-5	1.21	--	--
WP1A-6	1.26	0.6	2.10	WP2A-6	0.89	0.4	2.25
WP1A-7	0.45	0.2	2.25	WP2A-7	1.65	0.9	1.83
WP1A-8	1.19	0.6	1.98	WP2A-8	3.45	1.7	2.03
WP1A-9	1.79	0.9	1.98	WP2A-9	1.77	0.8	2.21
WP1A-10	0.58	--	--	WP2A-10	1.60	1.2	1.33
WP1A-11	3.11	1.6	1.94	WP2A-11	1.42	0.6	2.36
WP1A-12	0.99	--	--	WP2A-12	0.58	0.4	1.45
WP1A-13	2.45	1.4	1.75	WP2A-13	0.67	0.3	2.23
WP1A-14	1.12	0.5	2.24	WP2A-14	1.58	0.7	2.26
WP1A-15	1.69	0.8	2.11	WP2A-15	2.47	1.2	2.06
WP1A-16	2.52	1.2	2.10	WP2A-16	4.44	2.2	2.02
				WP2A-17	3.12	1.5	2.08
				WP2A-18	1.30	--	--
				WP2A-19	0.92	0.4	2.30
				WP2A-20	1.31	0.6	2.18
				WP2A-21	1.83	0.9	2.03
				WP2A-22	3.52	1.8	1.90
				WP2A-23	1.29	0.6	2.15
Mean	1.756	0.985	2.11	Mean	1.746	0.926	2.03
Standard Deviation	1.076	0.526	0.248	Standard Deviation	1.018	0.537	0.27
Minimum	0.32	0.2	1.75	Minimum	0.47	0.3	1.33
Maximum	3.51	1.7	2.80	Maximum	4.44	2.2	2.36
Sum	28.09	--	--	Sum	40.15	--	--
Mode	--	--	--	Mode	1.21	0.6	--

Table D.2 Raw Data Regarding the Weight, Density, and Volume of Surface Worm Casts for Collection Period B, a 24-Hour Period.

Sample	Dry Weight	Volume Displaced	Calculated	Sample	Dry Weight	Volume Displaced	Calculated
			Maximum Density				Maximum Density
WP1B-1	2.93	1.6	1.83	WP2B-1	3.93	2.3	1.71
WP1B-2	1.14	0.6	1.90	WP2B-2	3.92	2.0	1.96
WP1B-3	1.27	0.6	2.12	WP2B-3	1.78	1.0	1.78
WP1B-4	1.11	0.5	2.22	WP2B-4	0.65	0.6	1.08
WP1B-5	3.57	1.8	1.98	WP2B-5	1.42	0.7	2.03
WP1B-6	2.49	1.2	2.08	WP2B-6	2.55	1.4	1.82
WP1B-7	1.82	1.0	1.82	WP2B-7	2.73	1.2	2.27
WP1B-8	0.93	0.5	1.86	WP2B-8	1.53	0.8	1.91
WP1B-9	3.09	1.6	1.93	WP2B-9	2.69	1.3	2.07
WP1B-10	2.91	1.4	2.08	WP2B-10	4.88	2.5	1.95
WP1B-11	1.88	1.0	1.88	WP2B-11	1.61	0.8	2.01
WP1B-12	2.37	1.3	1.82	WP2B-12	2.14	1.0	2.14
WP1B-13	4.13	2.0	2.07	WP2B-13	1.49	0.8	1.86
WP1B-14	1.78	0.9	1.97	WP2B-14	5.07	2.6	1.95
WP1B-15	2.21	1.2	1.84	WP2B-15	3.68	1.8	2.04
WP1B-16	1.66	0.8	2.08	WP2B-16	1.49	0.7	2.13
WP1B-17	0.87	0.4	2.17	WP2B-17	2.41	1.4	1.72
WP1B-18	1.96	1.0	1.96	WP2B-18	0.16	--	--
WP1B-19	6.53	3.4	1.92	WP2B-19	1.57	0.6	2.61
WP1B-20	1.15	0.6	1.92	WP2B-20	0.74	0.4	1.85
				WP2B-21	2.99	1.6	1.87
Mean	2.29	1.17	1.97	Mean	2.354	1.28	1.94
Standard Deviation	1.349	0.69	0.12	Standard Deviation	1.343	0.66	0.29
Minimum	0.87	0.4	1.82	Minimum	0.16	0.4	1.08
Maximum	0.53	3.4	2.22	Maximum	5.07	2.6	2.61
Sum	45.8	--	--	Sum	49.43	--	--
Mode	--	--	2.08	Mode	1.49	0.8	1.95

Table D.3 Raw Data Regarding the Weight, Density, and Volume of Surface Worm Casts for Collection Episode C, a 72-Hour Period.

Sample	Dry Weight	Volume Displaced	Calculated Maximum Density	Sample	Dry Weight	Volume Displaced	Calculated Maximum Density
WP1-1	6.49	na	na	WP2-1	18.42	na	na
WP1-2	1.54	na	na	WP2-2	1.81	na	na
WP1-3	3.58	na	na	WP2-3	1.79	na	na
WP1-4	3.30	na	na	WP2-4	2.80	na	na
WP1-5	0.22	na	na	WP2-5	1.47	na	na
WP1-6	0.14	na	na	WP2-6	2.04	na	na
WP1-7	4.13	na	na	WP2-7	3.77	na	na
WP1-8	3.00	na	na	WP2-8	6.42	na	na
WP1-9	2.01	na	na	WP2-9	3.84	na	na
WP1-10	9.05	na	na	WP2-10	0.79	na	na
WP1-11	8.17	na	na	WP2-11	1.99	na	na
WP1-12	7.24	na	na	WP2-12	5.67	na	na
WP1-13	5.19	na	na	WP2-13	2.98	na	na
WP1-14	1.34	na	na	WP2-14	3.18	na	na
WP1-15	2.18	na	na	WP2-15	1.89	na	na
WP1-16	3.32	na	na	WP2-16	0.90	na	na
WP1-17	2.77	na	na	WP2-17	7.52	na	na
WP1-18	2.02	na	na	WP2-18	12.40	na	na
WP1-19	1.67	na	na	WP2-19	2.38	na	na
WP1-20	1.00	na	na	WP2-20	0.61	na	na
WP1-21	7.64	na	na	WP2-21	6.24	na	na
WP1-22	5.57	na	na	WP2-22	1.99	na	na
WP1-23	8.17	na	na	WP2-23	0.75	na	na
WP1-24	3.99	na	na	WP2-24	1.36	na	na
WP1-25	8.05	na	na	WP2-25	1.59	na	na
WP1-26	2.40	na	na	WP2-26	5.44	na	na
				WP2-27	0.56	na	na
				WP2-28	0.28	na	na
Mean	4.007	na	na	Mean	3.603	na	na
Standard Deviation	2.718	na	na	Standard Deviation	3.948	na	na
Minimum	0.14	na	na	Minimum	0.28	na	na
Maximum	9.05	na	na	Maximum	18.42	na	na
Sum	104.18	na	na	Sum	100.88	na	na
Mode	8.17	na	na	Mode	1.99	na	na

