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Lithic Raw Materials in the Lower Rio Grande Valley, South Texas and Northeast Mexico

Brandi Reger[a], Juan L. González[b] and Russell K. Skowronek[c]

[a]Independent Scholar; [b]School of Earth, Environmental, and Marine Sciences, The University of Texas Rio Grande Valley; [c]Professor of Anthropology and History, Director of the Community Historical Archaeology Project with Schools (CHAPS) Program, The University of Texas Rio Grande Valley

ABSTRACT

Analysis of 976 lithic artifacts from twelve museum and private collections in the Lower Rio Grande Valley revealed a preference for seven rock types. Sixty nine percent of all tools were made from gravel chert, which is locally the most abundant rock type on the Frio and Goliad Formations, as well as on the gravels of the Rio Grande. Representing less than 10% each were, the local El Sauz Chert, a black banded metamorphic rock, volcanic rocks, agates, silicified wood, limestone and black chert. Variations in the relative proportion of each rock type are observed by location, suggesting a tendency to use other suitable rocks that were locally available. Contrary to what has been suggested an abundance of lithic resources were available to stone tool makers in the Lower Rio Grande Valley. This study underscores the value of working with collectors in regions where little archaeological research has been conducted.

KEYWORDS

Lower Rio Grande Valley; El Sauz Chert; private collections; south Texas

The Lower Rio Grande Valley (LRGV), defined here as Cameron, Willacy, Hidalgo, Starr, and Zapata counties of South Texas and the northern part of the states of Tamaulipas, and Nuevo Leon in Mexico (Figure 1), spans approximately 27,000 km^2. The LRGV was an important corridor for the movement of human and animal populations across the landscape in prehistoric times, with the riparian environments along its banks providing food, shelter and resources necessary for survival. The archaeological record indicates that waves of humans have traveled up and down and north and south across the river for the last 11,000 years (Hester, 1981, 2004). All prehistoric populations were nomadic with open occupation or camp sites the norm, some of which are stratified or repeatedly reused (Hester, 2004). Site types and features have been characterized by Black (1989a, 1989b) and include, campsites, cemeteries (e.g. Terneny, 2005), stone quarries for tools (e.g. Kumpe & Kryzwonski, 2009), hearths, and rarely rock art (e.g. Hester, 2004).

The Texas Archeological Site Atlas indicates for the northern counties of the LRGV that there are over 300-recorded sites in the five counties. This record, however, underestimates the extent of human occupation since most of the reported sites occur along main highways, drainage canals, and transmission power lines, and they were recorded as part of cultural resource management surveys. Beyond these survey projects, only a handful of archaeological sites have been excavated (Bousman et al., 1990; Day et al., 1981; Frederick & Burden, 2018; Hall et al., 1987; Hester, 2004; Kibler, 1994; Mallouf & Tunnell, 1978; Shiner, 1983; Terneny, 2005), and the region remains poorly known archaeologically. Beginning eleven years ago the Community Historical Archaeology Project with Schools (CHAPS) Program at the University of Texas Rio Grande Valley began to address these shortcomings by analyzing collections and recording new archaeological sites (e.g. Bacha-Garza, 2015a, 2015b; Leal, 2013).

The LRGV has been described as impoverished in lithic resources (e.g. Banks, 1990; Collins et al., 2002) Yet, archaeologically it is known for the abundance of prehistoric chipped stone artifacts. For more than a century the area has been targeted by collectors (Zavaleta & Anderson, 1991), with the unfortunate consequence that important archaeological resources have been permanently lost to researchers. To further aggravate the problem, a century of agricultural activity followed by a quarter of a century of rapid and widespread urbanization has had a significant negative impact on the archaeological record. Fortunately, some responsible collectors and farmers have maintained clear and verifiable records of provenience. The CHAPS Program does not encourage private collecting.

CONTACT Juan L. González juan.l.gonzalez@utrgv.edu

In fact, the mission of the CHAPS Program is not only to conduct research but educate the community regarding the value of the archaeological record. Private collectors who agree to collaborate are provided with the Texas Historical Commission's *Guardians of the Past, Archeology in Texas* brochures on artifact collecting, documenting archaeological collections, the destruction of archaeological sites, and "a property owner's guide to archaeological sites" (https://www.thc.texas.gov/preserve/archeology/archeology-publications-resources). By garnering these individuals' trust we add to the knowledge of the prehistory of the region while educating new stewards for the protection of these artifacts and sites. This approach is aligned with Society for American Archaeology's ethical principles of not merely permitting but practically requiring scholars to engage in constructive collaboration with responsible or responsive collectors (Shott, 2017; Shott et al., 2018; Shott & Pitblado, 2015), and is consistent with Turner et al.'s (2011), proposal for hobbyist and collectors to become involved in a vocational archaeology and collaborate with scholars. We recognize that the use of private collections remains controversial and must be approached with caution. Given this caveat we also recognize that these collections have the potential to answer questions about regions which might best be describes as *tabula rasas* within North American prehistory.

Here we seek to identify and characterize the source of lithic materials used by the prehistoric inhabitants of the Lower Rio Grande Valley. This research provides baseline information on archaic mobility and trade in this region. We argue, based on a thorough analysis of collections, a comprehensive review of the geologic literature, and our own field observations, that an abundance of lithic resources occurring as loose gravels and as bedrock outcrops on both sides of the Rio Grande, was available to stone tool makers to supply their needs.

Collections considered in this study

Many museum and private collections were considered for this assessment. Each collection was rigorously scrutinized, and only twelve were selected having met the following criteria, 1- the provenience of each artifact is known. In most cases the artifacts were sourced to a property where they were found and collected by the owner, and in some cases, they were tied to an excavation project. 2- not a single artifact in any of the collections was obtained through a commercial transaction.3- all collections would be made available for future studies if needed. And 4- when possible diagnostic materials were selected to provide some temporal control (Table 1; Figure 1). Some collections (Nos. 1-3) had previously been studied and catalogued by the University of Texas Rio Grande Valley (UTRGV) (CHAPS) Program (e.g. Bacha-Garza, 2015a; Garcia et al., 2016). Others (Nos. 4-9) were donated to the Museum of South Texas History (MOSTH) in Edinburg following archaeological excavations, or directly by the property owners who found them. Every artifact in the MOSTH collections was curated and inventoried. Two collections (Nos. 10 and 11) were made available by private collectors for this project, and lastly, an old teaching collection (No. 12) from the Anthropology Program at Pan American University, the forerunner of UTRGV, was studied, bringing the total number of artifacts considered in this project to just under 1,000. Figure 2.

We acknowledge our data is biased by the spatial distribution and the sample size of the collections. The south side of the LRGV is represented by only two collections from Nuevo Leon, which comprise a scant 5% of the artifacts, and the coastal counties, which are the most lithic impoverished areas in the LRGV, are not captured in this study. On the other hand, collections from Hidalgo and Zapata counties combined represent 80% of the analyzed materials. Despite these shortcomings

Table 1. List of collections investigated in this study. Records are listed by county, donor and year of collection. Numbers refer to the locations shown in figures 1 and 2.

