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A Landscape Approach to Bighorn Sheep Rock Art in the Dolores River Valley

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Abstract: *This paper attempts to analyze the location of bighorn sheep rock art in the Dolores River Valley in relation to projected areas of bighorn sheep habitat. A landscape approach is applied in order to gain a better understanding of the reasons behind the placement of bighorn rock art presently found on the current landscape. Twenty six rock art sites recorded by Gay Ives in the Dolores River Valley of Southwestern Colorado will be analyzed in the current study. Eleven bighorn sheep elements were identified by Ives at four separate rock art sites. Geographic Information Systems (GIS) is employed to conduct a spatial analysis of the placement of bighorn rock art sites in relation to certain aspects of the landscape. More specifically the Dolores rock art sites are examined in relation to projected areas of bighorn habitat defined as southerly facing slopes at distances greater than 400 meters from habitation sites during the Anasazi occupation period. Possible relations between bighorn rock art sites and the projected bighorn habitat are addressed to gain a better understanding of the reasons for the placement of bighorn representations on the landscape.*

Background

Rock art is commonly found throughout the world in most types of environments. Variability in the placement of rock art ranges from cliff faces, boulders, rock shelters, and the interior of stone structures (Hartley 1992). Rock art is usually categorized into two groups. Markings pecked, scratched, or abraded on the rock surface are termed "petroglyphs.", while those that are painted using a brush or fingers are termed "pictographs."

Most archaeologists' interests in rock art have focused on the age, cultural affiliation, possible functions, and motivations for rock art creation (Hartley 1992). Problems associated with these interpretations stem from inaccurate methods for dating of rock art sites. Dating methods such as assessing lichen growth and patination on the rock surface, dating of the artifacts or structural remains found in close

proximity, comparison of rock art designs to those on pottery or clay pipes or on the walls of structures, and the presence of diagnostic elements such as the bow and arrow or horses in rock art depictions are commonly used. However, assuming contemporaneity based on these dating methods may lead to false interpretations.

To avoid the pitfalls of assigning rock art to a specific cultural affiliation, recent research has explored associations between the distribution of certain classes of petroglyph images and the environmental setting (Hartley 1992; Hartley & Wolley Vawser 2002, 2003; Potter 2004). This includes distance to water sources, elevation, location/distribution of game, trails, and so on. Landscape approaches to rock art research have focused on "examining the connections among the choice of imagery and the location of images on the landscape, the intended audience of the images, their accessibility (physically and intellectually), their temporality, and their integration into the wider pattern of settlement and land use" (Potter 2004). Potter suggests the existence of metaphorical hunting landscapes where gendered depictions of hunting and animals enforced the development of the male persona. Rock art depictions in effect inscribe symbols on the landscape and create culturally meaningful places through manipulation of the surrounding natural environment (Potter 2004).

This paper examines a simplified version of Potter's idea as applied to rock art sites with bighorn sheep elements in the Dolores River Valley. More specifically Geographic Information Systems (GIS) is utilized to analyze the landscape context of the Dolores River Valley rock art sites in relation to projected areas of bighorn habitat: southerly facing slopes at distances greater than 400 meters from habitation sites during the Anasazi occupation period. Possible relations between bighorn rock art sites and the projected bighorn habitat are addressed to gain a better understanding of the reasons for the placement of bighorn representations on the landscape in the Dolores River Valley.

The Dolores Study Area

The Dolores Archaeological Program (DAP) was conducted in preparation for the construction of the McPhee Reservoir near present day Dolores Colorado, which resulted in the inundation of the most of the program area. The DAP, lasted for nearly ten years (1978-1985) and resulted in the recording of over 1600 archaeological sites (Robinson et al. 1986) Gay Ives recorded 26 rock art sites during the DAP which is the basis for the present study. The following sections

provide a brief description of the study area's geology, climate, vegetation and prehistory largely derived from the DAP data.

The Dolores River is located in extreme southwestern Colorado, in the Colorado Plateaus Province. The Colorado Plateaus Province is a physiographic region, drained by the Colorado River and its tributaries, which covers over 130,000 square miles in the four corners area of the southwestern United States. Colorado Plateau landforms have mainly been shaped by "stream erosion under arid and semi-arid conditions" (Harris 1980: 171).