POST SCRIPT**Scientists and Humanists:
Alternative Perspectives on Science and the Geoaarcheological Investigations
at the Leon River Medicine Wheel**

Christopher R. Lintz

The archeological and ethnographic investigations at 41CV1505 were conducted under mandates of the National Historic Preservation Act requiring documentation and significance evaluation of cultural sites on federal property prior to modifications, including the addition and rearrangement of rocks in conjunction with the Leon River Medicine Wheel renewal ceremony. The archeological investigations also assisted the Traditional Elders in delineating the buried portions of the feature and staking out the missing portions of the inner and outer ring intersects with the spokes or passages of the medicine wheel.

This post script accomplishes three objectives: first, it summaries the scientific results of investigations at the Leon River Medicine Wheel with particular emphasis on the evidence for the shape, and antiquity of the Leon River Medicine Wheel and highlight areas where differing interpretations are possible. It also explores multiple working hypotheses about who, when, and why the rock alignment was built, and evaluates the strengths and weaknesses of each possibility. Second, this post script discusses the different world view perspectives inherent in using science to investigate religious sites, and especially highlights the problems involved with cross cultural studies. Some information about the criteria used by Traditional Elders in recognizing the Leon River Medicine Wheel as a Traditional Cultural Property is discussed to underscore the differences in world views. In addition, the importance of this sacred site to the Native American community in Texas is presented. The third objective focuses on the manner of protection for this site. Particular emphasis is placed on how the preservation process is weighted against minority ethnic groups, and that the existing mechanisms for protection are regarded by many Native Americans to be as effective as many of the United States treaties which were broken as a matter of convenience. Since the same scientific interpretations of the archeological and geomorphological data can be used to reach a different conclusion than those advocated from previous chapters in this study, the site may be eligible for inclusion in the NRHP.

Review of the Scientific Results

The documentation of cultural sites as mandated by laws of the dominant American society is typically approached from a scientific perspective of archeology. This discipline is best apt to provide information to general questions of *what* (in a morphological, not necessarily functional sense), and to a limited extend *when* a particular site formed; but information on *who* and *why* are more difficult to delineate from anthropological approaches. Indeed, archeology is on firmest ground when dealing with the "bean-counter mentality" involving descriptions and quantifications of recovered objects; less surety is available and more inferences are needed as one moves up the various levels of abstraction ranging from tool and feature functions, economic activities/systems, social organization/systems, to (at the highest level), belief systems. The following reiterates the archeological knowledge developed from investigations on the Leon River Medicine Wheel and offers comments where alternative interpretations are possible. The discussions will

employ English conversions of the metric measurements used elsewhere in the report to be more readily comprehensible to those familiar with that system.

What is the Morphology of the Leon River Medicine Wheel?

The scientific investigations of the Leon River Medicine Wheel discerned that it occurs on a plot of land which has never been cultivated or historically disturbed. The medicine wheel site generally has shallow sediments (less than six inches thick), but can reach depths of up to 12 inches thick around the base of trees. The underlying bedrock consists of a poorly consolidated bedrock limestone containing fossil oyster shells. A low linear ridge of fossil oyster shells dissects the medicine wheel feature. Three large live oak and juniper trees (trunks up to 20 inches in diameter) and many smaller, mostly juniper trees cover about 30% of the projected area of the feature; the rest was an open grassy area.

When initially found in 1991, the stone alignment was not entirely discernable. Nevertheless, projections of those visible portions, mapped using relatively crude procedures suggested concentric rings approximately 98.5 ft and 187 ft in diameter with six sets of connecting spokes each formed by parallel stone alignments about 27 to 35 inches apart which converged towards a central point at approximately 22.5° intervals. Based on this information it was suggested that the regularity of the two rings and the placement of the spokes could have been laid out using two ropes, each measuring approximately 100 ft long; the placement of the pairs of aligned spokes might have been accomplished by continually bisecting the circular feature in half, quarters, eighths, and finally sixteenths.

During the 1994 investigations, mapping and excavations demonstrated that much of the medicine wheel was incomplete (especially along the east side). The stone feature consists of more than 1,200 cobbles measuring from 1.5 to 9.8 inches in diameter and weighing from less 0.5 to 13 pounds. The average weights of a sample of cobbles from the inner ring (n=64), outer ring (n=77), and the spokes (n=95) were 6.1, 4.2, and 2.0 pounds, respectively. Many individual cobbles are one-half to three-fourths of the way embedded in the sediments, with average depths of 1.5 inches for the inner ring alignment, 2.1 inches for the spokes, and 3.4 inches for the outer ring alignment which skirts the edge of the live oak and juniper notes.

Precise mapping procedures and blimp aerial photography show that the inner ring is about 101.7 ft in diameter with a deviation of less than eight inches; the projected outer ring is nearly 197 ft. in diameter, with a major deviation in the alignment along the south side. The remaining segments of the feature consist of at least ten parallel rows of rock or spokes connecting an inner and an outer stone ring alignment, six of which are estimated to be more than 25% complete. Rather than being circular in form the inner and outer ring alignments meet the spokes at angular junctures, forming remnants of what may be 16-sided polygons. Seven of the spokes measure 50.5 ft ± 0.3 ft, and one spoke along the north side (where the outer ring is poorly defined) measures 53.8 ft long. However, a portion of the outer ring on the south side is composed of slightly larger and denser cobbles which deviates from the projected polygon shape by cross-cutting a few spokes in a single straight line. Here, the shortest spoke length is only 42 ft long. The area between the parallel rows of two spokes on the southwest side of the Medicine Wheel are covered with tiny crushed fossil oyster shells in depths ranging to 2 inches thick. No central cairn feature was present in the middle of the inner ring.