Collection	Donor	Year	Mexico	Zapata County	Starr County	Hidalgo County	Grand Total
CHAPS	1. Danielle Sekula	2000s		66		257	**323**
	2. Tom Eubanks	1970				12	**12**
	3. Victor Paiz	1990s				13	**13**
MOST	4. D. Ramirez	1980	24				**24**
	5. Joe Swindle	1950s		127			**127**
	6. Joel Shiner	1976				1	**1**
	7. Tom Aderhold	1950s				123	**123**
	8. W. Francey	1971				90	**90**
	9. Wanda Boush	1960s			27		**27**
Private	10. Boultinghouse	1980s		76			**76**
	11. Eugene Pilarczyk	1990s			76	18	**94**
UTRGV	12. Pan American University	1970	30		31	5	**66**
Grand Total			**54**	**269**	**134**	**519**	**976**

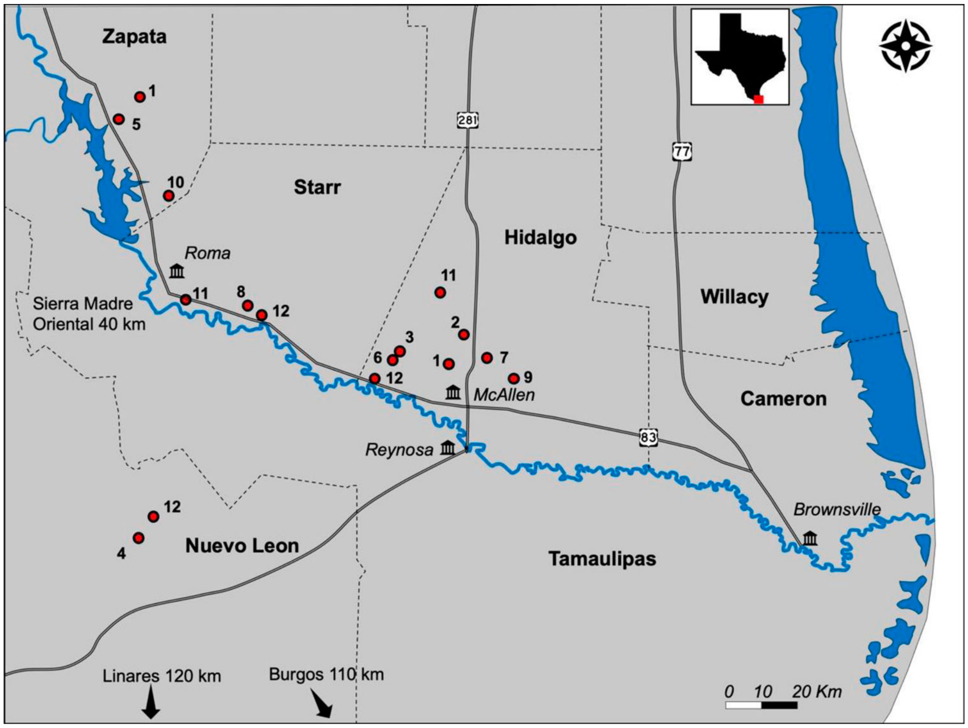

Figure 1. Map of the Lower Rio Grande Valley showing geographic features mentioned in the text. Dots indicate the location of collections used in this study, keyed to Table 1.

the collections span the target region and include a sample of the range of lithic resources found in the LRGV from the Pleistocene to historic times.

All artifacts in this study are chipped stone tools and projectile points. Although a detailed analysis of the typology of these tools is outside of the scope of this survey, we point out that the vast majority of these

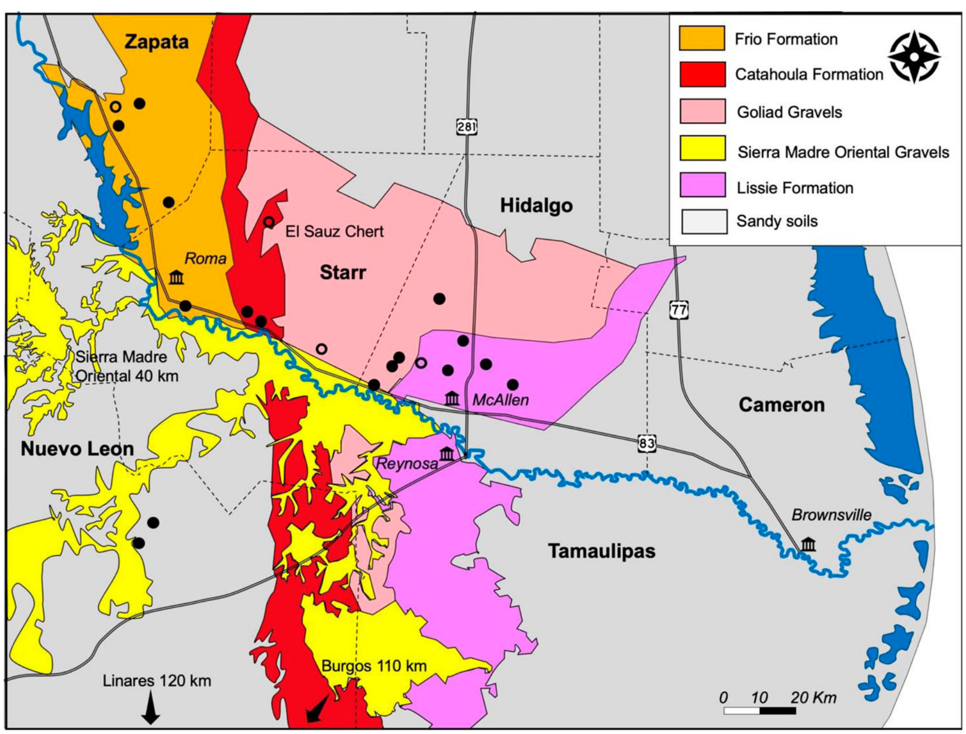

Figure 2. Schematic map showing geologic units of the Lower Rio Grande Valley with materials suitable for stone tool making. Solid dots indicate the locations where collections were found open circles denote the locations where reference raw samples were collected.

tools are unstemmed projectile points, scrapers, and choppers. About 30 percent of these artifacts were identified by their typology. These artifacts span the entire range of the known occupation of the LRGV, from the Paleo Indian, (Golondrinas) to the Historic period, (Guerrero).

Geologic setting

The coastal plain along the South Texas and Northern Mexico Gulf Coast is the product of sediment accumulation since the Oligocene (34-23 mya). Shallow marine and transitional sediments coalesced with fluvial deposition, mostly from the ancestral Rio Grande and its tributaries, during the Oligocene and Miocene (34-5 mya) (Galloway et al., 2011). Reworked gravels are the most abundant source of raw material in the LRGV; they contain a blend of rock types that were transported and deposited by the Rio Grande from as far upriver as New Mexico, west Texas and the mountains in Northeast Mexico.

