The Dolores Archaeological Program Rock Art Study, Southwestern, Colorado

by

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Introduction

The Dolores Project is located within the canyon walls of the Dolores River valley in southwestern Colorado, north of Mesa Verde National Park (Figure 1). It is a water reclamation project currently under construction by the Bureau of Reclamation and is a part of the Colorado River Storage Project. The major project feature involves the construction of the McPhee Dam and Reservoir (a distance of 11 miles), including the Great Cut Dike and buffer lands surrounding the McPhee Reservoir, called the project takeline. Additional features of the project include a water distribution system consisting of canals, lateral lines and supportive reservoirs. The Dolores Project will provide water for irrigation and recreational use for the local inhabitants of Montezuma and Dolores Counties.

The Bureau of Reclamation contracted the University of Colorado and Washington State University (a subcontractor) to conduct one of the largest archaeological mitigation programs undertaken to date. The DAP (Dolores Archaeological Program) is presently investigating the Dolores River valley Anasazi who occupied the area between A.D. 600 and A.D. 1200.

The recording of DAP rock art sites began in 1972 with several archaeological surveys conducted by the University of Colorado, Mesa Verde Research Center under the direction of Dr. David A. Breternitz. Rock art recording continued sporatically, with little consistancy in methods and procedures, through the summer of 1982 and ended with the completion of the survey of the Dolores Project takeline.

The DAP rock art study, as reported in the DAP Survey Pool Report (Orcutt and Goulding 1983), commenced in the spring of 1982. The 1982 investigations of the prehistoric rock art sites within the canyon

fig 1

walls of the Dolores River valley and its tributaries required a substantial amount of fieldwork including written, graphic, and photographic documentation. The fieldworkserved two purposes; (1) adequate standardized data recovery for the proposed research, and (2) preservation of all rock art sites through graphic and photographic records for future research. To aid in the standardization and availability of rock art data, the DAP Field Provenience Description Forms and Feature Forms were completed for each rock art panel.

Summary of Rock Art Elements

A total of 26 rock art sites were identified within the DAP study area (Figure 2), encompassing 1,857 glyphs (1,779 petroglyphs and 78 pictographs). The nomenclature used in describing attribute and element types for this study came from previous rock art studies such as Heizer and Baumhoff 1962, Grant 1978, Toll 1975 and Turner 1963. Local variations of each category were broadened and refined by the author for the Dolores Project. A representative sample of petroglyph attribute types with total counts are presented in Figures 3 through 6. The pictographs are red, white and black and consist of a probable mineral base pigment. Table 1 is a breakdown of attribute and element type with total counts for all petroglyphs and pictographs in the study area. Also included in the table are diagnostic features relating to the study; these are abraiding grooves, post-hole sockets and cupules (2-4 cm in diameter).

Abraiding grooves are defined as grooves in bedrock or boulders that result from tool sharpening. These grooves may vary in form as different tools, such as axes, awls, etc, were sharpened. A total of 186 abraiding grooves were identified in the study area. These grooves often occurred in conjunction with petroglyphs, but not with pictographs, unless

fig 2

fig 3

fig 4

fig 5

fig 6

Table 1 Attribute and element type with total counts for petroglyphs and pictographs

Attribute	Petroglyphs	Pictographs		
		Red	White	Black
Anthropomorphic:				
Stick	30	1	4	
Triangular	11			
Rectangular	4			
Blobular	27		2	
Kokopelli	1			
Anthro/zoo combination	2			
Body parts	2			
Hand prints:				
Positive left	1	3	1	
Positive right	2	3	2	
Negative left		1		
Negative right			1	
Foot prints:				
With toes left	1			
With toes right	2			
Without toes left	6			
Without toes right	6			
Total anthropomorphic	95	8	10	0
Geometric:				
Straight line:				
Isolated thick	63			
Isolated thin	508		1	14
Clusters of 2 or more	108			
Zig-zag	13	1		
Cross	30			1
Asterisk	8			
Fringed line	26			1
Ladder-like	24			2
L's	20			
V's	52			
Pronged forked V's	77			1
Y's	49			
Turkey tracks	66			
Consecutive tracks	22			
Complex	45			
Box	7			
Total geometric	1118	1	1	19
Curvilinear:				
Wavy	6		2	2
Spiral:				
Clockwise	1			
Counter clockwise	1			

