

# **Rio Frio Regional Archaeological Project (RiFRAP)**

## **Report on the Second (2019) Field Season**



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National Institute of Culture and History,  
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Department of Anthropology  
California State University San Marcos  
San Marcos, CA

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(RiFRAP)  
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Edited by Jon Spenard

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## **Chapter 1: Introduction and Summary of the Second (2019) Season of the Rio Frio Regional Archaeological Project (RiFRAP)**

Jon Spenard  
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Mike Mirro  
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From 13 June to 26 June 2019, the Rio Frio Regional Archaeological Project (RiFRAP) conducted its second season of investigations in the Mountain Pine Ridge Forest Reserve (**Figure 1**). Those investigations were supplemented by short lab and field seasons running simultaneously from 9 December through 18 December 2019. The collective chapters in this report detail those investigations, incorporating the results of the December lab season. The overarching goals for our 2019 investigations were continuing our archaeological investigations started in the inaugural season (Spenard 2018), with a specific focus on mapping and documenting archaeological features in Rio Frio Cave A and in Domingo Ruiz cave. That latter cavern was opened for tourism by the Forest Department sometime between the completion of our June 2018 field season and December 2018 lab season. In addition to the activities noted above, we planned to conduct test excavations in both caverns to establish their chronologies and patterns of ritual use. We also aimed to continue reconnaissance efforts to locate known and previously unrecorded ceremonial landmarks (caves, rockshelters, outcrops, etc.), sources of economically important rocks (slate and granite), and Maya settlements, and to conduct 3D digital documentation of known sites (Rio Frio caves, Bullard's [1963] bedrock outcrop shrine, and stone cairns reported by Thompson [1938]). The project also continued with data collection including extensive photography and surface collecting of diagnostic artifacts.

### **Season Objectives**

- 1) To map, construct a 3D cave model, take spherical panoramic photographs to use as part of a virtual cave tour, map and model features, and conduct excavation of several units in the Domingo Ruiz cave.
- 2) To finish mapping efforts in Rio Frio Cave A, including completion of the cave map, creation of 3D feature maps, and excavation of several units in the cave.
- 3) To relocate Rio Frio Cave E, digitally document a carved, anthropomorphic formation, and conduct minor excavations at its base.
- 4) To conduct reconnaissance in the Rio Frio Valley to identify other cave sites and locate rumored Maya settlement.
- 5) To conduct reconnaissance in the Mountain Pine Ridge proper to identify possible granite quarries and other resource extraction sites.
- 6) To expand on digital mapping and documentation techniques developed over the past four years.

## Overview of Results

This section provides an executive summary of the activities and overall findings of the 2019 field season. More in-depth discussions are provided in the following chapters of the report.

### *Rio Frio Cave A*

The majority of the June field season was dedicated to mapping, digitally documenting, and conducting preliminary excavations in Rio Frio Cave A. Dedicating the entire field season to researching this cavern was not our original plan; however, the roads to Domingo Ruiz cave were closed for the duration of the June season due to military activities. Instead, the majority of our efforts were focused on Rio Frio Cave A, where we placed 2 excavation units in its rockshelter entrance and continued with mapping and digital documentation efforts. The excavations are discussed in Chapter 2 of this report, and the other activities are discussed in Chapter 3.

Results of excavation included the recovery of ceramics, several obsidian blades, carbonized premature corn cobs, faunal remains (including spire lopped *jute*), and human remains. Ceramics were classified during the December lab season, and reveal the cave was used throughout the Classic period (250-900 CE), with most activity occurred during the latter portion of the Late Classic period (ca 700–900 CE). These dates are in accordance with those reported in other known cave sites in the Mountain Pine Ridge Forest Reserve (Moyes et al. 2017; Pendergast 1970). It also fits the broader pattern of cave use common to Belize (Moyes et al. 2009). Many of the formal types identified are similar to those found in the Belize Valley, although a pattern of local modes is emerging with our research. In particular, we have identified various types of handles and applique nubs occurring on unslipped jars unique to the sites in the Rio Frio region. Pendergast (1970:50) noted a similar stylistic overlap to Belize Valley ceramics from the Rio Frio Cave E assemblage, with little in common with the major center of Caracol 25 km to the south, suggesting the people using the cave were possibly culturally affiliated with the former. This relationship may be explained by the fact that the Rio Frio is part of the Belize River watershed and thus directly connected to the northern sites, while travel to Caracol required traversing mountainous terrain (Pendergast 1970). The obsidian blades indicate ritual bloodletting was a component of ceremonial activities in the cave and the immature state of the cobs suggests “first-fruit” agricultural rituals may have been performed there (Morehart 2011).