Excavations of over 70 m² on parts of the stone alignments and in projected and expected locations failed to document that the entire feature was complete. The shallow soils and results from ground penetrating

radar also contributed to the notion that much of the eastern portion of the medicine wheel is missing. The incomplete condition of the feature as documented by the surface mapping, excavations, and ground penetrating radar may not be so much of a reflection of an unfinished project, as much as it reflects the undisturbed remaining portions of a feature which had cobbles salvaged during the recent historic era for use elsewhere.

A survey of 67 known medicine wheels from the northern plains discerned eight general forms, none of which was directly comparable in precision, layout, or size to the Leon River Medicine Wheel. Although the scientific study stopped short of drawing any explicit conclusions, an impression was left that the uniqueness of the Leon River Medicine Wheel as a 16-sided polygon raised questions as to whether it belong to the class of medicine wheels. The technology of laying out the feature need not be complex, nor sophisticated. The two rope procedure as advocated by Carlson (1993:29) could have been used as long as the configuration was inscribed in the dirt first, and the rocks were set up on the spokes prior to completing the inner and outer rings. It should also be pointed out that the typology of medicine wheel forms has been imposed by archeologists on examples from the northern plains. This typology presupposes that the full range of medicine wheel forms and sizes have been discovered during surveys, and/or that other forms will not be recognized in the future.

When was the Leon River Medicine Wheel Built?

The archeological investigations used eight distinct potential dating methods to attempt to determine the antiquity of the Leon River Medicine Wheel. The following reviews the chronometric information derived from three kinds of absolute dates (radiocarbon, snail epimerization, and tree rings), which along with cross-dating of temporally diagnostic artifacts provides calendrical ages are determined. Other approaches including, lichenography, soil chemistry oral histories, and geomorphology, can occasionally provide relative age estimates. Each is reviewed below.

Radiocarbon Dates

Three pieces of charcoal recovered from the excavations around the stones yielded dates of 520 years old, 210 years old and modern. All three age estimates were rejected as useful in dating the medicine wheel since the contextual association and stratigraphic relationships were not conclusive. There is no way of determining whether the minute charcoal flecks represent cultural activities or natural range fire occurrences.

Snail Epimerization Date

One snail epimerization date, estimated between 275 and 350 years old, was similarly rejected due to the inability to conclusively correlate the dated snail to the rocks.

Tree Ring Dates

Three large live oak trees within and along the margin of the stone alignment structure were cored and the rings counted to determine the age of the trees. The results of 92, 96, and 119 rings may reflect the initial growth of these trees in 1899, 1895, and 1872, assuming that the trees added only one ring per year. The antiquity of these trees was rejected, since none disrupted the alignments of stones, and the root systems had not captured any rocks. Although it is possible that the stone alignment may have been built

around the trees, the Traditional Elders maintain that medicine wheels are built in clearings, and therefore any tree within the medicine wheel must post-date its construction.

Cross Dating of Temporally Diagnostic Artifacts

Three temporally diagnostic chipped stone spear, dart, and arrow points were found in the area surrounding the Leon River Medicine Wheel. General calendrical age estimates are possible for these materials since comparable forms have been found elsewhere associated with materials datable by radiocarbon methods. One point, identified as an Angostura is believed to be about 8,000 years old, a broken dart point is undiagnostic but is believed to predate the occurrence of arrow points in Central Texas which is would make it greater than 1,250 years old, and a corner notched arrow points was found which were commonly manufactured between 1,250 and 750 years ago. Although these specimens document multiple occupations in this area, none can be demonstrably associated directly with the wheel due to their lack of stratigraphic context relative to the stones.

Lichenography

Lichen growth on rock has been successfully used in some areas to infer age based on the size and symmetry of individual patterns. Although lichen occurred on 68% of the rocks in the medicine wheel, the growth patterns were generally not the kinds of species to produce concentric growth and insufficient studies have been done of these types to suggest rates of growth. Furthermore, since some rocks used to build the feature may have had pre-existing lichen growths, even the mere presence of lichen does not prove great antiquity. Therefore, lichenography was inconclusive and rejected as a dating method.

Domaar Soil Chemistry Test

The chemistry of soil beneath rocks placed on a surface through time can differ from that in adjacent soils, since the rocks divert dust and rains, which affect changes associated with soil development. An acid test to measure the amount of calcium carbonates accumulating beneath rocks yielded qualitative results suggesting that there was no overall marked difference in the soils beneath and adjacent to rocks. Furthermore, none of the 235 rocks studied for lichen growth contained carbonates on their under sides. Although one interpretation might suggest that the rocks have not been in place for sufficient time for the carbonates to form, the lack of difference might also relate to the small rock sizes, the shallow sediment depths, the rate of lateral transport by groundwater of dissolved carbonates through the soil or a myriad of other factors. This test is regarded as inconclusive and not informative about the antiquity issue.

Oral Histories

Interviews with the wife of Mr. Troy Hunt, the most recent landowner prior to acquisition by the U.S. Army and who once lived about three-quarters of a mile away, discerned that the existence of the stone alignment was not known. Presumably this means that the Hunt's conducted no activities on this site that would leave the stone alignments of the Leon River Medicine Wheel. However, this testimony can not be used as proof that the medicine wheel was not present on their property, since the rocks composing the medicine wheel are not large and typically spouses of farmers are not as intimately familiar with conditions of the property as their husbands who frequently work the lands. It is truly unfortunate that Mr. Hunt was not available for interview, since he might have been able to indicate why this particular

parcel of land was never plowed. Were the soils too shallow for practical farming, or did he recognize and respect the existence of the stone alignment?