Table 1 Attribute and element type with total counts for petroglyphs and pictographs--continued

Attribute	Petroglyphs	Pictographs		
		Red	White	Black
Curvilinear: (continued)				
Dots:				
Single (isolated)	70			1
Cluster	3			
Random	4			
Patterned	9			
Rows of 2 or more	68			
Circles:				
Single (isolated)	3			
Attached	13			
Nonattached	2			
Concentric	1			
Curve	43			3
Complex	16		1	
Total curvilinear	240	0	3	6
Zoomorphic:				
Bighorn sheep	12			
Deer	4			
Canid	8			
Quadruped	11			
Frog	2			
Serpent-like	1			
Insect-like	1			
Tracks:				
Paws	12			
Artiodactyl	39			
Other	1			
Total zoomorphic	91	0	0	0
Complex:				
Dot/straight line	35			
Curve/straight	22		2	23
Dot/curve/straight	1			
Total complex	58	0	2	23
Posthole socket:				
Decorated	2			
Abraiding grooves:				
Decorated wide	29			
Decorated thin	41			
Cupules:				
(2-4 cm in diameter)	104			
Unidentifiable:	1	6		

petroglyphs also occurred In many cases these abraiding grooves form designs in association with petroglyph elements A total of 70 decorated abraidng grooves were identified.

In several rock shelters, post-hole sockets were recorded indicating a possible habitation. Two decorated sockets were observed in association with petroglyph elements.

Cupules were observed throughout the study area and were found with most petroglyph panals These small holes are approximately 2-4 cm in diameter. The function of these glyphs is not known. Further investigation in this matter is warrented.

The Association of Rock Art to Environmental Variables

It is proposed in this study that trends in rock art may reflect economic exploitations such as land use (agriculture intensification) and availability of natural resources (water and geology). Rock art is a probable link to a hunting and gathering adaptation, as agriculture increases in importance in the economy, then the importance of rock art decreases. This should be reflected in the archaeological record through less use of rock art sites One can measure this by the diversity index. Less diversity equals less use of rock art. Rock art should be linked to a land use strategy for hunting and gathering. These sites should be located near important resource areas or routes to these resources. This may reflect the use of drainages for access into the Dolores River valley where farming activities occurred and access to the uplands for hunting activities. A discussion on the association of rock art sites with environmental variables follows.

The rock art sites were located in conjunction with five geologic formations and were found in rock shelters, on boulders and on sandstone

rock faces. One site was recorded in the Dakota Formation, 14 in the Burro Canyon Formation, 3 in the Morrison Formation, 5 in the Junction Creek Formation, and 3 in the Summerville Formation.

The landform and surficial geology showed little diversity in the location of rock art sites. The general landform of all sites was the canyon walls of the Dolores River valley or the tributaries which flow into the valley. In three cases, rock art sites were found on terraces, 20-25 m above the Dolores River. All sites, with the exception of one, were located on sandstone and shale colluvium; the other was located on sandstone colluvium.

The elevation of rock art sites varied throughout the study area, however, the sites are clustered in three separate areas; these are: 2060-2080 m (6759-6824 ft), 2103 m (6900 ft) and the majority of the sites are clustered in the vicinity of 2120-2140 m (6955-7021 ft) elevation.

One environmental variable is the locational diversity in terms of distance of rock art sites to the mouth of canyons. It appears that the majority of the sites are within 250 m of the mouth of canyons which flow into the Dolores River. This is a significant factor in the location of rock art sites within the project area.

Water appears to be an important environmental variable. All of the sites are located near a water source, whether it be permanent or intermittant. Distance to three types of water sources, permanent, nearest water and "other" water source were measured in meters. In the project area, permanent water sources include the Dolores River, the western portion of House Creek and Beaver Creek. Nearest water refers to the closest intermittant or permanent source to the site. The third measurement of water is "other" water source, which is any drainage other

than the aforementioned catagories. The results show that the majority of the sites (96%) fall within 450 m or less of the Dolores River, House Creek and Beaver Creek which are permanent, 2060-2110 m (6759-6929 ft) elevation. A large portion of the sites (69%) are within 200 m of intermittant drainages such as Ferris, Salter, and May Canyon and several unnamed drainages, 2100-2120 m (6890-6955 ft) elevation. The "other" water source catagory does not show any clustering.