Stratigraphy in both units was complex consisting of a series nearly level floors covered by 5 to 10 cm thick layers of fill. In both units, thick ash deposits with dense quantities of large charcoal chunks were observed on floor surfaces indicating unconfined burning of wood and other unidentified materials. Several pits were observed intruding through multiple floors, some of which may be looter pits or excavations from the 1920s (Mason 1928, 1940), while others sealed beneath younger floors are likely pre-Hispanic. In Unit 2 a poorly preserved plaster floor with human remains beneath was uncovered approximately 50 cm below the surface. Plaster floors are commonly found in caves in southern Belize, and Moyes and colleagues (2012) suggest they were used for ritual performance stages. The human remains were found in poor condition and were

difficult to recover. Nonetheless, we tentatively identify the deceased as an individual who was between 16 to 25 years of age.

In addition to excavations in the cave's entrance, we continued our 2018 mapping and location documentation inside (Mirro and Spenard 2018). These efforts are documented in Chapter 3. Approximately 70 meters of the main cave passage and about 60 meters of tunnels and connected chambers in the breakdown were mapped. Eighty-five new cultural locations including features, sherd concentrations, architectural constructions and other points of cave modification were documented. These locations were photographed, plotted on the cave map, and are described in table form in Chapter 3.

### *Rio Frio Cave C*

As excavations in Rio Frio Cave A were wrapping up during the June 2019 season, Mike Mirro conducted preliminary documentation and mapping activities in Rio Frio Cave C, which he discusses in Chapter 4 of this report. Rio Frio Cave C, more commonly known today as “Rio Frio Cave” is one of the two excavated by Mason in the 1920s (Mason 1928, 1940). It remains a popular tourist destination for visitors to the Mountain Pine Ridge reserve and Caracol. In addition to providing a general description that places the cave in its geologic context, Mirro (Chapter 4 this report) presents a formal map of the cavern, and he discusses the dearth of artifactual material present compared to when Mason investigated it. His chapter ends with several suggestions for future research in it, including in locations that may have been investigated by Mason (1928, 1940).

### *Domingo Ruiz Cave*

Although we were unable to access Domingo Ruiz Cave during our June field season, we dedicated some of our December field season to documenting it. These investigations are discussed in Chapter 5 of this report. Two 1 m x 1 m excavation units were placed in the cave. Unit 1 was placed in a partially walled sub-chamber of the entrance chamber. We placed Unit 2 over one of two ash lenses near the center of the cave, adjacent to a broad travertine floor. Lastly, our investigations involved experimenting with a low-budget 360° camera to record a virtual walking tour of the cave.

Neither unit was very productive, but both revealed that little soil has accumulated in the cavern since the Classic period, and more likely back to the Pleistocene. The few diagnostic ceramics recovered from the excavations and surface collection reveal Late Classic period use. In particular, we recovered a Mount Maloney Black bowl sherd common to the Hats' Chak phase (670-780 CE) at Xunantunich (LeCount et al. 2002:Table 1). A chert biface was also surface collected from a travertine pool at the foot of a small stalagmite along the north wall of the middle of the cave where the passage bends to the east. A 3D model of the scene where it was recovered was made to record its context.

Perhaps the most significant find in our investigations in this cavern were several fragments of highly polished animal bone, possibly dating to the Pleistocene. The elements including

fragments of what may be equine teeth, and a scapula of a small to medium sized mammal with cutmarks.