Subsequent to the archeological investigations, two Comanche women reported separate oral traditions about a medicine wheel within the region. Ms. Terry Bullock stated that her grandfather told her about the use of medicine wheels in Central Texas in the early 1900s. Similarly, Ms. Susan Ginnings stated that her grandmother mentioned an oral tradition of Comanche use of medicine wheels in this region prior to their removal to the Oklahoma reservations in 1868 (personal communications with Christopher Lintz, 1995). She claimed that the full participation of the ceremonies was lost when several religious leaders were killed during the various wars of the late nineteenth century. The precise location of the Central Texas medicine wheel is uncertain, but based on the general configurations of rivers, Ms. Ginnings felt that the sacred site was within a 30 mile radius area of North Fort Hood, which includes the site of the Leon River Medicine Wheel. From an objective perspective no confirm evidence exists to prove that the medicine wheel mentioned by Ms. Ginnings's grandmother is the Leon River Medicine Wheel site.

Geomorphology and Stratigraphic Context

Geomorphology of the Leon River Medicine Wheel feature discerned that it was built on relatively shallow sediments over bedrock, and that for most of the feature the substrate has no discernable stratigraphy. Clear stratigraphic context was found only along a low, raised ridge of fossil shells which overlay both soil sediments and parallel anomalies interpreted to be road ruts; and underlay several rocks of the inner, outer rings and spokes of the original Leon Medicine Wheel alignment. This stratigraphic sequence offers strong evidence that the rocks in these portions of the medicine wheel on top of the fossil shell ridge must post date the ridge and the road. A series of early aerial photographs show that the road is present by 1941 and is traceable to a gravel quarry where similar fossil shells occur. The quality of the film on the earliest aerial photograph is too poor to determine if the medicine wheel was present (the stone alignment is only visible in the October 1951 picture).

Archeological and geomorphological studies show that in contrast to the rocks on top of the fossil spillage above the roadway, many of the other rocks are buried in sediments with average depths ranging from 1.5 inches for the inner circle, to 2.1 inches along the spokes, to 3.4 inches for the outer circle. The differential depths relate more to overland water flow patterns which move fine sediments from up slope and sediment capture around the base of trees, than to any evidence of differential construction episodes. Nevertheless, the occurrence of larger size and greater density of rocks along a misaligned southern segment of the outer ring suggests that multiple building episodes probably occurred.

Empirical evidence was gathered on the surficial castings left by earth worms after rains to develop a model of rates of upward sediment displacement to potentially account for the recent burial of the rocks. Empirical observations found that worm castes were not uniform across the medicine wheel and some areas even with good surface visibility had no discernable up-ward movement of sediments. Nevertheless, the model stipulated that it was theoretically possible that worm action alone could account for the burial of rocks during an interval of 55 to 97 years and that such factors as colluvial deposition organic accumulations around trees were not necessary to account for the rate of deposition.

Interpretations and Alternative Views

The geomorphic studies and especially the occurrence of some stones in the alignment occurring on top of the fossil oyster shell gravel spillage stratigraphically above the historic rutted road has been interpreted to suggest that the entire medicine wheel feature post-dated the gravel quarry and road. Since the quarry was not in operation while the property was owned by the Hunts, it has been asserted that the entire Leon River Medicine Wheel post-dates the Army acquisition. The antiquity of the gravel quarry operation is confirmed by the sequence of aerial photos.

Although this interpretation is consistent with much of the accumulated evidence, it is based on a potentially erroneous assumption that the stones built atop the road spillage were contemporaneously placed with those cobbles outside of the road. The harsh scientific reality is that there is no stratigraphic way of relating the rocks on top of the spillage to the same events responsible for the other rocks of the medicine wheel. The same lack of stratigraphy which was used to contextually dismiss the association of the various projectile points, the radiocarbon, and the snail epimerization dates equally applies to all rocks outside the roadway. Essentially, the rocks above the gravel spillage clearly post-date the road usage, but they do not provide solid information on the age of those rocks outside the road way. Alternate views will be explored below. Clearly, many questions remain about the shape, age, number of building episodes and construction sequences for which answers have not been adequately found.

Who Constructed the Leon River Medicine Wheel, and Why?

Two tactics are taken to address this issue. The first involves summarizing the anthropological and historical literature to find out the geographical extent of medicine wheel occurrence, and possible tribal affiliations of groups in the region that might possess this knowledge. The second approach involves logically working through a series of hypotheses about when and who built the Leon River Medicine Wheel.

The Historical Record

The anthropological answer to the identification of the ethnic or cultural group responsible for building such a large rock feature is extremely difficult to do using scientific methods. The summary of anthropological literature suggests that previously documented medicine wheel features are most common in the plains and mountainous region of Canada and the northern United States; 85% of the 67 previously documented medicine wheels (involving at least eight forms) occur in the provinces of Alberta and Saskatchewan; another 12% occur in Montana, and single examples have been reported from Wyoming and South Dakota. Scientific investigations in a few of these northern plains medicine wheels indicate that they may be as much as 5,000 years old. The archeological typology of medicine wheel forms shows that they come in a range of shapes, and that no single attribute (central cairn, outer ring(s) nor spokes) are critical to defining medicine wheels. Indeed, Traditional Elder Wise has indicated that various shapes have different meanings. It may be presumptuous to think that medicine wheel forms were rigorously followed and that archeologists have identified the complete range of forms or even the entire geographical distribution of medicine wheels. Nevertheless, even though unreported medicine wheel sites may exist in a broader geographical region than presently known, it seems reasonable to suggest that medicine wheels on the southern plains were most likely made by people who once resided or had prolonged contacts with people living far to the north.