Elevations range from 5,000 feet in the lower canyon regions to more than 11,000 feet in sections of the high plateau. Southwestern Colorado generally has a semi-arid climate which has shaped the variety of plants and animals in the region as well as the adaptations they have developed to cope with the unpredictable environment The Dolores area receives an average of 12 inches of precipitation a year. Average temperatures range in July from 83-50° F and in January 40-1° F (Keen 1996). The main habitat types defined in the area by the DAP include; Ponderosa pine habitat, Douglas-fir habitat, Riparian transition zone, Mountain Scrub, Sagebrush (Neusius 1985). The DAP Formal Series, a chronological framework specific to the project area, was developed to reflect the areas local cultural variation. The following 5 traditions are defined: Paleoindian Tradition (prior to 5000 BC), Archaic or Desert Tradition (5000 BC—AD 500), Anasazi Tradition (AD 1-1200), The Shoshonean Tradition (AD 1500-1800), Protohistoric Tradition (AD 1775-1870) (Orcutt 1986).

Bighorn Sheep

In North America, mountain sheep are found from Alaska through Canada and in the western United States to Northwestern Mexico and Baja California. It is estimated that 500,000 Bighorns would have inhabited the North American continent during "pristine" times (Valdez & Krausman 1999). Modern studies of Bighorns provide the best insights into prehistoric habitat characteristics. Three main factors influencing bighorn habitat will be discussed for the purposes of this study: availability of steep rocky escape terrain, seasonal cycles of movement between habitat ranges, and human disturbance.

Bighorn sheep show preference for rocky, steep, terrain and open grasslands with high visibility. Specifically well adapted to leaping and climbing, the bighorn uses rocky escape terrain to avoid predation. Bighorn sheep remain close to rocky escape terrain at all times. One recent study estimated that 99% of bighorn sheep activity

occurs within 300 m of rocky escape terrain concluding that availability of escape terrain was of more importance than available forage, and visibility (Matheny et al. 1997).

Seasonal climate change is the second factor influencing Bighorn sheep habitat. DAP data indicated that bighorns would have typically occupied the study area during winter months when the sheep usually move to lower elevations as areas with more than 30 cm of snow cover are typically avoided (Neusius 1985). During winter, bighorns are typically found on steep Southern, Southwestern, or Southeastern facing slopes (Shackelton et al. 1999). Increased solar radiation on these slopes reduces snow cover and increases forage availability.

The first bighorn bones appear in the archaeological record 7,000 to 8,000 years ago at the Ventana Cave site in southern Arizona (Grant 1980). Other evidence of bighorn interaction with humans in the past includes archaeological evidence from caves, rock shelters, ruins, rock art depictions of bighorn sheep, and ethnographical information. Bighorns were commonly procured for food; however, other parts of the sheep such as the horns and hide were also used to make clothing and weapons. Mountain sheep skins were used for making robes, shirts, dresses, skirts, and mittens among the Northern Paiute and Northern Shoshone. Ute tribes also used the bighorn skins for leggings and other clothing and made bows and out of sheep horns, as well as other tools (Matheny et al. 1997). Bighorn sheep also appear to have been important in the ceremonial life of many prehistoric peoples.

Within the Dolores River Valley, bighorn sheep remains have been identified in archaeological deposits recorded during the DAP, indicating exploitation by the local Anasazi population (Neusius 1986). DAP data indicates that while the Anasazi were horticulturalists, game and wild plant foods also constituted a portion of the overall resource mix (Petersen 1986). Ethnographical accounts of bighorn sheep hunting offer the most insight into how they would have been hunted prehistorically. Ute, Southern Paiute, Northern Paiute, and Western Shoshone tribes have recorded accounts of bighorn hunting. During the late 1800s and early 1900s, Paiute informants gave detailed descriptions of traditional hunting methods through more recent changes with the introduction of horses and rifles. Traditional methods mentioned by these groups included hunting blinds, surrounding sheep, pitfalls, ambushes on trails near salt licks or water holes, driving sheep into enclosures, guiding sheep using dogs or fire, and running sheep past hidden hunters (Grant 1980). Hunting blinds were usually constructed in rocky escape terrain. Hunters would lie in wait as the

rest of the hunting party drove the sheep past the hiding spot so that they could be shot. Petroglyphs are often found in association with these hunting blinds. The use of corrals was also a common communal hunting method. Large high walled corrals would be constructed near known bighorn sheep trails. Large groups of people were needed to perform this act, and often dummy hunters were made out of stone to prevent sheep from escaping as they were driven into the corral (Grant 1980).