### *Mountain Pine Ridge Reconnaissance*

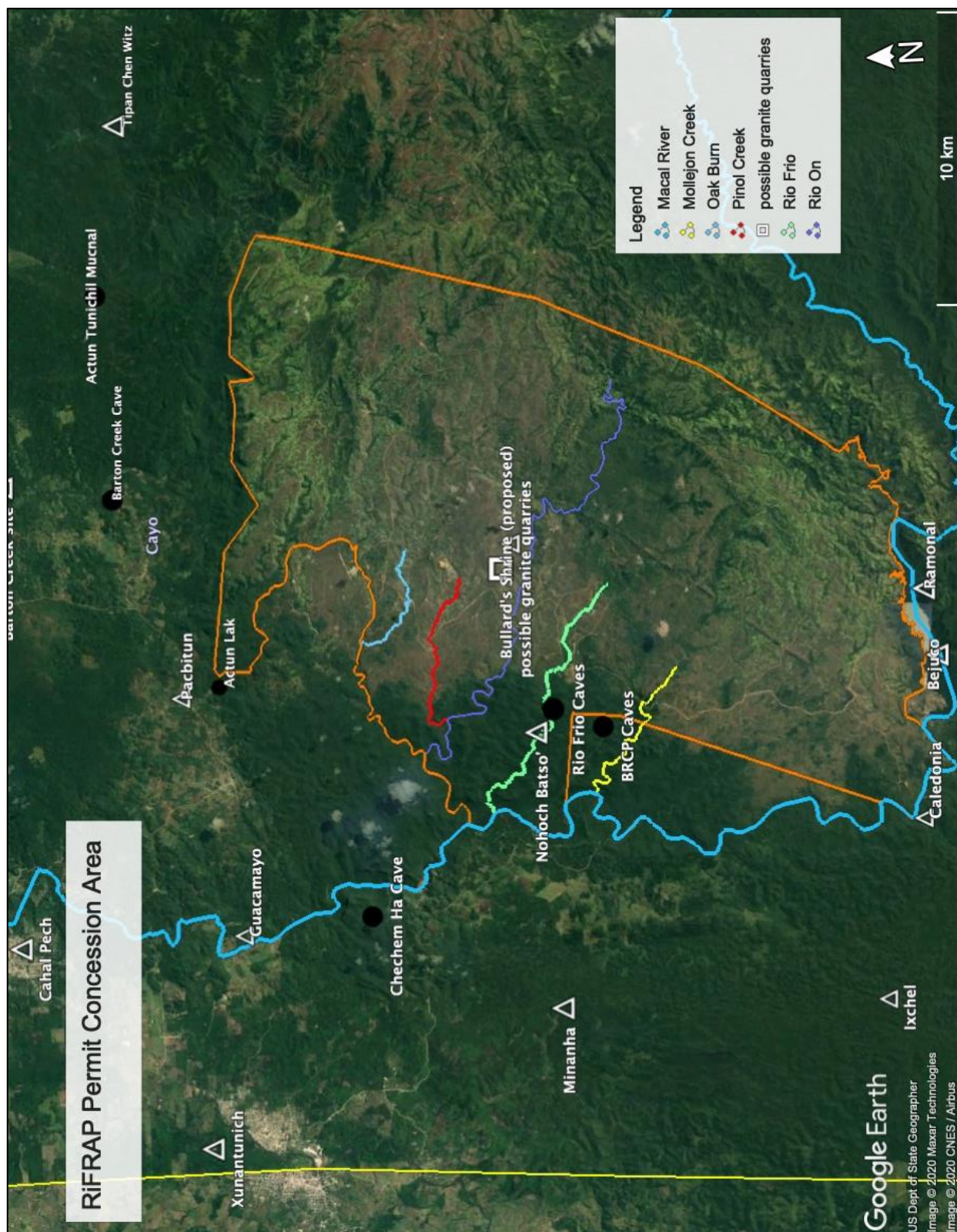
We conducted systematic, opportunistic survey of approximately 10 hectares along the Caracol road throughout the field season. In part, our survey strategy was dictated by the presence of veins of metamorphic rock, and outcrops of granite and slate from which samples were gathered for building a comparative geological collection. When a collection was made, the location of the rock was added into the project GIS. The results of these small surveys are presented in Chapter 6 of this report. These investigations recorded several isolated flakes, and one low-density lithic scatter. Artifacts in most cases were located on deflated hilltops and no associated features were observed making dating difficult. Nevertheless, what is important to note is that in nearly all areas surveyed, artifacts were encountered suggesting pre-Hispanic peoples were in the area in larger numbers and interacting with it more regularly than previously suspected.