The Blackfoot have specific words in their language for sacred medicine wheels sites, but some ethnographic records also suggests that the Crow, Blood, and Peigan used or maintained medicine wheels. In Addition, archeologists and historians have variously attributed the Bighorn Medicine Wheel in Wyoming to have been made or maintained by the Cheyenne, Crow, and/or Shoshone. Traditional Elders involved with the Leon River Medicine Wheel renewal ceremony feel that the site was made by Comanche, citing that they separated from the Shoshone (in the 1700s) and several of the "Elders of the Comanche seem to remember something about the wheel, but they can't recall (aspects of its use) because it was not directly taught to them" (statement from Mr. Haman Wise to Ms. Dorothy Lippert, 1994). Ethnographic records do not generally recognize the Comanche as users of medicine wheels, assuming that the knowledgeable traditional people were interviewed. Potentially then, both the Cheyenne and Comanche are historically resident southern Plains groups which may be connected to medicine wheel usage. In addition, historic records suggest that other northern plains groups (include Blackfoot, Sioux, Gros Ventres, and Crow) made brief forays into northeast New Mexico and perhaps other areas of the southern Plains (Winter 1988:116-121), just as the plains Kiowa with linguistic ties to the New Mexican Puebloans were in the northern plains region where medicine wheels occur for a sufficiently long time to acquire legends about the origin of the Black Hills, Devil's Tower, and features near Yellowstone National Park (Mooney 1895). The historical tapestry of group movements, whether displaced by aggressive neighbors, or drawn by horses, firearms, and buffalo, is very complex and difficult to document in the historical records. Reality is often more complex than social scientists like to believe.

Similarly, gaps exist in recorded knowledge about traditional religious practices. As a general statement, religious leaders tend to be conservative and are apt to be reluctant to reveal religious beliefs to inquisitive Euro-American explorers or ethnologists. It may be presumptuous to reject specific groups as possible candidates of medicine wheel practitioners on the scientific basis of answers provided by a few elderly tribal members under "salvage ethnographic" conditions of the late 1800s. The historical and scientific documents leave many questions, and no single groups can be positively identified by this method.

Alternative Hypotheses and Logical Choices

An alternative tactic asks the simple question: "Who logically was available to constructed the stone alignment?" The choices surrounding construction may be speculative, but each can be evaluated within the context of the knowledge collected during the archeological and geomorphological investigations of the stone alignment. Since interviews with Mrs. Hunt, wife of the landowner, suggest that, to her knowledge, the Hunt family had no involvement in the building of the wheel, and the size and precision of the undertaking, suggests that it was probably not the labor of children at play, only four hypotheses might rationally account for groups making the stone alignment of this size: (1) Army soldiers camping on the site involved with camp maintenance activities, (2) Native American soldiers stationed at Fort Hood during training for armed conflicts involved with religious observances, (3) prehistoric or protohistoric Native American groups involved with religious observances, or (4) some combination of the previous three hypotheses.

The Army bivouac camp hypothesis merits consideration due to the size of the feature (nearly twice as large as any other known medicine wheel), its location on a military base, and the precision of execution and layout (which differs from other documented medicine wheels in its polymorphic shape). The U.S. Army occasionally requires troops in training to engage in physically exhausting yet menial tasks, and has been known to erect rock borders at long-term camp sites. Mechanized equipment is also available to assist in the layout of the polygon stone alignment around existing trees and for transporting the fossil

oyster gravel for deposition within the two spokes of the medicine wheel. Thus, this hypothesis is within the technical realm of possibility that such activities are represented at this site and is stratigraphically consistent with the geomorphic evidence. However, several problems prevent the serious consideration of this hypothesis. (1) The polygon alignments of the rings with spokes set at 22.5° is not compatible with any known bivouac campsite border arrangement. (2) The sparse quantity of historic military artifacts found within the stone alignments (consisting mostly of a few C-ration cans, and M-16 cartridge casings, small quantities of broken glass, in addition to a few other civilian cans and remnants of a deer hunter's blind round out the historic assemblage) does not reflect a major Army encampment on the site. (3) No records are known to exist for such military use at this spot. (4) No mechanism exists to fully account for the incomplete condition of the rock border alignments. Thus, this notion of the stone alignment being a product of Army manufacture is regarded as extremely unlikely, and is rejected.

The second hypothesis stipulates that the stone alignment was a medicine wheel made by Native American soldiers stationed at Fort Hood as a place to go to pray in a traditional manner and a location to get knowledge about how to conduct one's life, especially in preparing oneself for overseas armed conflicts. It is unlikely that the construction of such a religious site during the 1940s to 1950s would have been sanctioned by the U.S. Army. Nevertheless, the location may have been chosen due to its in close proximity to the North Fort Hood Facility in a secluded setting visually obscured by trees on a plot of land never previously cleared for agricultural purposes. In such a secluded place, Native American soldiers with strong traditional beliefs may have prepared themselves relatively free from potential persecution. This hypothesis is compatible with the stratigraphic evidence and estimated age based on the gravel quarry road and the worm caste model, and the technological ability of transporting fossil oyster shells to embellish and line the spokes. Problems exist with this hypothesis as well. (1) It requires that the medicine wheel be constructed around some standing trees, and assumes that a full medicine wheel would be more effective than a simpler sweat lodge in asking for help from the grandfathers in preparing one self. (2) It doesn't account for the rebuilding episodes as reflected by the misaligned southern portion of the medicine wheel. (3) It also doesn't account for the missing portions of rocks along the east side of the wheel. (4) It requires that Native American soldiers stationed at North Fort Hood have been given sufficient, training, knowledge and rights to conduct the medicine wheel ceremonies (thus, they are apt not to be young recruits). Military personnel records searches of the 1940-1950 era have not been conducted to identify Native Americans veterans with potential knowledge of this feature and its usage. Nevertheless, preliminary inquiries conducted among some veteran groups has yet to identify any Native Americans with knowledge about the existence of the site. Thus, a number of serious problems exist in accepting this hypothesis at face value, but further inquiries and perhaps personnel file searches are viable avenues for additional investigations.

The third hypothesis postulates that the Leon River Medicine Wheel was made by some Native American group (possibly Comanche or Cheyenne) long before the property was acquired by the Army. The antiquity of the medicine wheel is uncertain, but if the Traditional Elders are correct in asserting that the medicine wheel was built in a prairie clearing, then the minimum age would be before 1872 when the oldest live oak began growing on the site. The polygon layout of the inner and outer circles would have been engineered with relatively crude measuring devices and could have been accomplished with two ropes, as described above. The site was used as a sacred spot for a number of years and fell into disuse due to Indian removal from the region and perhaps the loss of religious leaders familiar with the ceremonies. Some of the earliest Anglo settlers were aware of and used rock alignment as a ready source of cobbles perhaps as footings for fence posts or other building activities in the area. Difficulties with this hypothesis relate to (1) the rebuilding episode along the south side of the medicine wheel; (2) the

stratigraphic sequence involving the road under the ridge of fossil oyster shells, the placement of rock alignments above the fossil oyster ridge, (3) the absence of alignment rocks within the roadway, and (4) the occurrence of fossil oyster shells within two spokes. The geomorphological and stratigraphic evidence mustered for the early historic roadway is too overwhelming to accept this hypothesis at face value.