Two major gravel units are recognized in the western LRGV, the unconsolidated gravels associated with the Frio Formation and Goliad Gravels. Frio Formation gravels contain multicolored chert, a variety of volcanic material eroded from the Trans-Pecos in west Texas and the Sierra Madre Oriental (SMO) in Mexico during the Early Oligocene (Ewing, 2016), and agates in lesser proportions. These Frio deposits are unconsolidated and sometimes deeply buried, but in Zapata and western Starr County they have been re-exposed through uplift and erosion. The much younger Goliad Gravels, in contrast, form an erosion resistant cap on many local hills in eastern Starr and Hidalgo Counties and tend to be caliche (a pedogenic calcium carbonate cement which forms in semiarid regions) cemented. Goliad Gravels consist primarily of multicolor chert with lesser amounts of volcanic clasts and silicified wood.

In Starr County and Tamaulipas Mexico, the Pliocene (5.3-2.5 my BP) Goliad gravels unconformably overlie a 20-meter-thick deposit of Oligocene (34-23my BP) altered rhyolitic volcanic ash, the volcanic member of the Catahoula Formation. Interaction of groundwater with the silica-rich ash produced a high-quality fine-grained chert suitable for stone tool making, this chert is known in the archaeological literature as El Sauz Chert (González et al., 2014; Kumpe & Kryzwonski, 2009). Groundwater and the silica-rich ash also contributed to the unique silicified wood found throughout the Catahoula Formation, which litter the landscape and collects in nearby stream beds (Bailey, 1926). Galloway (1977) remarked that silicified wood from the Oligocene Age Catahoula Formation could be distinguished from silicified wood in older formations by the amount of abrasion and rounding these pieces have endured. Eocene Age silicified wood in the Frio Formation transported as bed-load by streams has been significantly reworked, so specimens have a smooth, polished look. Silicified wood from the Catahoula Formation are fresher looking and much less reworked; many pieces still have rough bark surfaces.

Farther east in Hidalgo County, is the Pleistocene (2.6 mya-12,000 ya) Lissie Formation. It was deposited during a period of time when the Rio Grande carried mostly fine-grained sediments, but sometimes, gravels from older deposits up river were eroded and redeposited into the developing formation. Gravels from the Lissie Formation are loosely cemented and roughly stratified, and the pebbles average less than 3 centimeter in diameter, although there are lenses and pockets containing cobbles as large as 15 centimeters in diameter (Trowbridge, 1932). Individual clasts in the Lissie gravels are therefore smaller than material acquired farther west, but compositionally they are the same.

The oldest rocks in the study area are Cretaceous age (140-65 mya) limestones found in the SMO in Mexico. This mountain range is the result of uplift during the Laramide Orogeny (80-35 mya) and periodic volcanic emplacement since then (Perez Cruz, 1992). Many of these limestone formations are reported to be associated with lenses and beds of chert, and gravel beds in arroyos draining from these mountains are rich in chert and limestone cobbles (Epstein, 1969; Imlay, 1931; Perez Cruz, 1992). The majority of limestone and black banded metamorphic materials are thus found in gravel beds south of the Rio Grande.

Methods

All artifacts in the collections were first inspected visually using mesoscopic magnification (5 to 10x). Each item was photographed and, when possible, identified as to type and associated age. For the most part, visual inspection was sufficient to identify the majority of the rock types in the artifacts in this study. Accurate identification of tools made from the geochemically unique local El Sauz Chert, however, required X-Ray Fluorescence (XRF) analysis to verify the high zirconium and titanium content. Artifacts suspected of being made from this chert were scanned with a handheld Bruker Tracer IV XRF analyzer at 40kv/16μA/filter #1 for 60 s. Most challenging of all were artifacts made of a black rock with a glassy appearance that might easily be incorrectly identified as obsidian. Correct identification of these required X-Ray Diffraction (XRD) analysis which identifies the atomic structure of materials. XRD analysis of selected artifacts was performed using a Bruker D8 XRDwith Cu K-alpha radiation to confirm mineral and/or glass content.

Results and discussion

Based on these analyses six different rock types were recognized as the parent materials of the 976 artifacts. Chert is by far the most commonly occurring rock amounting to 76% of the artifacts in the collections (Figure 3A). It was found to occur in a wide range of colors and microscopic and macroscopic textures. We recognized three different varieties, gravel chert (69%), black chert (2%), and the local El Sauz Chert (6%). Black chert is differentiated from gravel chert because it is visually distinct with a dull appearance and the presence of stylolites. More restricted geographically is the geochemically unique El Sauz Chert that has a fine-grained, waxy texture and occurs in a range of colors with distinctive smear patterns. The dominance of chert artifacts in this dataset is no surprise, it is the most commonly occurring raw material. Other lithologies represented in the collections include, volcanic rocks (5%) which are common in the gravel formations throughout the LRGV and account for up to a third of the clasts in the gravels; in this study no effort was made at differentiating them by type, thus, samples in this category were bundled into a single group that we refer to as un differentiated volcanic rocks (5%). Agate (6%), silicified wood (5%), a banded black metamorphic (5%), and limestone (2%). Less than 1% of artifacts were made of rocks not found in the study area and are hence considered exotic materials.

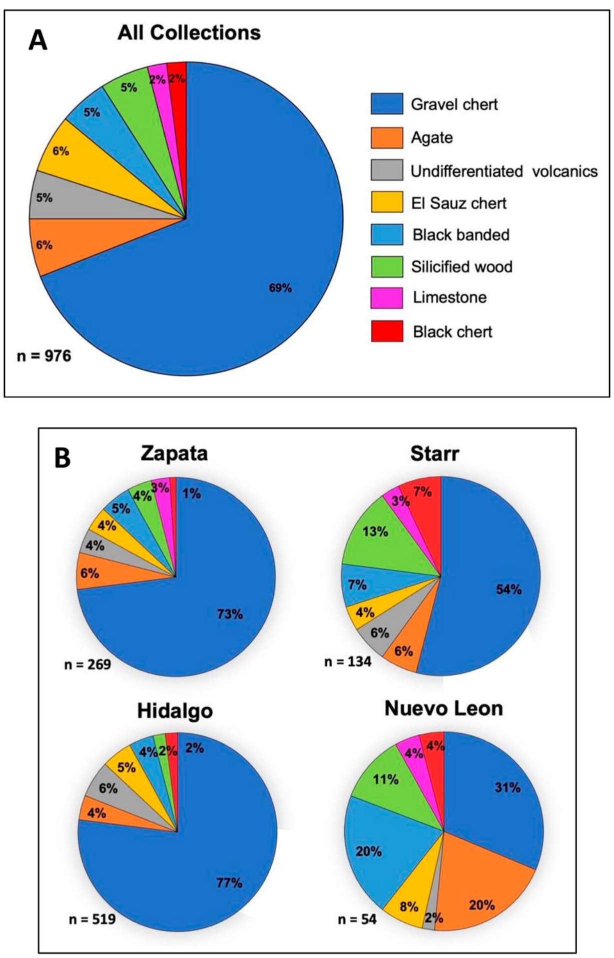

Figure 3. Relative proportion of raw materials used to make chipped stone tools in the LRGV. A- Entire data set. B- data sorted by county/state.