Hunting disguises were also employed by certain groups. Head-dresses made of the head and horns of bighorn sheep were used, as well as the entire skin among some groups. One head-dress found in Canyonlands National Park, Utah, has been attributed to the Anasazi. The headdress had been altered, the horns were cut in half, to reduce its weight and they had been sewn to the skull. Olivella shells were also attached to the skull using sinew. Its elaborate preparation suggests that it was used for ceremonial purposes rather than as a hunting disguise (Matheny et al. 1997).

Bighorn depictions are the most abundant rock art designs in the Western United States (Grant 1980). Grant believes that the difficultly in hunting this animal accounts for this phenomenon. Knowledge of bighorn sheep ethology and ecology would have also been important factors for a successful hunt. For example, bighorns are very skittish and disturbance from human activity is not tolerated. Studies of modern bighorn behavior indicate "rigid and ritualized" behavioral patterns which translate to the fact that they do not adjust well to disruptions. Bighorns are known to abandon areas when human activity increases. A study of bighorn behavior at a ski resort in San Bernardino National Forest, California indicated that bighorns reduce habitat areas to those that are out of sight of human activities. The flight reaction of bighorns to the presence of humans usually occurs at an average distance of 440 meters (Krausmann et al. 1999).

Dolores Bighorn Rock Art

The DAP report on the 26 rock art sites in the Dolores area was prepared by Gay Ives (Ives 1986). A total of 78 pictographs and 1779 petroglyphs were identified. General attribute categories were assigned to analyze the rock art data. These included anthropomorphic, zoomorphic, geometric, curvilinear, and complex. Subcategories called elements were then utilized to break down the attribute categories. Bighorn sheep rock art elements are identified at 4 sites in Ives' study: 5MT7491, 5MT4549, 5MT4728, 5MT2216 (Figs. 1-4). After artiodactyls tracks, bighorn sheep and paw tracks are the most common

zoomorphic petroglyph elements. A total of eleven complete and one partial bighorn rock art elements were recorded. Seven of these elements occur at one site, 5MT4549 (Ives 1986).

For the current study, the location of bighorn sheep rock art will be assessed in relation to habitation sites during the Anasazi occupation and steep, southern facing slopes, which would have been preferred by bighorn during winter. These factors were chosen based on the preference of bighorn for steep rocky terrain, which is the most important component in bighorn habitat choice and the known avoidance of human activity. Also bighorns place a greater importance on the availability of steep rocky terrain and would have spent the greatest portion of time near these areas, regardless of the distribution of quality forage areas.