The fourth hypothesis stipulates that the rock configuration found in 1991 represents a composite resulting from some combination of behaviors and time intervals stipulated in the previous three hypotheses. The road and stratigraphic evidence most plausibly suggests that some aspects of the medicine wheel was built after the gravel quarry existed, whereas other aspects were built before the roadway. For there is no viable way of contextually relating the buried rocks adjacent to the road to the same construction episode as those on top of the fossil oyster spillage and roadway. The justification for rejecting the association of the tree ring dates, radiocarbon dates and snail epimerization dates due to a lack of stratigraphic context equally applies to the relationship between the rocks on and off the fossil ridge over the roadway. The rocks of the alignment may have been applied during separate building activities, which we suspect exist from the misalignment of the southern portion of the outer ring.

If components of hypotheses 2 and 3 are combined, then a number of interpretative problems are diminished. In this situation, the rock configuration represents a medicine wheel of unknown antiquity; however, it was constructed sometime prior to 1872 (the age of the oldest tree within the wheel) using instruments as simple as two ropes perhaps by Comanche or Cheyenne Traditional Elders. The Leon River Medicine Wheel may have been a focal point for prayer and was used up to the time the Indians were moved out of Texas. The ceremonial practices surrounding medicine wheel usage were lost with the deaths of the Traditional Elders, perhaps in conjunction with the Indian Wars of the later nineteenth century. Early Euro-American settlers may have avoided plowing this area solely due to the shallow soils on this hill slope. Over the years, various taphonomic processes, including worm castes buried the rocks; oaks and some juniper continued to grow in the undisturbed areas adjacent to cultivated fields. Aspects of the rock feature may have been noticed by early settlers and some rocks along the southern and perhaps eastern sides of the feature may have been collected and hauled off to use in various construction projects (e.g., fence post footings, etc.). Further degradation came to the feature as a haul road was built to a gravel quarry located higher up the slope. Possibly some rocks of the alignment within the roadway were regarded as a hindrance to transportation and removed. Road usage and perhaps intentional deposition of the fossil oysters to improve traction created the low ridge across the medicine wheel feature. Perhaps remnants of the old medicine wheel were recognized by a small contingent of Native American soldiers stationed at Fort Hood during the 1940s to 1950s, and secret efforts were expended to restore the medicine wheel before rededicate or extensive use. These later rebuilding activities may have included (1) replacing cobbles in the alignment on top of the fossil oyster ridge, (2) adding a thin layer of fossil oyster shells to several spokes, and (3) rebuilding portions of the south edge of the outer ring with bigger cobbles. It is unclear whether the medicine wheel rebuilding efforts were abandoned before the feature was completely restored on the east side, or if it was completely rebuilt and used as a medicine wheel after the abandonment of the quarry road. In the latter instance, the sacred site may have fallen into disuse with the transfer of participating soldiers; however, if the medicine wheel was completely rebuilt, then subsequent mechanisms must account for the loss of rocks from the east side of the wheel. This hypothesis is far more complex in that it invokes multiple activity periods, but it also leaves fewer loose ends.

The Religious Aspects of the Leon River Medicine Wheel

Difficulties exist in relying on science to investigate religious issues. Science mandates a objective and skeptical detachment in compiling and evaluating physical evidence. Often the burden of proof is more stringent than the physical evidence will tolerate. Thus the scientist is forced to adopt conservative interpretations. On the other hand, religion is a matter of faith and convictions of the heart. It comes from the personal belief about the existence of a higher being and the trust an individual places in a greater power to derive comfort in organizing their daily lives. The fact that scientists have been unable to demonstrated the existence of the human spirit underscores the tremendous differences in the world views underlying the two positions.

The mandate for scientific investigations of the Leon River Medicine Wheel as required by federal law for protection of the site, places an undue burden by presupposing that the archeologists has the ability to recognize the importance of religious sites on the basis of physical morphological attributes. However, the differences between scientific and religious world views as well as the cultural differences involved with backgrounds, and up-bringing, and even the very definition of the kinds of information worthy of cultural transmission between Native American Traditional Elders and Euro-American descended archeologists practically guarantees miscommunication and misunderstanding about the nature of the phenomena at sacred sites and Traditional Cultural Properties. Within the context of these cultural barriers, it is not surprising that few agreements about the nature of medicine wheels will occur.

The Native American Traditional Elders rely as much on the sensual aspects in the delineation of sacred sites as they do on the physical manifestations. In the Leon River instance, the Traditional Elders mentioned the existence of the buried rocks in conjunction with the importance of vegetation, natural sounds of birds, insects, and especially breezes. All of these Elders immediately recognized the buried stones as a medicine wheel. Mr. Haman Wise recounts that during his first few moments at the Leon River Medicine Wheel, he was welcomed by an approaching spirit as manifested by a minor thermal whirlwind (cynically called dust-devils by Anglo Americans), and that during the final renewal prayers inside the Medicine Wheel a spirit in the form of a slight breeze, during an otherwise still moment, lifted an eagle feather off the ground and on to Mr. Wise's lap. All the cultural signs of a medicine wheel were present when initially confronted with the rock alignment as a sacred medicine wheel locality. They feel that other medicine wheels exist in the southern Plains which eventually will be revealed by the earth and grass.

The Traditional Elders have repeatedly expressed consternation that the Anglo community regard Medicine Wheel sites as "Indian relics," scientific curiosities, or tourist attractions. Such attitudes are heart-breaking and insulting to their beliefs. The medicine wheels are living, sacred sites that are integral to helping the Native American practitioners reconnect with their past and as place to request help from their ancestors in dealing with life's problems.