The relative proportions of raw materials for all collections combined (Figure 3A) is largely controlled by the larger collections from Zapata and Hidalgo Counties (Figure 3B). Despite the biases in spatial distribution and sample size, important differences emerge when the data is grouped by county/state. Gravel cherts remain the preferred raw material in the four areas, there are however, differences in the percentages of the different rock types, suggesting a tendency for tool makers to use other suitable rocks that were locally available. The pie charts for Hidalgo and Zapata counties are nearly identical, except there were no tools made from Limestone in the Hidalgo assembles. The most striking departure from the relative proportions of raw materials for all collections combined (Figure 3A) appears in the assemblage from Nuevo Leon. There, gravel cherts total only 31%, less than half of that in all collections combined. The reduced proportion in the use of gravel chert is balanced by a four-fold increase in two rock types, black banded metamorphic, and agate. Given that gravel cherts are locally abundant in the foothills of the SMO, the general vicinity of where the two assemblages originate, the higher percentage in the use of black banded metamorphic can be accounted for by a combination of, proximity to the sources in the SMO and the massif near Burgos, and to the exceptional flaking properties and visual appearance.

Gravel chert

An impressive 69% of all points (n = 672) were made from gravel cherts (Figure 3). These are characterized by a dominance of ordinary brownish-grey to grey to brown colors with no distinguishing features and other colors in lesser amounts (Figure 4A and B). These nondescript cherts are the most abundant raw material in the region, occurring both as bed load sediments of the Rio Grande and its tributaries and as gravels in the Frio and Lissie Formations, and the Goliad Gravels in Zapata, Starr and Hidalgo Counties.

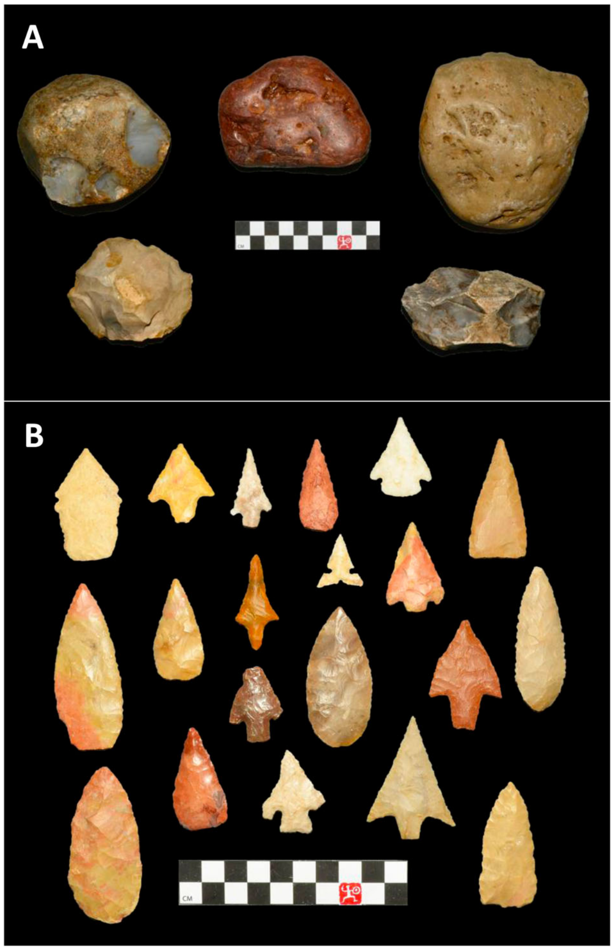

Figure 4. A- A representative sample of chert cobbles from the Frio, Goliad and Lissie Formations, the gravelly geologic units in the LRGV. The sample in the lower left corner is a rough core made by striking flakes off a large cobble with a hammer stone. Two other clasts also show evidence of reduction by percussion. B- A subset of artifacts representing the variety of gravel cherts observed in the collections used in this study. The set includes large knives, darts and arrow points dating from the Early (Lerma), Middle (Arenosa, Langtry, Marshall), Late (Shumla), and Terminal (Caracara) Archaic.

Black chert

Black cherts originate in the Tamaulipas Limestone Formation in the mountains of Mexico and can be found as gravel beds south of the Rio Grande, in the southwest corner of the study area (Imlay, 1931). About 2% of artifacts (n=15) were crafted from this chert (Figure 5). Epstein (1969) reports the dominant chert type in the local gravel was a "black opalized chert". According to his analysis, most artifacts were made from the local gravel, thus black chert was a common material type in his assemblage. This material was interpreted by Shiner (1983) as a "black marine chert" and determined its source near Linares, on the eastern edge of the SMO in the Mexican state of Tamaulipas, where black chert co-occurring with limestone is frequently mentioned in geological reports. Nance (1992) also stated that this material was common in his excavations in a rock shelter in Nuevo Leon. There is consensus from these authors that black chert artifacts were made of material from primary deposits in the SMO and secondary gravel deposits in streams draining the mountains, but no additional details of this material were provided beyond referencing it as "black".

Figure 5. Example of black chert points dating from the Early (Early Triangular), Late (Catan) and Transitional (Frio) Archaic.

El Sauz chert

El Sauz Chert has been recognized as an important lithic resource that was extensively used by stone-tool makers in prehistoric times in the LRGV; it outcrops as two isolated hills in Starr County (Figure 2). Kumpe and Kryzwonski (2009), and González et al. (2014) report on the large volume of debitage and discarded artifacts blanketing the outcrops which served as quarries for thousands of years. This chert formed by devitrification of the volcanic ash in the Catahoula Formation (González et al., 2014) and is chemically different from other cherts in the area. El Sauz Chert is typically a light grey color, though it can have spotted and smeared colorations of red, purple, yellow, and honey (Figure 6A and B). Its fine-grained texture, rare coloration, waxy appearance, irregular vugs, and opal-filled cavities are key distinguishing features, however positive identification of El Sauz requires XRF analysis.

