

# Digital Documentation and the Archaeology of the Lower Pecos Canyonlands

Carolyn E. Boyd <sup>1,2</sup>, Francisco Marcos Marín <sup>1,3</sup>, Christopher Goodmaster <sup>4</sup>, Angel Johnson <sup>1</sup>, Amanda Castaneda <sup>1</sup>, Benjamin Dwyer <sup>1</sup>

<sup>1</sup> SHUMLA Archeological Research and Education Center, Comstock, Texas

<sup>2</sup> Department of Anthropology, Texas State University, San Marcos

<sup>3</sup> Department of Modern Languages and Literatures, University of Texas at San Antonio

<sup>4</sup> Geo-Marine, Inc. Plano, Texas

## Resumen

*Las cañadas de la parte baja del Río Pecos en el suroeste de Texas y el norte de México se abren una serie de cuevas con impresionantes pictografías que presentan algunas de las composiciones más complejas e intrincadas del mundo. Debido a sus cualidades excepcionales y a la incomparable riqueza de este legado cultural, es urgente crear un archivo visual permanente, auditivo y documental que puedan aprovechar las generaciones presentes y futuras. El proyecto Shumla's Lower Pecos Rock Art Recording and Preservation Project pretende lograr este objetivo a través de la documentación digital de los sitios con arte rupestre, de la creación de una biblioteca digital para archivar los datos relacionados con el arte rupestre y el desarrollo de un programa coherente de investigación multidisciplinaria.*

**Palabras Clave:** ARTE RUPESTRE, LOWER PECOS, 3-D LIDAR

## Abstract

*The Lower Pecos Canyonlands of southwest Texas and northern Mexico house some of the most complex and compositionally intricate prehistoric rock art in the world. Because of the unique nature and the incomparable richness of this cultural legacy, it is imperative to create a permanent visual, auditory and textual archive for present and future generations and to promote preservation of this resource through education. SHUMLA's Lower Pecos Rock Art Recording and Preservation Project is meeting this need through digital documentation of rock art sites, creation of a digital library to archive rock art data, establishment of a comprehensive, multi-disciplinary research program, and continuation of hands-on education programs that connect people of all ages to this unique cultural legacy.*

**Key words:** ROCK ART, LOWER PECOS, 3-D LIDAR, ROCK ART RECORDING, PICTOGRAPHS

## 1. Introduction

William Carlos Williams (1883 –1963) was an American poet closely associated with Modernism and Imagism who in 1923 wrote a book called *Spring and All*. Since the moment we learned that some of us will be here in Seville, a close association with one of its paragraphs sprang forth (WILLIAMS, 1970:88).

*"If anything of moment results, so much the better . . . There is a constant barrier between the reader and his consciousness of immediate contact with the world. If there is an ocean, it is here. Or rather, the whole world is between: Yesterday, tomorrow, Europe, Asia, Africa, -- all things removed and impossible, the tower of the church of Seville, the Parthenon".*

Our purpose is to remove the barriers, to make the tower of the church of Seville possible, and to do that by linking the remote forms of rock art with the open spaces that technology may offer. We knock at your door to tell you who we are and what we do. Our hope is that you will suggest avenues of research and tell us how you can help.



Fig. 1. Lower Pecos Canyonlands of southwest Texas (United States) and northern Coahuila (Mexico). Map by Kerza Prewitt.

We are engaged in a critical endeavor to document the oldest known pictorial texts in North America. The Lower Pecos Canyonlands of southwest Texas and northern Mexico house some of the most complex and compositionally intricate prehistoric rock art in the world. Sadly many of these magnificent panels are rapidly deteriorating due to human and natural agents of deterioration. These ancient murals, or more appropriately “codices”, prescribe ritual, document myths and histories, and communicate factual data regarding ecological relationships (BOYD 2003; 2010). The unique nature and incomparable richness of this threatened cultural legacy inspired SHUMLA to create a permanent visual, auditory and textual archive for present and future generations and to promote preservation through education.

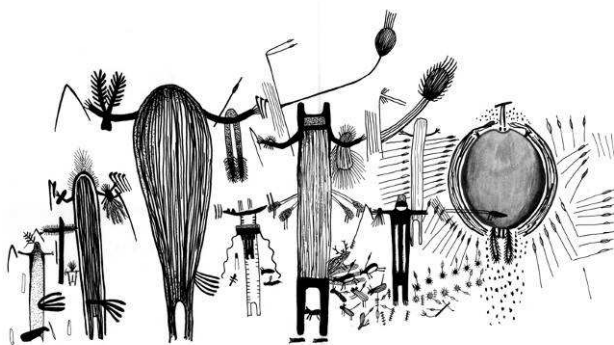


Fig. 2. Pecos River Style pictographs from Panther Cave dating to approximately 4,000 years ago. Illustration by Carolyn Boyd.