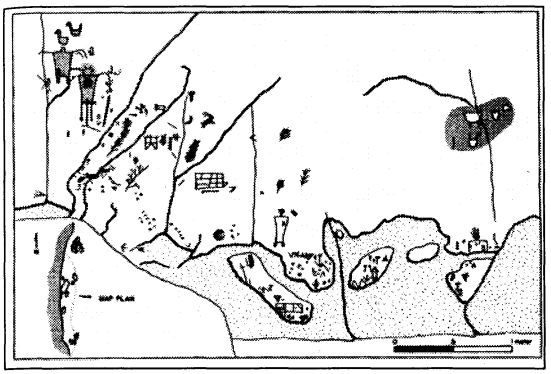

Figure 1. Site 7491

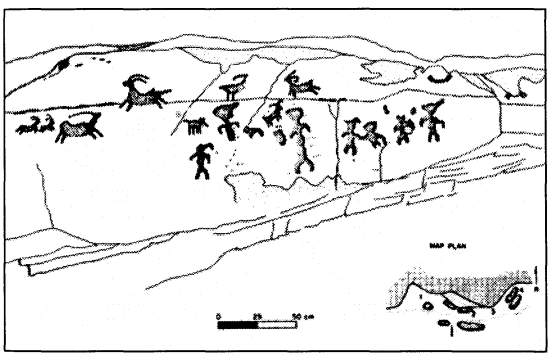

Figure 2. Site 4549

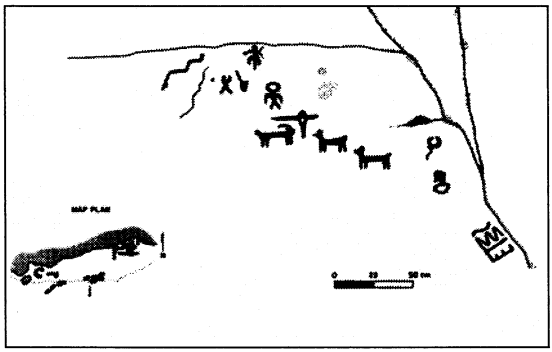

Figure 3. Site 4728

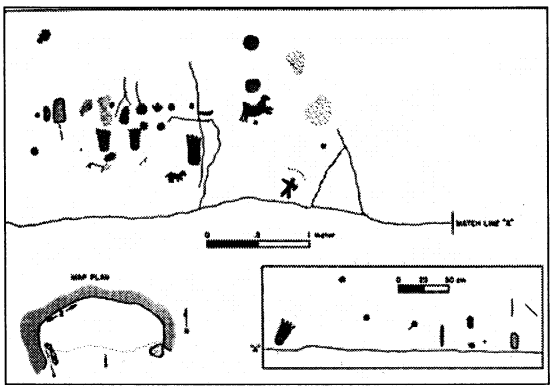

Figure 4. Site 2216 (Panel 2)

Methods and Materials

Using Geographic Information Systems (GIS), the slope, aspect, and distance from habitat sites in the study area was calculated to determine if bighorn sheep rock art sites are located at least 400 meters from known habitation sites during the Anasazi occupation, on steep southern facing slopes. ArcGIS 8.3 was used for the manipulation and analysis. The 26 rock art site locations from the Ives study were obtained from the San Juan National Forest. These locations were then compared to a Digital Elevation Model (DEM) for the study area obtained from the USGS seamless data distribution website. Unfortunately this DEM does not show the pre-reservoir topography,

and the areas below the fill line are not visible. The ArcGIS Spatial Analyst tool was used to determine the percentages of slope and aspects of the study area. The raster calculator was used to select areas with a steep slope that also were facing in a southern direction. Steep slopes were defined as a percentage slope greater than 51%. Slopes facing South, Southeast, and Southwest were also included in the calculation.

Results

Rock art with bighorn sheep elements at sites 5MT2216, 5MT4728, and 5MT4549 are located on steep southern facing slopes, 5MT7491 is located on a steep northern slope. Figure 5 shows the location of all 26 rock art sites in comparison to the steep southern facing slopes in the study area. Areas below the fill line of the reservoir were not included in this analysis, thus several of the rock art sites now located underwater were not able to be assessed in this analysis. However, information provided by Ives indicated that 69% (18/26) of the rock art sites in the study area had southern, southeastern, or southwestern aspects (Ives 1986).

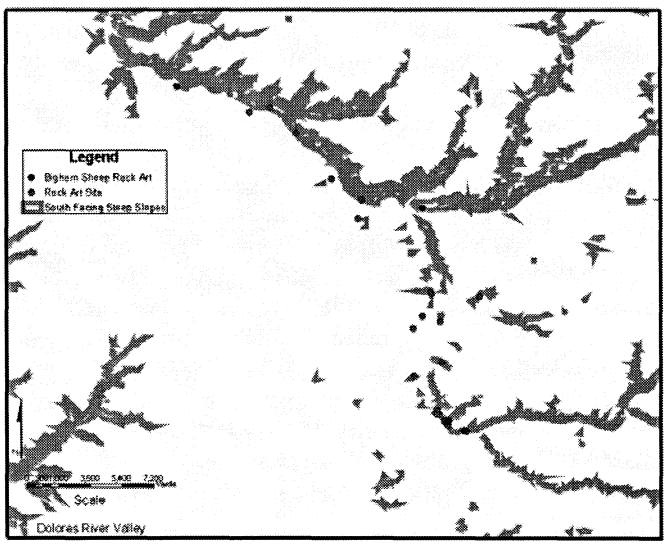

Figure 5. Bighorn Rock Art Sites in Relation to Steep, Southern Slopes.

The distance of rock art sites from hamlet and village sites was calculated using the ArcGIS distance measurement tool. As defined by the DAP, habitation sites were continuously occupied or were occupied for most of the year and substantial architectural remains such as rooms and pit structures were found at these sites. Small hamlets are characterized by one to three households, large hamlets three to seven households, and villages eight or more households (Kane 1986). Buffer rings were set up around each hamlet and village site in intervals of 100 m to assess which rock art sites were at least 400 m from habitation sites. The average distance of all rock art sites in the study area from hamlets sites is 2100 m. The average distance of bighorn rock art sites in the study area from hamlet sites is 3664 m. The average distance of all rock art sites in the study area from village sites is 3572 m. The average distance of bighorn rock art sites in the study area from village sites is 5557 m (Fig. 6). Thus bighorn sites appear to be located on average greater distances from both the hamlets (1564 m) and village sites (1985 m) than the other rock art sites in the study area.