The importance of El Sauz Chert to the prehistoric inhabitants of the LRGV can't be overstated. Although it represents only 6% of artifacts studied (n=58), unlike

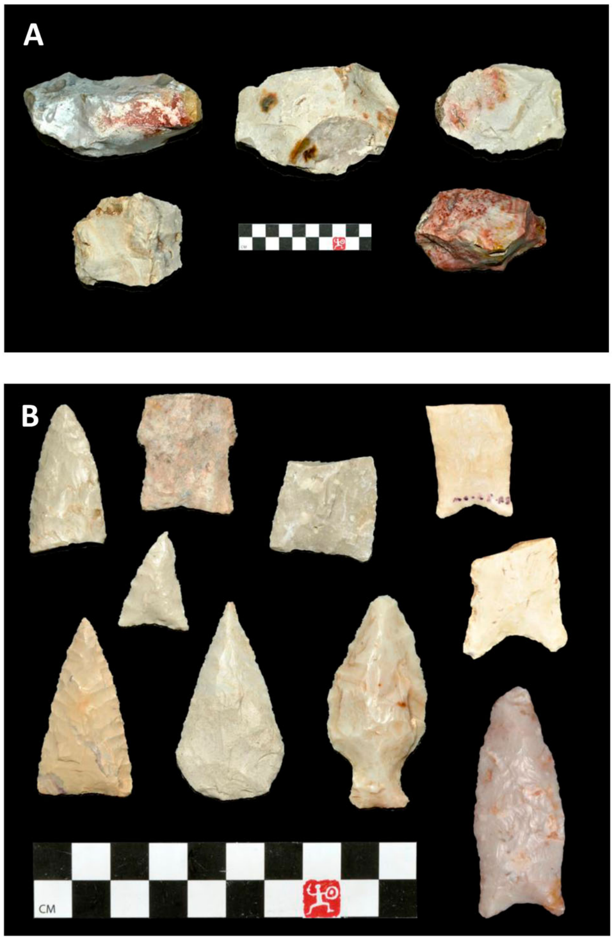

Figure 6. A- Fragments of El Sauz Chert collected at the quarry sites in Starr County. The waxy appearance and irregular vugs are distinctive features of this rock. An estimated 10% of the samples have unique smeared and spotted colorations. B- El Sauz Chert was used to make dart and spear points during Paleo-Indian (Golondrinas), and Early (Hidalgo), Middle (Pedernales, Refugio), Late (Matamoros) Archaic, and for arrowheads in the Late Prehistoric (Fresno).

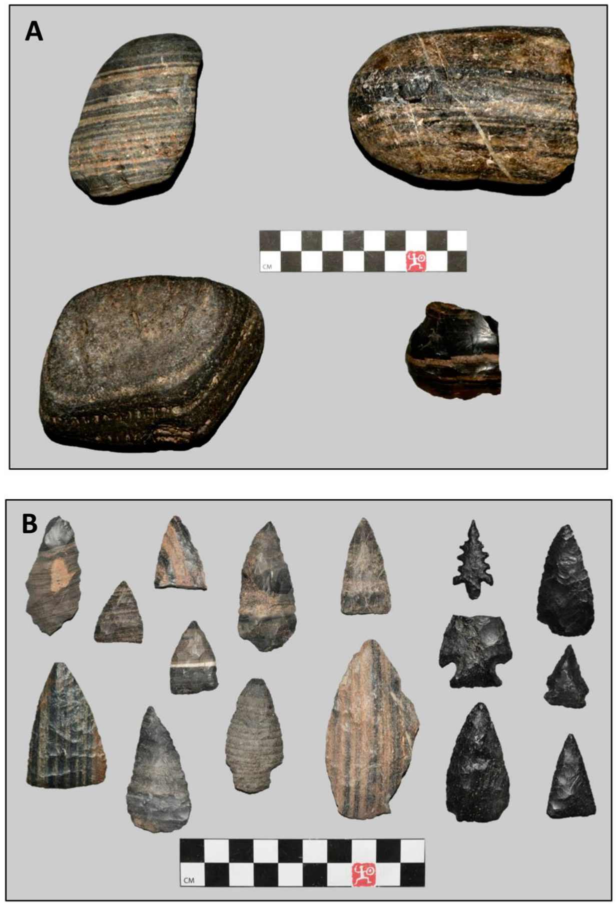

Figure 7. A- Cobbles of black banded metamorphic rock collected from the Frio Formation Gravels. Note the variation on the width of the banding and the sheen on the freshly broke piece on the lower right corner. B- Artifacts made from this rock vary in appearance from highly lustrous and uniform black to thickly banded, all exhibit very similar diffraction patterns dominated by quartz and feldspar. Examples include those dating from the Middle (Palmillas), Late (Matamoros) and Transitional (Ensor) Archaic to Late Prehistoric (Scallorn, Toyah). Interestingly, this rock was used parallel and perpendicular to the fabric given by the banding.

other rock types, artifacts made of El Sauz Chert are found in every collection in this study. Collectors have prized the brightly colored artifacts made from El Sauz Chert for decades, therefore, they are less likely to be found in museum collections (Kumpe & Kryzwonski, 2009). In all likelihood the proportion of El Sauz Chert artifacts we report here, underestimates the true quantities found in the pristine archaeological record.

Black banded metamorphic

A dark grey to black rock, often with fine-scale brownish banding, and closely resembling a volcanic glass, was the parent material for 5% of the artifacts (n=54) in the collections. As observed in projectile points, it ranges in appearance from coarsely banded (up to 1 cm wide) to very finely banded, to highly lustrous uniform black (Figure 7A and B). The presence of artifacts spanning these categories suggests that these differently appearing materials are all from the same source. This unusual rock with exceptional flaking properties is virtually indistinguishable from obsidian by visual examination and was tentatively identified as a contact metamorphosed chert. XRD analysis on 7 of these artifacts (Figure 8) precluded the possibility of it being a volcanic glass; diffraction patterns show no glass component, only crystalline material, dominantly quartz, sometimes with feldspar. This rock has different hardness and physical properties than obsidian or chert, as noted while grinding it to make powder slides for XRD analysis. The primary source of these materials is the SMO, where sandstone,

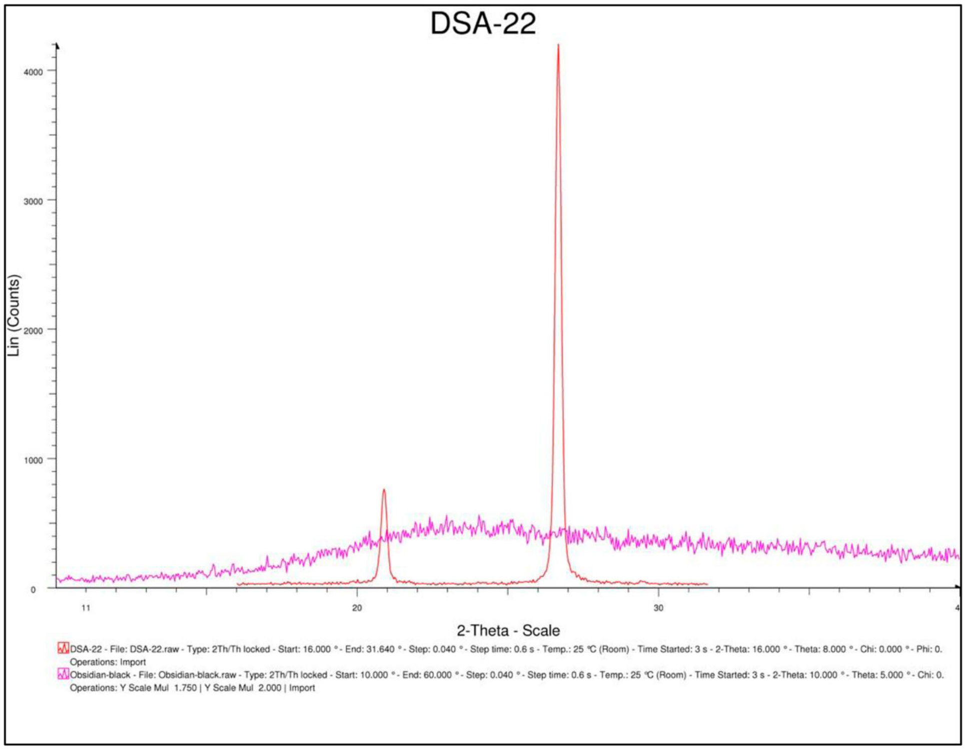

Figure 8. Typical XRD pattern of black, fine grained, shiny material (sample DSA-22). All peaks observed are from quartz, indicating this sample is >98% quartz. Significant glass content (obsidian) would appear as a low, broad, peak (raised background) spanning the 20–30 degree 2-Theta range.