SHUMLA is a nonprofit archeological research and education center working internationally to connect people of all ages with the land and their cultural heritage. Since its inception in 1998, SHUMLA has served over 21,000 children and 3,000 adults in the United States and Mexico through heritage education programs. Recognizing the uniqueness of the region and its outstanding value to humanity, SHUMLA established a research board of distinguished scholars from around the world and developed a ten-year multi-disciplinary re-examination of stability versus change in the prehistoric cultural and natural history of the region. The Lower Pecos Rock Art Recording and Preservation Project, which we share with you now, is a critical component of this ten-year plan. Results from the project will be used as supporting documentation for submission of the region for nomination to the World Heritage List.

## 2. Rock Art of the Lower Pecos Canyonlands

The Lower Pecos Canyonlands provides one of the best-preserved and longest continuous record of forager lifeways in North America. Over 250 rockshelters are known to contain rock art; new sites are discovered each year. The pictographic record spans from 4,000 years ago to historic contact times (BOYD, 2003; TURPIN, 2004). Pictographs, or rock paintings, are the most abundant form of rock art found here. Although not all paintings fit neatly into these categories, the main classifications of prehistoric rock art are Pecos River Style, Red Linear Style, Red Monochrome Style, and rock art of the Historic Period, such as Plains Biographic Style.

The vast majority of the art was produced during the transition between the Middle and Late Archaic period and is collectively referred to as the Pecos River style. The presence of an organic binder in the paint has made it possible to date the art using accelerator mass spectrometry (AMS). Twenty-five dates have been obtained so far and place production of the art to between 3,000 to 4,500 years ago (ROWE, 2009).

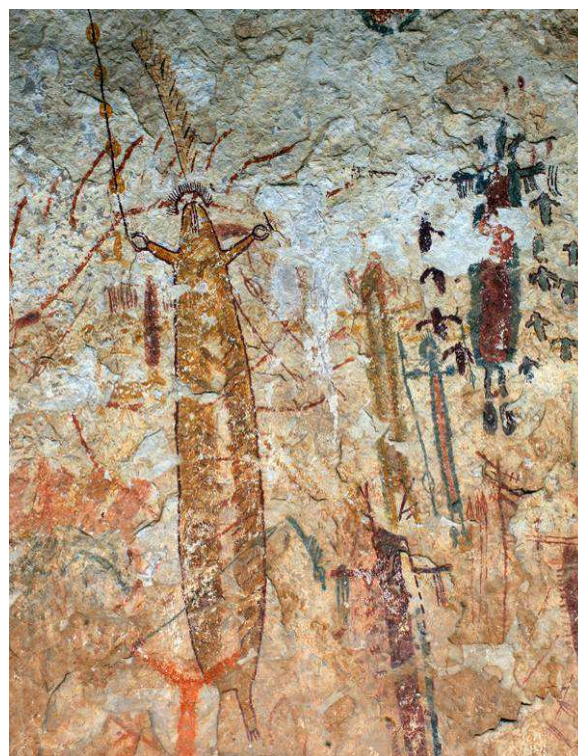


Fig. 3. Pecos River Style anthropomorphic figures from Halo Shelter (41VV1230). The yellow and red anthropomorph is 1m in height.

The Pecos River style consists of polychrome and monochrome anthropomorphic or human-like figures accompanied by animals, such as deer and felines, as well as an assortment of enigmatic figures. The artists used an array of earth colors to create murals that are impressive both in the level of skill required to produce them and in sheer size and complexity. Many of the panels are over 30 meters long and some of the anthropomorphs are seven meters tall – a feat requiring significant planning as well as the construction of scaffolding. Other panels are quite small, tucked away in secluded alcoves high above the canyon floor.

The Red Linear style is characterized by animated, small, fine-lined figures of animals and humans. Although referred to as “Red Linear,” implying the use of only red in their production, some images are black or yellow. Based upon subject content and two radiocarbon dates, the Red Linear style was believed to have been produced around 1,280 years ago. Recently, however, SHUMLA identified multiple examples of “older” Pecos River style painted over “younger” Red Linear style pictographs, highlighting the need for further dating and re-examination of the stylistic classifications.