The vegetation within the study area encompasses a variety of plant life influenced by elevation, climate, soils and water sources. With all of these variables, predicting the prehistoric environment is a difficult task. The study utilized both the contemporary vegetation zones and vegetation zones circa 1920 to describe the vegetation of the rock art sites. The circa 1920 vegetation estimates were obtained by a historic approach, using old aerial photographs to measure change in the environment. When the contemporary zone and the vegetation circa 1920 are used, there is little change seen in plant communities. The results showed that the majority of the rock art sites (19) are located in the pinyon-juniper woodland, while 1 was located in sagebrush shrubland, 5 were in pinyon-juniper-oak woodland, and 1 was in ponderosa-oak forest.

Since the ability to define site function provides the roots from which settlement system studies can be developed (Orcutt 1982), the rock art study cannot proceed without describing the site types represented in the prehistoric settlement system of the Dolores Project. For the purpose of this study, all rock art sites were placed into four major catagories, based on the presence or absence of architectural characteristics. The four catagories are as follows: architectural features with ceramics; architectural features without ceramics, non-architectural features with

ceramics and non-architectural features without ceramics Combining the DAP systematics (Knudson et al 1981) and the rock art study typology the results revealed that 14 sites are habitations, 2 are seasonal occupations, and 10 are limited activity sites.

The DAP ceramic periods, as developed by the Additive Task Group are as follows: Period I (A.D. 600-800); Period II (A.D. 800-880); Period III (A.D. 880-950); and Period IV (A.D. 950-1300). Only 15 rock art sites out of 26 had ceramics. Based on the assemblage and quantity of ceramics found, these rock art sites were placed into date ranges (Blinman 1982). The assemblage analysis results showed that 9 sites fell in Period I, 12 in Period II, 15 in Period III, and 9 sites were placed in Period IV The majority of datable sites fall between ceramic Period II and III within the date ranges (A.D. 800-950). All sites showed an occupation around A.D. 900; several of the sites showed dual occupations. These dual occupations occur in Period I (A.D. 600-800), and Period IV (A.D. 950-1300).

The Shannon-Wiener Information measurement index and diversity in rock art attributes

Using the DAP ceramic periods as temporal catagories, a diversity index measurement, the Shannon-Wiener Information measurement (Wilson and Bossert 1971), was employed to describe change in the diversity of rock art attributes through time and within each ceramic period. This diversity index, in plain terms, measures distribution of elements among specific numbers of categories while measuring total abundance (see Wilson and Bossert 1971). After a total count of all elements within each attribute catagory was tabulated for both pictographs and petroglyphs for each ceramic period, the Shannon-Wiener diversity index measurement was applied.

The diversity measurement was applied to the rock art attributes in hopes of defining the actual variability of the attributes (wheather or not there was indeed any variability). Once the diversity index measurements were calculated, they were compared with climatic and population data. These comparisons will be discussed later.

Within the ceramic periods the measurement results are somewhat different (i.e., there are differences in the amount of diversity of attributes between the ceramic periods). The climatic reconstruction for the DAP will be examined to explain this possible variation. Petersen (1982) developed the climatic reconstruction by using killing frost days. In the study Petersen outlines the years for successful growth of corn. Orcutt (1983), using Petersen's data, ranks the ceramic periods in terms of agricultural potential. The rankings, from best to worst, are: Periods II, I, IV and III. Population size within the project area has also been ranked by ceramic periods (Orcutt 1983). The rankings, from largest to smallest are Periods II, III, I and IV. See Table 2.

Table 2. Associated DAP ceramic period data

DAP Ceramic Periods	Number of sites	Element totals	Diversity index measurement	Climate	Population size	Dates
Period I	9	582	.666	Good	Small	A.D. 600-800
Period II	12	1018	.519	Best	Largest	A.D. 800-880
Period III	15	1420	.602	Worst	Large	A.D. 880-950
Period IV	9	660	.664	Bad	Smallest	A D. 950-1300

During Period I (A.D. 600-800) the Anasazi were moving into the Dolores River valley. Climatic reconstruction indicates that favorable rain regime in the river valley may have made it more attractive during droughts in lower elevations (Petersen 1982). Within ceramic Period I (A.D. 600-800) a great amount of diversity of rock art attributes can be

seen A total of 582 elements fall within this period; the diversity index measurement is .666.