shale, limestone with intercalated chert were contact metamorphosed by volcanic activity (Imlay, 1931); and the isolated massif south of Burgos in Tamaulipas. Secondary sources are the gravel beds in the rivers draining these mountains (Figure 2). Artifacts made from this rock are most frequently found in collections from Mexico, consistent with the proposed source.

Undifferentiated volcanic rocks

Classified under this group are artifacts made from fine-grained volcanic rocks of felsic compositions, this includes mainly rhyolites, dacites and trachytes. Most common are rhyolites of maroon color with visible quartz phenocrysts scattered throughout the matrix, but yellow rhyolites with a distinctive dull patina are also present (Figure 9A and B). In total 5% of the studied collections (n=50) were made of volcanic rocks. The geologic literature indicates that 23% of the gravel east of Rio Grande City consist of volcanic rocks (Trowbridge, 1932), our own observations on the outcrops of Frio, Goliad, and Lissie gravels, confirmed that number. Numerous outcrops of igneous materials occur in the SMO to the south and west, where gravel deposits are well supplied with volcanic rocks. The bulk of artifacts classified under this group come from assemblages close to the Rio Grande. Thus, we favor the local gravel deposits, rather than the outcrops on the SMO in the state of Nuevo Leon, as the source for these volcanic materials.

Agate

About six percent of artifacts (n=58) were manufactured from agate, a cryptocrystalline form of silica, also known as chalcedony. Most common are the moss and plume varieties, with explosions of dark inclusions in an otherwise translucent or semitransparent white matrix (Figure 10A and B). Other agate varieties have a cloudy appearance but exhibit fine concentric banding when held to bright light. Artifacts made of agate are most frequently found in the assemblages from Zapata and Starr Counties in the western LRGV, where agates are most abundant in gravels associated to the Frio and Goliad Formation, as well as in Nuevo Leon on the Mexican side of the LRGV.

Silicified wood

The Lower Rio Grande Valley has a wealth of silicified wood with good qualities for knapping, however, only 5% of the analyzed artifacts (n=45) were made from it.

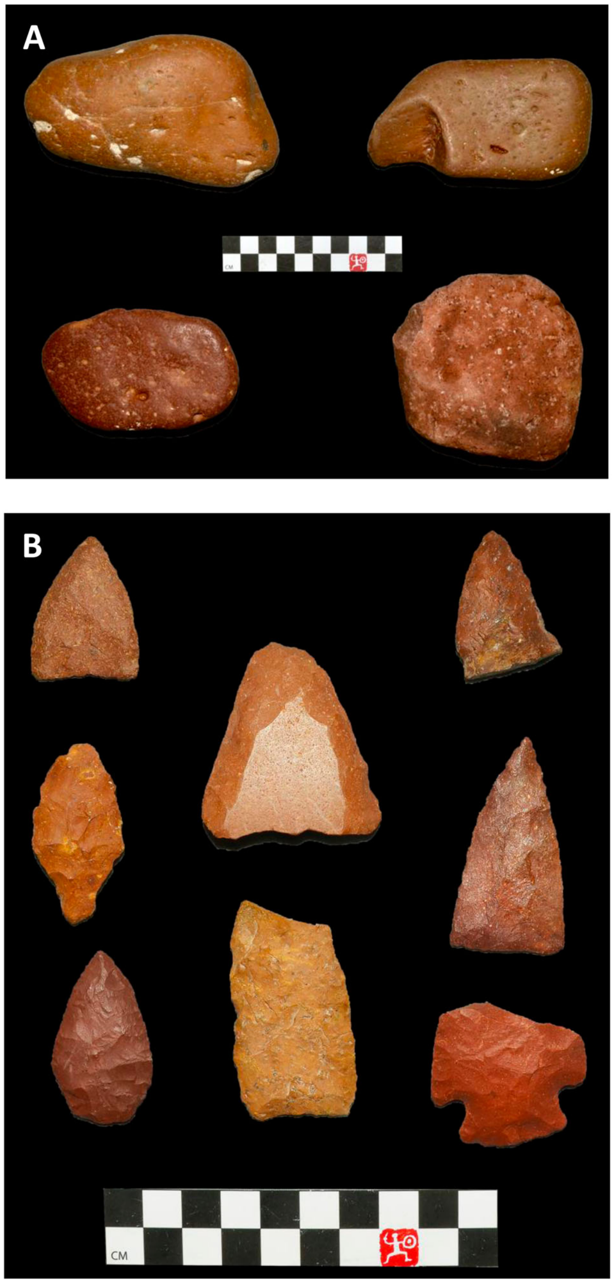

Figure 9. A- Cobbles of rhyolite collected during field reconnaissance of the Frio and Goliad gravels. Note the range of colors. B- Points made from rhyolite date from the Early (Early Triangular), Middle (Refugio), Late (Matamoros) and Transitional (Ensor) Archaic.

There are two distinctly different sources for this material: Frio Formation gravels deposited by the ancestral Rio Grande, and silicified wood found *in situ* within the Catahoula Formation. The latter is known for the highly prized silicified palm (*Palmoxilum*) (Figure 11A and B). According to Galloway (1977) and supported by our own observations, these materials can be distinguished by the amount of weathering and abrasion they have undergone during transport as bed load.