### *Rio Frio Valley Reconnaissance*

Due to the complexities of excavations in Rio Frio Cave A, we were only able to dedicate one day to relocate Rio Frio Cave E. Although we were unsuccessful, we recorded 16 previously unidentified karst features, rural settlement, agricultural modifications, and a here-to-fore undocumented medium-sized center called Nohoch Batso'. These activities, and descriptions of the settlement are documented in Chapter 7 in this report.

The karst features (caves, rockshelters, sinkholes, etc.) identified are all comparatively small and shallow reaching no more than a few meters deep. Many contained evidence on their surfaces of having served a ritual function in the past, including stone manuports (rocks brought to the location by human agency), minor modifications, and ceramics.

We encountered low-density settlement throughout the area we conducted reconnaissance for Rio Frio Cave E, identifying 5-7 possible house mounds, a small hilltop complex with two or three disconnected courtyards, and a long hillside range structure and ancillary construction with a series of terraces below it. Agricultural terraces and dams across seasonal creeks were also recorded. Although time did not permit for a full exploration of Nohoch Batso', we documented that the monumental core contains at least 16 structures arranged around 3 or 4 east-west oriented plazas, and one toppled slate stela. Building types include pyramid-temples, open and restricted plazas, walls of uncertain function, and a possible sacbe.



**Figure 1.** Satellite image showing RiFRAP permit concession area and other known pre-Hispanic Maya archaeological sites in the region. Orange polygon is the permit boundaries, triangles are Maya settlements, and solid circles are caverns.



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## Chapter 2: Overview of the 2019 Excavations in Rio Frio Cave A

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June 2019 marked the second season of the Rio Frio Regional Archaeological Project (RiFRAP) in the Mountain Pine Ridge. One of the project's primary goals for the season was conducting excavations in Rio Frio Cave A (RFA) to establish its chronology and begin understanding how it was used. Our investigations mark the first scientific excavations conducted in this cavern. The only other excavations conducted there prior to ours were made by Gregory Mason who was on an expedition to Belize to collect museum quality artifacts (Mason 1928, 1940). Unfortunately, his reports were written to a general audience, do not contain maps or useful descriptions of where he excavated, and only a few of the ceramic artifacts he recovered were published.

Rio Frio Cave A was selected for investigations due to having been previously excavated, its large rock shelter entrance (**Figure 1**), and other culturally significant aspects for the Pre-Hispanic Maya. Within the center of the cavern is a large columnar formation that was modified to project a zoomorphic face onto the cave wall when lit (**Figure 2**). There is also a small stream that flows in the rear of the cave.