Since the Leon River Medicine Wheel was rededicated by the Traditional Elders of the Medicine Wheel Alliance and attended by representatives of numerous southern Plains tribes, the site has been reactivated as a Traditional Cultural Property. Numerous people have come as individuals to pray and seek help at the site; furthermore, the location has been the focus for regular sweat purification by groups and even one adoption ceremony has occurred at the Medicine Wheel. The Leon River Medicine Wheel continues to be the spiritual focus for the Native American community within and beyond the boundaries of Texas. Many have claimed that the wheel has helped them through personal crises. The sacredness of the locality

and psychological healing of those believers in the ways of the Medicine Wheel can not be denied nor ignored. The testimony of the practitioners should be adequate to justification to accept the locality as a sacred site.

Disposition of the Leon River Medicine Wheel: A Case for Management and Protection

The methods and criteria used to evaluate the cultural significance of a cultural resource site were developed by laws in Congress with implementing regulations developed by Americans mostly of European ancestry and acculturation. These laws and implementing criteria have been adequately summarized in Chapter 9.0. Generally, they stipulate that significant archeological sites must be over 50 years old, or that Traditional Cultural Properties must have a history of traditional usage before they can be declared to be eligible for protection under the NRHP.

The previous archeological and geomorphic investigations have found evidence suggesting that the Leon River Medicine Wheel does not meet the normal NRHP criteria due to the purported recency of construction. But, as previously discussed, the scientific approach does not greatly solve the problem in identifying precisely when and who was responsible for building the Leon River Medicine Wheel. However, it does show that the scientific evidence of archeology and geomorphology can be interpreted to reach different conclusions than that advocated by Frederick and Quigg. Due to the lack of stratigraphic and geomorphic contextual association between the rocks over the road/fossil oyster shells and those adjacent to the quarry roadway, there is no compelling scientific reason to advocate that the entire medicine wheel is less than 50 years old. At the very least the summary of scientific investigations shows that lines of evidence can be interpreted in a variety of ways. Science has failed by its own criteria to eliminate this site from the NRHP based solely on its age.

Similarly, the exclusion of the site from the National Register as a Traditional Cultural Property may be unwarranted. The problems arise in the definition of a Traditional Cultural Property as a place associated "with cultural practices of beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (National Park Service Bulletin 38:1). Due to the nineteenth century policy in Texas of ethnic cleansing, an historical loophole exists in that there was no continuity in a community practice with this site prior to its discovery by archeologists in 1991. Nevertheless the forced removal of Indians from Texas caused untold disruptions to cultural practices and beliefs, and the potential loss of many sacred sites (cf. Kenmotsu et al. 1994). In reconciling apparent conflicts between documentary data and testimony of contemporary consultants on traditional cultural properties, the guidelines stipulate that the interests of the contemporary sources should be carefully considered. It is important to be sensitive to the cultural values involved and avoid ethnocentric biases. In particular, although properties owned by a religious institution or used for religious purposes require additional justification for National Register inclusion to avoid any appearance of judgement by government about the merits of any religion or belief, it is also necessary to be careful not to allow similar judgements to serve as a basis for determining the property to be ineligible.

The suggestion that the antiquity of the Leon River Medicine Wheel has no relevance to it being a sacred site, denies the extra layer of protection and status offered to locations listed by the NRHP. The National Register status certainly carries more weight in the eyes of the Army Commanders at Fort Hood than those archeological sites which are not so listed. Furthermore, the point suggesting that exclusion of the Leon River Medicine Wheel site from the National Register may be more desirable, since the location of the

property may be published, is also not valid. The locations of most National Register archeological sites are excluded from publication for concerns over their protection. Thus, there is no compelling reason why the site should not be listed. The specific criteria which could make the Leon River Medicine Wheel potentially eligible for inclusion to the National Register are criterion (a); associated with events that have made a significant contribution to the broad patterns of our history, and criterion (c)(1); embodiment of the distinctive characteristic of a type, period, or method of construction. In regards to specific sites which have achieved significance within the past 50 years, such sites generally:

...are not eligible for inclusion to the Register, unless sufficient historical perspective exists to determine that the property is exceptionally important and will continue to retain that distinction in the future....A significance ascribed to a property only in the last 50 years cannot be considered traditional....(however), the fact that a property may have gone unused for a lengthy period of time, with use only beginning again only recently, does not make the property ineligible for the Register. (National Register Bulletin 38:15-16).

The argument raised that the Leon River Medicine Wheel can be effectively protected under the existing MOU between the U.S. Army, AIREC, and the Comanche Nation provides little comfort to an ethnic group accustomed to witnessing treaties formulated and broken at the convenience of the Government. Laws can be changed at the whims of the controlling political party over the protests of any minority ethnic group. The protection of the Leon River Medicine Wheel is of great importance to the Native American community who have become religiously reconnected through the medicine wheel with their past, have seen and felt the benefits of retaining an identify through traditional practices.

Thus the laws of the land, developed by the dominant political power mandate the use of scientific investigations of cultural resource sites (even if such sites have religious significance) to delineate protection. Unfortunately, most archeologists, through no fault of their own, are culturally ill equipped to recognized the traditional criteria which make a religious sites holy. And scientific investigations are poorly equipped and to deal with the notion of significant properties when it comes to religious sites worthy of protection. Individuals involved with the National Register process (including archeologists, lead federal agency administers, State Historic Preservation Officers, and Keepers of the Register) should ask themselves whether the process they follow is in the best interests of important Native American Traditional Sites, or is it an ethnocentric way for the dominant society to denying a minority group protection of their rights for expressing traditional religious freedoms. Full protection of this site by placement on the National Register is fully justified by the scientific information contain in this report.

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EPILOGUE

Indians and Anthropologists and the Politics of Identity

Steve Russell

I am an Elder of the Leon River Medicine Wheel, and I write for my *yonega* (white) sisters and brothers. My Registry Number with the Cherokee Nation of Oklahoma is CO143499. I am without a clan identity to tell you because my male relatives married outside the tribe. I was born Teehee, a name that spans the history of the Cherokees from rolls taken before the Trail of Tears to the current Tahlequah telephone directory. Although my father was enrolled, the only time enrolling me ever arose was when it became apparent that I would not make it in your schools. I was threatened with Indian boarding school, but my relatives could not do that to me.