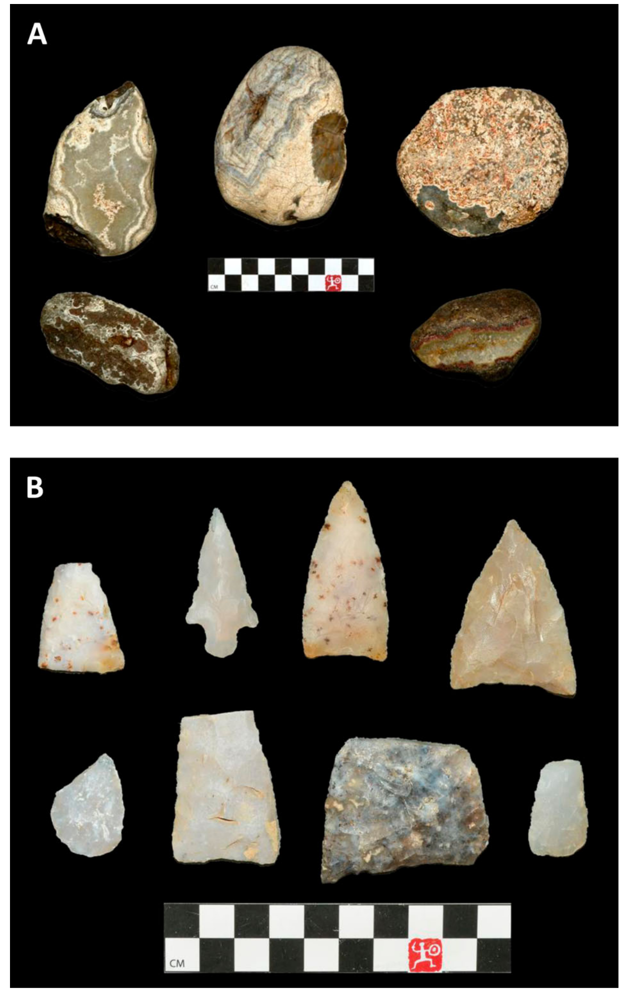

Figure 10. A- A representative set of agate cobbles collected during field reconnaissance on the Frio Formation in Zapata County. Note the sample in the middle with a test flake removed. B- Artifacts made from agate include Palmillas, Pandora, and Tortugas points from the Middle Archaic.

Older, more rounded silicified wood fragments associated to the Frio Formation have been heavily reworked during transport as bed load by streams. Younger, more angular and less weathered silicified wood fragments are likely from the Catahoula and can be found on the western side of this formation. Unfortunately, these distinctions are lost in chipped stone artifacts, and at present it is not possible to distinguish them.

Limestone

Epstein (1969) reports that the most common stone material collected from the San Isidro archaeological site in Nuevo Leon was limestone, which most likely came from the gravel deposits nearby. In his report, the author described it as "blue or grey-black silicified limestone, some patinated a deep brown color."

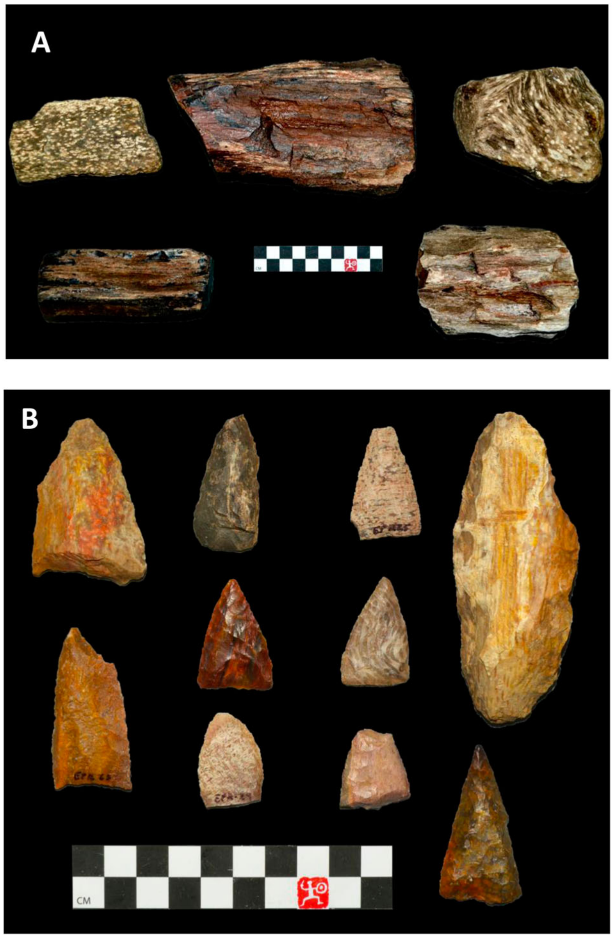

Figure 11. A- Fragments of silicified wood collected on the Catahoula Formation in Hidalgo County. Samples on the upper left and right corners are silicified palm (*palmoxilum*). B Representative set of artifacts made from silicified wood, ranging in size from a large knife to small dart (Matamoros) and arrow points (Cameron, Guerro) dating from Late Prehistoric to Historic times.

(Figure 12A and B). Limestone represents only 2% of the artifacts (n=20) in this study. Cobbles of blue grey and partly silicified limestone represent less 1% in all gravel units on the LRGV. The exact location of where the limestone is exposed as bedrock remains unknown.

Alibates

Five artifacts appeared to have been made from a rock exotic to the LRGV. These were identified as Alibates chert which outcrops in Alibates Flint Quarry National Monument, on the Texas panhandle, over 1,000 kilometers north of the LRGV (Figure 13A and B). Our assertion on the Alibates origin of these points is merely based on visual identification, we noted that the material is strikingly different when compared to those on the rest of artifacts in all the collections, but also on the similarities of the blue, red and speckled

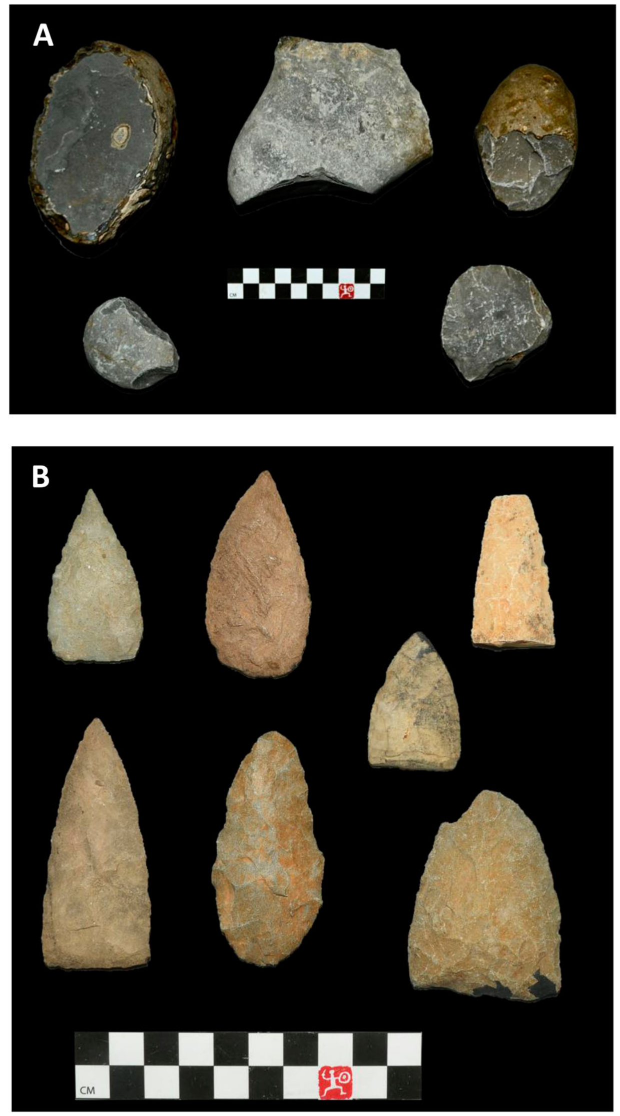

Figure 12. A- Cobbles of blue grey and partly silicified limestone from the Goliad Gravels. All pieces show evidence of having been worked on. B- Representative set of artifacts including Middle (Refugio) and Late (Desmuke) Archaic points made from limestone. The dull appearance of these points is due to a light-colored patina that developed over time, note chipped edges on lower right corner sample.

