

# The 2006 Archaeological Field Season at Bighorn Canyon National Recreation Area:

## Integrating GIS, GPS, Remote Sensing, and Excavation

Shelley Bloch<sup>1</sup>, Jake Gee<sup>1</sup>, Laura L. Scheiber<sup>1</sup>, Judson B. Finley<sup>2</sup>, David P. Maki<sup>3</sup>

<sup>1</sup>Department of Anthropology and William R. Adams Zooarchaeology Laboratory, Indiana University; <sup>2</sup>Washington State University and Northwest College; <sup>3</sup>Archaeo-Physics, LLC  
64th Annual Plains Anthropological Conference, Topeka, Kansas, 2006

### Introduction

In 2006, archaeologists from Indiana University and Northwest College initiated a joint research program to document acknowledged but unrecorded stone circle sites at Bighorn Canyon National Recreation Area (BICA). Bighorn Canyon is located on the Pryor mountain range in southern Montana and northern Wyoming. BICA is surrounded by the Crow Indian reservation to the North and East. BICA is an important research area to be studied, because it documents a heavily used semi-nomadic, precontact era. Our methodology employed detailed mapping using total station and GPS surveying equipment, geophysical survey for remote sensing of subsurface features and archaeological deposits, and limited test excavations.



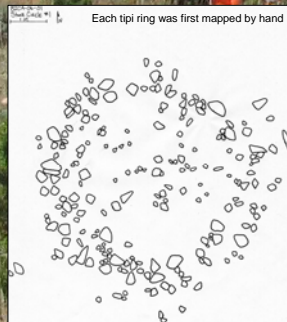
Using the GPS technology to map each rock

### GPS and GIS technologies:

Teams employed survey-grade Thales Promark3 GPS receivers to achieve sub-centimeter accurate mapping of each individual rock of tipi rings at four sites. PDA personalized data computers were used to record individual data on each rock – including the length, width, and height of each rock, long axis orientation, and rock material – as well as information pertaining to each ring. Coordinate UTM data and attribute data were merged in ArcGIS (geographic information system). These data will provide information about temporal change, economic organization, mobility and subsistence strategies, social organization and family relationships, and season and length of occupation.



Using EDM to map each rock



### Stone Circles:

Stone circles are one of the few types of prehistoric architecture that survive on the Northwestern Plains. They represent on-the-ground remnants of family organization, camp activities, and domestic life. Data were recorded on each ring, including maximum inner diameter, minimum inner diameter, long axis orientation, short axis orientation, number of rocks, doorway orientation, doorway width, and distance to the next ring. These data provided information about temporal change, economic organization, mobility and subsistence strategies, social organization and family organization, and season and length of occupation

### Test Excavations:

The third stage of the field season involved sample excavations of selected features to test the results of geophysical surveys. Excavations were necessary to establish occupational chronologies for individual features and to effectively describe daily activities that occurred at these sites. Radiocarbon samples collected from hearths found through geophysical testing will be submitted for analysis. Test excavation began with marking off a one meter by one meter three unit grid. Students excavated 15 centimeters down in each unit, sifting through the excavated soil as they went to find small items that were not recorded in situ. After excavation had finished, the units were filled in with the excavated dirt.



Excavation of the first level of each unit



Excavation of the last level of each unit



Using a 1/8 screen to find small artifacts and charcoal

### Future Plans:

Based on the accomplishments of our 2006 fieldwork and the immediate needs of the National Park Service requiring a condition assessment of all archaeological sites recorded prior to 1990, we are planning a three-year program to continue the Bighorn Canyon stone circle study. In the future we propose to develop a Microsoft Access catalog archiving multiple levels of spatial, architectural, and artifact data which will then be integrated as layers in the park's GIS database that will, in essence, populate a cyber landscape with prehistoric domestic data.

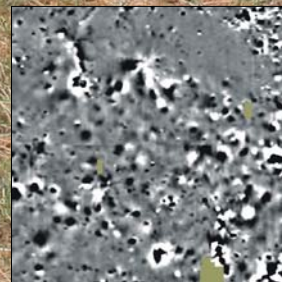


### Geophysical Survey:

Geophysical survey using a gradiometer is a highly effective, low-cost technique that was employed to determine the integrity and extent of archeological deposits by showing possible subsurface anomalies related to thermal changes in soil caused by hearths, pits, and stone circles.



Results of Geophysical survey. Black indicates heat alteration, magnetic signatures, geomorphic anomalies.



Geophysical survey results

### Acknowledgements:

The authors of this paper would like to thank Bighorn Canyon National Recreation Area, the National Park Service, the Department of Anthropology at Indiana University, Northwest College Office of Extended Campus, Chris Finley, and BICA staff and crew. Funding was provided by the Western National Parks Association and Indiana University Office of the Vice President for Research.