The Anasazi occupied the study area from AD 600-950. While mainly horticulturalists growing corn, beans, and squash, a variety of wild plant and animal resources were exploited by the Anasazi in the Dolores River Valley. The increasing human populations caused intensification of food production and land clearing, drastically altering the Dolores River Valley environment. As populations increased in the valley, permanent habitation sites developed with high levels of human activity year round. It is likely that increased populations and higher levels of human activity in the valley would have had negative effects on the bighorn sheep habitat. Consequently, the hunting of bighorns possibly became extremely difficult during this time as bighorn habitat was reduced. The prevalence of bighorn rock art might reflect the reduction of bighorns in the area if as Grant hypothesizes bighorn rock art is due to the difficulty in hunting this animal.

Bighorn rock art appears to be located in the areas where drainages meet, as are a majority of sites in the canyon. Ives (1986) hypothesizes that if "these rock art sites are at locations related to resource use, this may reflect the economic importance of areas where drainages meet. It is possible that these areas are transition zones between the main valley area where most activity was occurring and more secluded animal habitat areas in the smaller tributary canyons.

The results of the current study indicate that bighorn rock art is located at a greater average distance from both hamlet and village sites than the other rock art in the area. Most of the rock art in the study area, including three out of four bighorn rock art sites, is also

located on southern facing canyon walls. Differential preservation could account for this observation or a preference for southern facing slopes could be possible. Possibly due the direction of the river, more southern facing slopes are available in the study area, creating a skewed interpretation as well. Southern facing slopes would have had less snow cover during winter and more vegetation due to higher levels of solar radiation, possibly making these areas more attractive locations for rock art creation, hunting, or gathering especially at distances greater than 400 m from habitation sites. Perhaps, then, economic productivity of certain areas is reflected in the location and abundance of rock art.

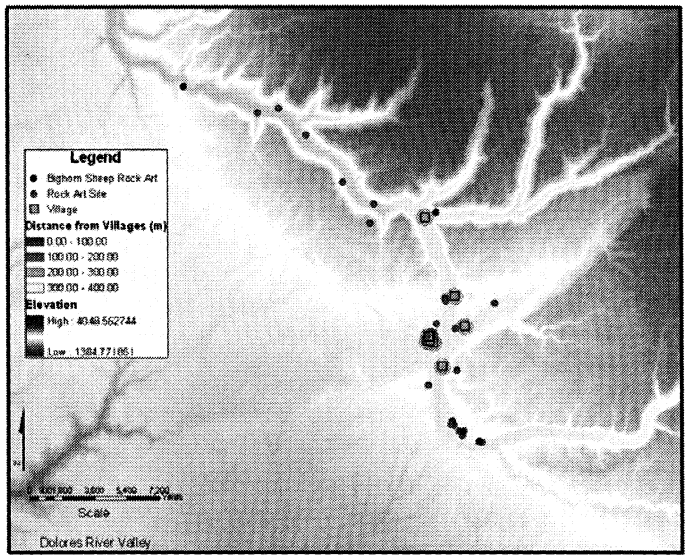

Figure 6. Bighorn rock art in relation to village locations.

Conclusion

This paper was an attempt to analyze spatial relationships between bighorn rock art sites and projected bighorn habitat. A landscape approach was applied to gain a better understanding of the reasons behind the placement of bighorn depictions on the landscape where they are found today. Geographic Information Systems was used to spatially analyze the landscape context of bighorn rock art sites in the Dolores River Valley. Bighorn rock art sites were more

specifically examined in relation to two main factors in bighorn sheep habitat: steep southerly facing slopes and distance from habitation sites.

Results indicated that most rock art sites in the Dolores River Valley were located on steep southerly facing slopes and that bighorn sites appear to be located on average greater distances from habitation sites than other rock art sites. Implications of these results for the greater understanding of the placement of rock art depictions on the landscape could be that economically productive areas typically used for resource procurement or exploitation of the game resources also dictates the landscape context of rock art reflecting these areas of high productivity. The small number of sites available for analysis in the study should be taken into consideration when assessing the results presented in this paper. A larger study area with greater amounts of bighorn rock art could be analyzed in the future to see if the general results reported here apply to other areas with larger amounts of rock art. It could be possible to extend the study to the entire San Juan National Forest, for example.

Rock art is often an untapped resource by archeologists in their interpretations of past human behavior and can be limited by uncertain dating methods however, a landscape approach provides an alternative way to understand rock art placement and the reasons for its creation. Thus, archeologists are better able to interpret the role of rock art in past cultures adding another aspect to our understanding of past and present cultural systems.

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