Fig. 4. Red Linear Style anthropomorphic figures from Kakie's Gallery (41VV/201).

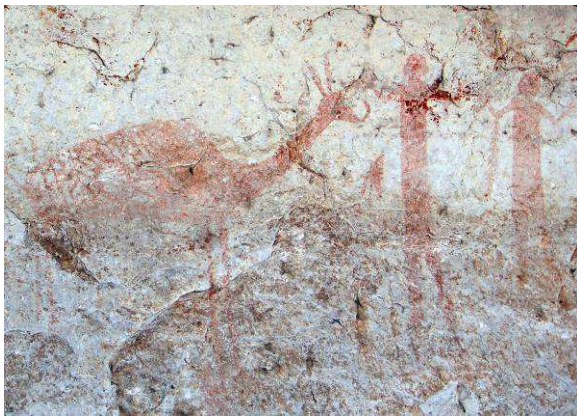


Fig. 5. Red Monochrome Style figures from Painted Shelter (41VV/78).

The Red Monochrome style portrays static, frontally posed human figures associated with bows and arrows and realistically depicted animals in profile or dorsal view. This style began sometime around 1000 AD during the Late Prehistoric. Although younger in age, there are relatively few known Red Monochrome sites.

Historic Period rock art includes images that reflect European contact, such as missions, crosses, men on horseback, cattle and robed figures. The earliest known Historic Period rock art dates to the 16<sup>th</sup> century in New Mexico. In Texas, Historic Period rock art has continuity between the 18<sup>th</sup> century and the early 1900s. Its contribution to the understanding of the social and economic history of Texas is difficult to exaggerate (MARCOS-MARÍN, 2010).

### 3. Threats to Rock Art

First efforts to document Lower Pecos rock art began in the 1930s – in some cases producing the only surviving record of paintings destroyed by vandals, lost to weathering, or inundated by the creation of Amistad Reservoir in 1968. With a surface area of over 89,000 acres and a maximum depth of 217 feet, this

hydroelectric reservoir submerged thousands of archeological sites, including many containing pictographs. The remaining rock art sites face serious conservation threats attributable to creation of the reservoir. Sites located on private land previously inaccessible to the public are now easily accessible by boat, leading to increased vandalism. An estimated average of 131,000,000 gallons of water evaporates each day from Amistad Reservoir. The resulting increase in humidity is directly responsible for damage to the pictographs through spalling of the limestone substrate, increased insect activity and formation of mineral accretions obscuring the imagery (MUELLER, 2010).

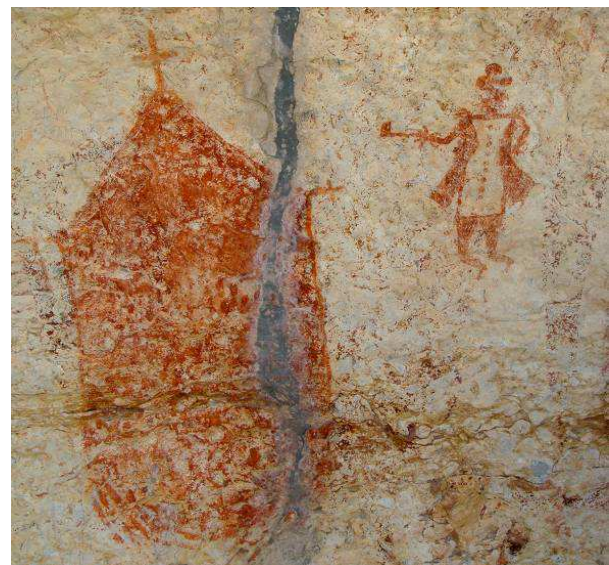


Fig. 6. Historic rock art from Vaquero Shelter (41VV/77) dating to the early 19<sup>th</sup> century.



Fig. 7. Panther Cave is located along the banks of Amistad Reservoir.

One of the most impacted sites, Panther Cave, is also one of the most significant sites in the region. The massive panel at Panther Cave spans greater than 50 meters, housing hundreds of polychromatic pictographic images dating to over 4,000 years.

According to Dr. Jean Clottes (personal communication), the rock art at Panther Cave is “second to none in the world and is worthy to be placed on the World Heritage List of UNESCO”.