banding of the five points with samples from the quarry that reside at Museum of South Texas History. Projectile points and other tools made of Alibates flint have been found in Texas, central and western Oklahoma, southern Kansas, eastern Colorado and western New Mexico (Shaeffer, 1958). The presence of artifacts made from Alibates chert from sites in the obsidian source areas of northeastern New Mexico, some 220 km west of the Alibates quarries, reveals the movement of this high-quality material across the region by prehistoric populations (Wiseman, 1992), therefore it is conceivable that it was also used locally. The typology of the five artifacts are not unusual, however, which is

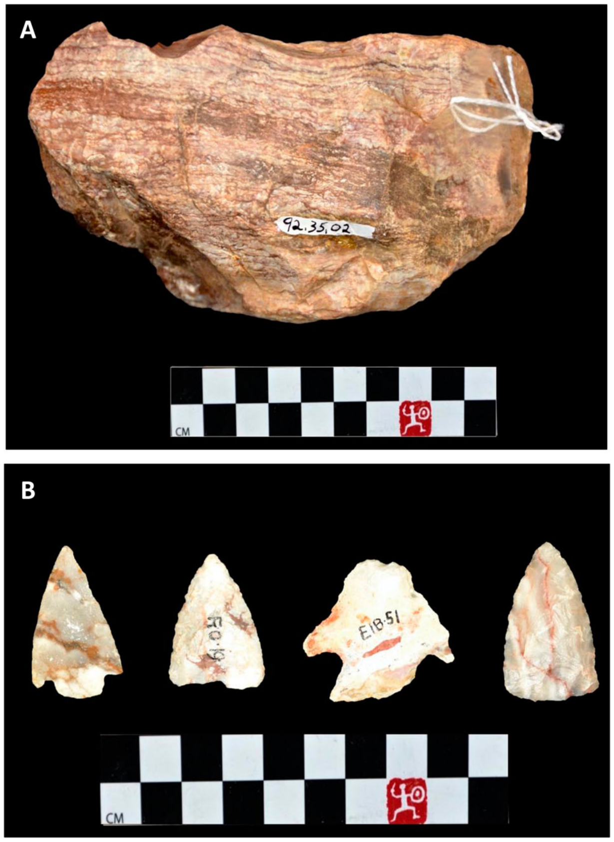

Figure 13. A- Cobble of Alibates chert from the Museum of South Texas History collection. B- Projectile points made from Alibates chert. These artifacts were found in collections from Starr and Zapata Counties. Typologies include, Palmillas, Tortugas and Marcos from the Middle and Late Archaic.

an indication that they might have been made locally. These artifacts were observed in collections from Starr and Zapata Counties.

Conclusions

The overwhelming majority of artifacts examined in this study were made from chert (76%), and most of these (69%) were made from gravel chert. Chert has long been recognized as the single most important and widely used stone in nearly every part of the world (Luedtke, 1992). This is due to it being a common rock in many geologic settings, but also on the ease of workmanship, sharp durable edges, and physical appearance with a wide range of colors and patterns. Given the abundance of colorful cherty gravel deposits on both sides of the Rio Grande it is not surprising that it was the preferred raw material used in prehistory in the LRGV. There are differences in the nature of the gravel cherts, with several subtypes. Differentiating these will require further geochemical characterization and could be a next step.

When examined by county/state, the most striking departure from the overall distribution of rock types found for the entire data set, including the dominance of gravel cherts (69%) occurs in the assemblages from Nuevo Leon, where it amounts to only 31%. By contrast the proportion of black banded metamorphic rock there is four times larger (20%). This is not entirely surprising given the proximity to outcrops of this rock in the SMO and the massif south of Burgos in Tamaulipas. Worth noting is the fact that gravel cherts are also common in the area, so the higher percentage in black banded metamorphic suggest it was highly regarded as a raw material, probably due to the exceptional flaking properties and to the visual appearance of the finished tools.

The presence of El Sauz Chert in almost every collection considered in this study is remarkable, despite its source being two small, restricted, and remote, quarries associated with the Catahoula Formation in Starr County. Collections from Nuevo Leon and Hidalgo County have a higher proportion of artifacts made of this material than collections in Starr and Zapata Counties. This may indicate that this chert was highly prized and thus was traded long distances. However, there is a possibility that there might be other outcrops of this rock south of the Rio Grande, that have not yet been reported (Kumpe & Kryzwonski, 2009).

This survey has demonstrated that contrary to the opinion that the LRGV is a lithic poor area, an abundance of high-quality raw materials occurring as loose gravels and as bedrock, on both sides of the Rio Grande, was available to stone tool makers to supply their needs.

Finally, this project underscores the value of working with collectors in regions where little or no formal archaeological research has been conducted. Private lithic collections with clear and verifiable records of provenience can be used to answer questions regarding prehistoric resource exploitation and explore dispersion patterns that provide baseline content for future studies of this topic.

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No potential conflict of interest was reported by the author(s).

Notes on contributors

Brandi Reger, completed a BA in Multidisciplinary Studies (Geology, Archaeology and Statistics) University of Texas Rio Grande Valley, in 2019. Main areas of research are stone tool use and variability in south Texas, geochemical fingerprinting of raw materials, and exploring ways to apply statistically inspired methods to archaeological datasets.

Juan L. González is an Associate Professor, at the School of Earth, Environmental, and Marine Sciences, University of Texas, Rio Grande Valley. He has a Ph.D. in Geology from Tulane University. His research focusses on human transformation of the landscape inprehistory, Holocene paleoclimate and sea level change, the Quaternary Geology of the Rio Grande Valley. Current projects include constructing a paleo-sea-level curve for Caribbean Colombia, assessing the environmental impacts caused by the emergence of a large-scalestone tool industry on the Caribbean Lowlands of Colombia, and studying the geologic history and human occupation of the South Texas Sand Sheet.

Russell K. Skowronek is Professor of Anthropology & History at the University of Texas Rio Grande Valley. He has a Ph.D. in Anthropology from Michigan State University and a M.A. in History from Florida State University. His research focuses on the archaeology and ethnohistory of prehistoric Texas and California, and the Spanish colonial empire. Professor Skowronek is the director of the Community Historical Archaeology Project with Schools (CHAPS) Program at the University of Texas Rio Grande Valley where he also serves as an Associate Dean in the College of Liberal Arts. Professor Skowronek has held the Houston Endowment Chair for Civic Engagement since 2017.

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