Period II (A.D. 800-850) had the highest projected population size within the DAP area and the best climatic conditions during the A.D. 800's. The occurrance of a drought period about A.D. 850 may have prohibited agriculture at some lower elevations that had been adequate up until that time, but still increased the attractiveness of the DAP area (Petersen 1982). With population growth and the best climatic conditions for the project area it is inferred that during this ceramic period less subsistance stress was present within the prehistoric population. Period II shows the least amount of diversity of rock art attributes. A total of 1,018 elements are classified in this period; the diversity index measurement is .519.

In ceramic Period III (A.D. 880-950) the population was decreasing rapidly and the climatic conditions suitable for agriculture worsened. The killing frost periods were longer and higher decadal drought indicies also occurred within this period. These factors combined, the Dolores River valley became too cold for reliable agriculture. The diversity of rock art attributes within the valley increases from Period II. The total element count is 1,420 within Period III and the diversity index measurement is .602. This increase in rock art elements is inferred to result from economic stress. If rock art was part of the Dolores Anasazi social, economic, and religious systems, in times of severe stress, diversification in rock art may represent an adaptive strategy. This is a possible explanation for the distinctive increase in the amount and diversity of rock art elements within this ceramic period.

Period IV (A.D. 950-1300) is ranked lowest in population size and the climate conditions are ranked second to worst. The same climatic

conditions perservered as in Period III, with longer periods of killing frost days and droughts. The river valley continued to be too cold for reliable agriculture, possibly a significant factor in the abandonment of the Dolores River valley during the A.D. 950's. During Period IV there is an increase in rock art attribute diversity; diversity increased over Period II and III but was less than in Period I. The diversity index measurement is .664. A total of 660 elements were placed in this period based on ceramic and architectural typology. The raw count is lower than in Period III, possibly due to the decrease in population within the river valley.

Rock art diversity is greatest with the movement of the Anasazi into the river valley during Period I. It appears that more emphasis on conformity was placed on rock art in Period II, when the population size was increasing and agriculture was at its best. In Periods III and IV, where there is a steady decrease in population, and the climatic conditions for agriculture are worsening, one sees an increase in rock art diversity.

The diversity index measurement was also applied to rock art elements by site type. The catagories used were rock art sites with architecture and without architecture. A total of 861 rock art elements were identified in architectural sites, the diversity index measurement was .532. A total of 1,006 rock art elements were identified for non-architectural sites; the index for attribute diversity increased slightly in this catagory to .617. The results show that there is more diversity of rock art attributes in non-architectural sites than in architectural sites.

The final measurement was applied to rock art sites with ceramics and sites without ceramics. All of the elements which fell into each ceramic

period were collapsed into one catagory to arrive at a total count A total of 3,680 rock art elements were identified; the diversity index measurement is .601. The rock art sites which were aceramic showed a total of 553 elements. The diversity index measurement is less than rock art sites with ceramics, .568. The diversity of rock art sites with ceramics is slightly more than sites without ceramics.

Conclusion

A total of 26 rock art sites were identified in the DAP study area. The most abundant from of rock art was petroglyphs; a total of 1,799 elements were identified. Seventy-eight pictographs consisting of three mineral base pigments, red, white, and black were recorded. These design elements can provide insight into aspects of ecological adaptations of the Dolores Anasazi.

Analysis of the association of the rock art sites with environmental variables (including geologic formation, landform, surficial geology, elevation, distance to the mouth of canyons, water and vegetation) showed little diversity.

The study expected less locational diversity in rock art as agricultural subsistence intensified and population-aggregation increased. Table 2 shows this to be true in that during ceramic Period II, when population was at its greatest and the climate was at its best, the diversity in rock art was at its lowest. The Shannon-Wiener Information measurement as well as Petersen's (1982) climatic reconstruction for the DAP and Orcutt's (1982) population study were employed to describe changes in the diversity of rock art attributes through time and within each ceramic period.

The results showed rock art diversity was greatest in Period I, decreased in Period II, and increased in Period III and Period IV.

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