SHUMLA has identified alarming degradation of images at this site through analysis of legacy photographs taken before and after the creation of the reservoir. Panther Cave pictographs are being destroyed by hundreds of mud daubers building nests directly on top of the imagery.

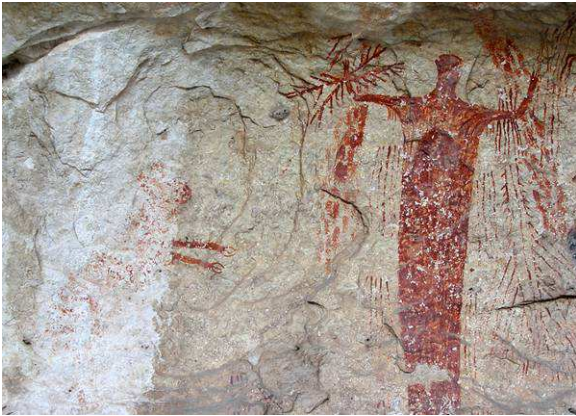


Fig. 8. Mineral accretions obscure Pecos River Style paintings at Panther Cave (41VV83).



Fig. 9. Black and Yellow Mud Dauber (*Sceliphron caementarium*) nest. Hundreds of these nests are damaging the rock art at Panther Cave and other sites in the region.

#### 4. Preservation Actions

SHUMLA has embarked on a technologically advanced program of documenting, monitoring, interpreting, and preserving the rapidly deteriorating aboriginal rock art at Panther Cave and other sites in the region. Responding to the urgent need for documentation of these remarkable archaeological sites, SHUMLA launched the Lower Pecos Rock Art Recording and Preservation Project in 2009. The primary objectives of this project are to record and visualize the prehistoric pictographs preserved within the region. The project is funded through foundation grants, individual gifts, and government contracts. Goals of the project are to:

- Preserve the rock art of the Lower Pecos Canyonlands for future generations using state-of-the-art documentation technology

- Identify current threat levels to rock art and develop baseline data for monitoring conditions in the future
- Provide the basis for proactive preservation, management, and education decisions and development of interpretive products for the general public
- Produce a multimedia digital library housing all visual, audio, and textual rock art data with multi-tiered access for the general public and researchers
- Establish comparative and collaborative research projects globally utilizing Lower Pecos data

We employ both standard recording techniques and state-of-the-art technologies to document imagery and archaeological sites; it represents the most intensive rock art documentation project undertaken in the United States.



Fig. 10. SHUMLA students recording rock art at the White Shaman site (41VV124).

During the course of this project, the detailed rock art recording methods developed by SHUMLA are being augmented and enhanced by the addition of high resolution three-dimensional laser scanning and digital photogrammetric recording techniques. These non-invasive and non-destructive methods provide detailed and accurate digital models of selected pictograph panels as well as the rockshelter in which they are preserved.

High resolution laser scanning is used to record three-dimensional data and produce a highly accurate digital model of rockshelters and their immediate environment via a time-of-flight scanning system. These data are referenced to geographic coordinates through strategically-placed survey monuments. This high resolution model is combined with ultra-high resolution data of selected rock art panels preserved within the shelter via a triangulation-based scanning system. This ultra-high resolution data collection provides baseline data for monitoring the degree of degradation of the rock art in future years.

High resolution digital photogrammetric techniques are integrated to provide accurate natural color imagery for the resultant three-dimensional models and augment areas that could not be recorded with the laser-based systems. The resultant digital models provide not only a detailed recording of the rock shelter, but also serve as a basis for the spatial analysis of the site and its associated rock art.

The application of geospatial analytical methods to the dataset will likely provide additional insights to the nature of the rock art, its manufacture, and its preservation. From the resulting three-dimensional models and the derived analytical data, two-dimensional vector representations such as planimetric maps, elevations, and profile sections of the site are generated. Finally, the three-dimensional model will provide a platform for the integration of previously recorded legacy datasets related to Panther Cave and its associated rock art.



Fig. 11. Triangulation survey conducted at Panther Cave by Geo-Marine, Inc.

The daunting task of rock art recording is not only to preserve the imagery and its context for future generations, but to capture the data in such a way that it is useful for detecting patterns and, subsequently, interpretation. SHUMLA is currently entering data into a newly created Microsoft SQL Server database. At present, the SHUMLA database holds only rock art figure attribute data and their related photographs. The next step will link this information to a GIS database containing spatial and geographical data for the surrounding region.