When, as an adult, I needed enrollment to be a full voting member of several organizations, it was easy because my family history was known. I had to submit to the Bureau of Indian Affairs certified copies of birth certificates showing a direct descent from a person on the Dawes Rolls. My great-great-grandmother and grandfather, as well as my great-grandfather--as Euro-Americans reckon kinship--appear on the Dawes Rolls.

The Dawes Rolls were taken when the United States *abrogated* its treaties with the Cherokee Nation and destroyed the reservation. Because I have a law degree, I can tell you that *abrogated* is a technical legal term designed to make lies and other dishonorable conduct sound benign. But I digress. The point here *en passant* is that descendants of Cherokees who stood on their treaty rights and refused to enroll, to break off a piece of the reservation that belonged to everybody, would not today be recognized by the United States as Indian.

The American Indian Resource and Education Coalition, trustee of the Leon River Medicine Wheel and the Comanche National Indian Cemetery, requires in its bylaws that a majority of its board be enrolled members of federally recognized tribes. Let me tell you about some of the Elders of the Leon River Medicine Wheel who do not meet that standard of Indian-ness.

One of the Elders has a grandfather who was full-blooded Lakota. After the murder of Crazy Horse and the extinction of the bison, this man absconded from the reservation and did the unthinkable: he separated from this tribe, all the way down the Great Plains to Mexico. He and his Mexican-Indian bride re-entered the country stolen from his people as illegal aliens, and he passed on bits of Lakota language and lore to his descendants. But this Elder, one-quarter Lakota and more than that Indian, will never be recognized as such by the United States. Any anthropologist will tell you that there are no Lakotas in Mexico.

Another Elder, according to his family oral history, was descended from Coahuiltecas and Senacas. He cannot be recognized by the government because any anthropologist can tell you that the Coahuiltecas are extinct and there are no Senacas in Texas, where his family has lived for generations. Recently, this Elder has been working with a scholar who is translating the baptismal and marriage records at the Spanish missions. And there, in Spanish, handwritten in the eighteenth century, is his Seneca ancestor.

All converts were recorded by tribe, but perhaps the priest made a mistake with that entry, not having an anthropologist around to tell him that the Senacas are in New York.

And while we are on the subject of Yankees, Table 3.1 of this report notes Louis Axeman as one of the rebuilders of the medicine wheel in the capacity of "assistant to Steve Russell." Lou is a Roman Catholic Hungarian from Michigan. We have been close friends since we were both warriors for the United States in the years 1964 to 1968. Several years ago, Lou lost his wife to cancer. As part of his healing process, he spent some time with my family in Texas.

On the fourth day of the month of the rebuilding ceremony, I lost my wife of 12 years, who had been my good friend for 25 years, to a sudden stroke. When Lou found out about my situation, he was on a plane to Texas the next day. I was brain dead. If I had tried to go the medicine wheel alone, I would have been lucky to remember where I was going before I wound up in Oklahoma City. Lou was more than my assistant, he was my keeper, and I needed one.

When the medicine men saw my hair, they knew I was in mourning, but I was allowed to participate in the rebuilding ceremony. So was Lou. I was surprised that he did because he is the kind of Catholic who finds a place to attend Mass at least once a week. He said that he believes all of our prayers go to the same place. While he had never seen or heard of a medicine wheel, he has vast experience of churches, and he believes the medicine wheel to be a sacred place.

Without asking the reader to believe anything I believe, and without boring the unbeliever with proof, I will say that I had a substantial healing of the spirit when the wheel was rebuilt, a healing I needed desperately. I'm sure an anthropologist would attribute the signs I was given to hysteria, and I cannot deny that I was hysterical, but no one who saw me before and after would deny that I was better. And is this not the same comfort Euro-Americans get from *their* church? Of course, any anthropologist can tell you that medicine wheels are Plains Indian artifacts and Cherokees are not Plains Indians.

We assume that the feature examined in this report is a medicine wheel. The Traditional Elders of the Plains tribes tell us that it is. For those who worship there, the wheel's power is apparent. There are only three viable theories of its creation, involving Native Americans, God, or space aliens. No one has suggested why Euro-Americans would create such an artifact.

Since God and space aliens are marginally less credible than Native Americans in the archeological branch of anthropology, the working hypothesis has been and remains that the Leon River Medicine Wheel was created by Native Americans. To us, it does not matter when the wheel was created. We do not understand why it matters to the United States--after all, there must have been a time when the Notre Dame Cathedral was only a week old--but the age of the wheel does matter for the purpose of its inclusion on the National Register of Historic Places.

The data show what they show, but there remains no credible scenario to explain all of the data. As Jack Jackson points out in his Foreword, the scenario of a group of Native American GIs stomping through the brush to line up rocks sometime in the forties makes little sense, especially when the Traditional Elders tell us that a space would be cleared before building a medicine wheel. The part of the wheel on top of a recent road could be evidence of an attempt at restoration that makes at least as much sense as the recent origin scenario.

Questions remain, and they will remain. Why was the area of the wheel not cultivated when it was surrounded by cultivation? Why is it so big, if it was built on the sneak by Indian GIs or Indian trespassers on an Army post? Do the stones missing from one side of the wheel line some farmer's well? Does the slight flattening on one side indicate an attempt at restoration?

Any competent lawyer can tell you what happens when this much ambiguity is shown: the party with the burden of proof loses. The archeologist, donning the false mask of objectivity, assumes no meaning in the absence of physical evidence. If Wrigley Stadium is without explanation, the burden of proof is on those who hypothesize baseball. So the Indians, unable to bear the burden of proving the antiquity of their sacred place, are reduced once more to reliance upon the good intentions of the United States. Those familiar with our experience of the good intentions of the United States will understand our fear.

Even to assert an Indian identity is to assume a burden of proof that some Indians can meet and other Indians cannot. To bury our dead from the boxes in the back rooms of your museums requires that we assume a burden of proof that the Comanches can meet but the Karankawas cannot. To protect our sacred ground under your laws, we must prove what cannot be proven even though no alternative hypothesis explains the data any better. So, if the time comes when the United States finds it expedient to scrape away the Leon River Medicine Wheel, the Elders of the Wheel--virtually all of whom are honorably discharged veterans--will stand without law and without science and remember the words of our Traditional Elders caught in similar circumstances: *It is a good day to die!*