Once the SQL and GIS databases are fully linked, SHUMLA plans to explore methods of interaction, such as searching photographs and rock art site information using software and touch/sketch pads. Projects such as this, coupled with previously accumulated data, would put SHUMLA well on the road to creating an accurate, interactive exhibit of Lower Pecos archaeology.

## 5. Conclusion

The rock art of the Lower Pecos represents a shared legacy of worldwide importance. Far from being the idle doodling of ancient peoples, Lower Pecos rock art is well-ordered, highly patterned and rule governed.

Through analysis of these patterns researchers are gaining insight into the meaning and function of the art and the lifeways of the people who produced it. As more people appreciate what can be learned from this rock art, the sites that remain unharmed will be protected for the future. In the meantime, SHUMLA is creating a permanent rock art archive of this threatened cultural resource for present and future generations.

Nineteen sites have been recorded to date. Three sites, including Panther Cave, have been documented using 3-D laser scanning. SHUMLA's research team has illustrated and collected attribute data for over 1,500 pictographic images and archived more than 15,000 photographs. However, this represents only a fraction of the imagery in urgent need of documentation.

What we do demonstrates what we know, as well as what we need. I am certain that your minds already are devising new proposals, new issues. Our project will benefit from this conference. We came to Seville to offer collaboration and request help. SHUMLA has a well-established structure of facilities and scholars. Because of our historical commitment to work as a team, we welcome the assistance of scholars from all over the world. Knocking on doors is one of our specialties; we invite you to join us in this effort, to provide us with new insights, experience and knowledge. Please share with us in the excitement of bringing the old rock art of the New World to the world of all.

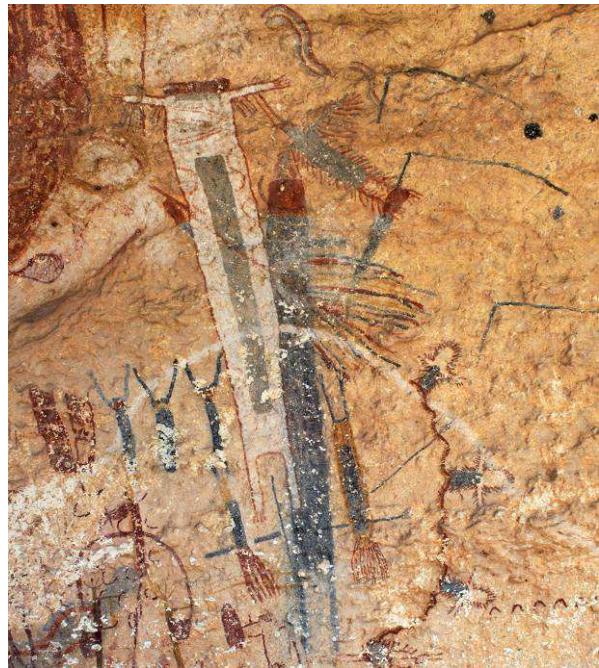


Fig. 12. Pecos River Style paintings at the White Shaman site (41VV124).

## Acknowledgements

This project would not be possible if not for all our partners and collaborators, including Amistad National Recreation Area-National Park Service, Seminole Canyon State Park and Historic Site, and the Rock Art Foundation. To all with whom we work, we are grateful for your support and contributions.

## References

- BOYD, Carolyn E. (2003): *Rock Art of the Lower Pecos*. College Station: Texas A&M University Press.
- BOYD, Carolyn E. (2010): "El Arte Rupestre de Tejas: Análisis Contextual de Motivos Recurrentes en el Área de la Desembocadura del Río Pecos" in *Revista Iberoamericana de Lingüística* n° 5, pp. 5-42.
- MARCOS-MARÍN, Francisco (2010): "Arte rupestre y Lingüística amerindia. Estilos y conceptos", in *Revista Iberoamericana de Lingüística*, n° 5, pp. 43-71.
- MUELLER, Stephanie (2010): *Museums and the Conservation and Interpretation of Rock Art*. MA Thesis. Texas Tech University, Lubbock, Texas.
- ROWE, Marvin W. (2009): "Radiocarbon Dating of Ancient Rock Paintings" in *Analytical Chemistry*, 81(5), pp. 1728-1735.
- TURPIN, Solveig A. (2004): "The Lower Pecos River Region of Texas and Northern Mexico", in *The Prehistory of Texas*, edited by Timothy K. Perttula. Texas A&M University Press. College Station.
- WILLIAMS, William Carlos (1970): *Imaginations*. New York: New Directions Publishing.