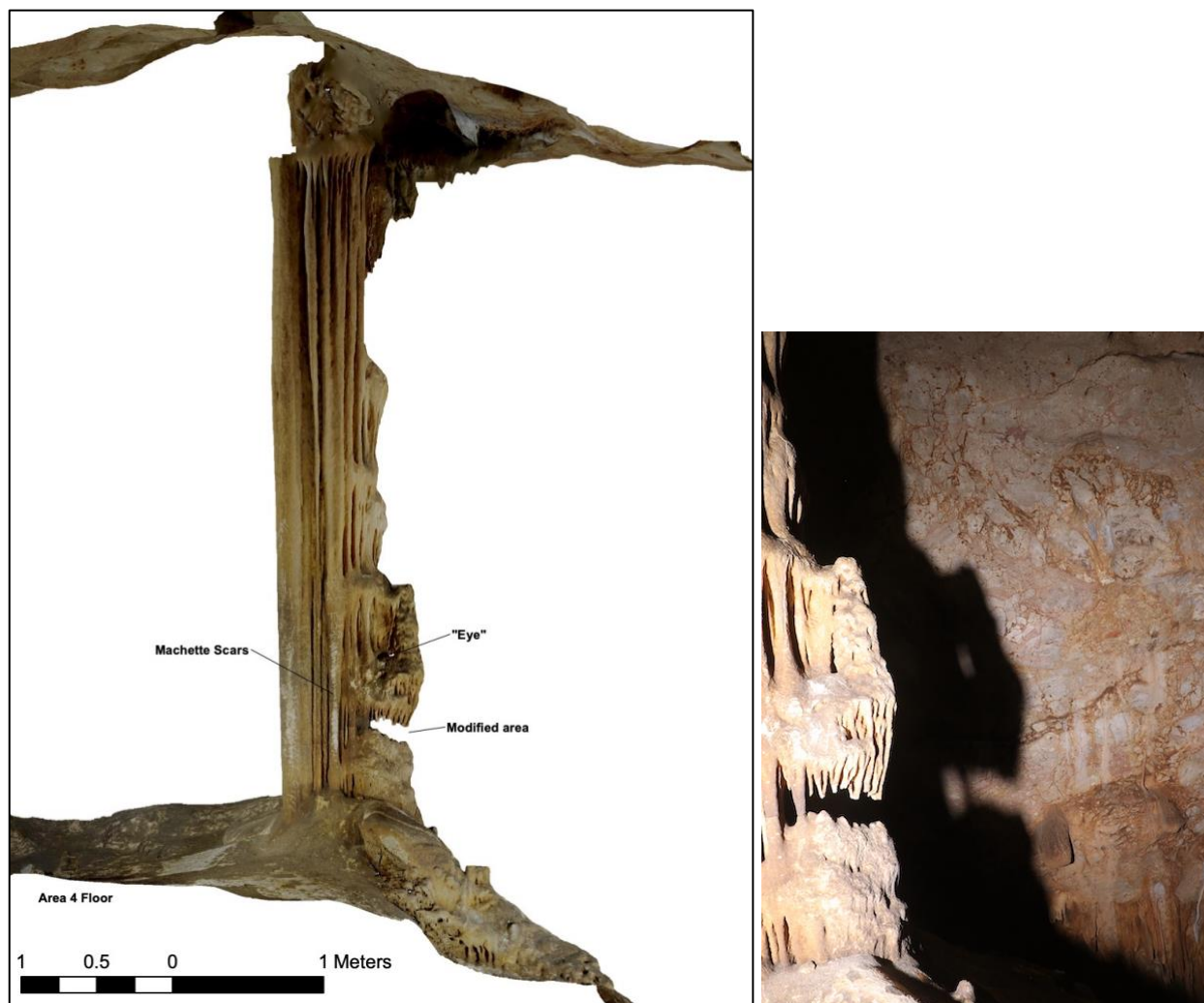
**Figure 1.** Rio Frio Cave A, Entrance (Photo by: J. Spenard).

We placed two 1 m x 1 m stratigraphic test excavations, called Unit 1 and Unit 2 in Chamber 1, the rock shelter entrance of the cave. Unit 1 was placed over a dense ceramic scatter (Location 100) along the rear wall in the approximate center of the chamber. Unit 2 was placed in an alcove approximately 2 m to the northeast (**Figure 3**). Unit labels were assigned based on the chronological order they were established. Excavation was accomplished using hand tools trowels, and all matrix was screened using 1/4" wire mesh. Unit plans and profiles, and a symbol legend are given at the end of this chapter in an appendix titled, "Plan and Profile Drawings Appendix."

Ceramic totals from each unit remain to be tabulated, instead, we report only on the diagnostic ceramics recovered to assist with chronology building. In short, the pottery closely resembles ceramics from sites in the Belize Valley, but several unique local modes have begun to emerge. These are most obvious of those are on unslipped jars which have a variety of decorative handle types and applique elements. Moreover, similar to the observations made by Pendergast (1970) about the material recovered from Rio Frio Cave E, ceramics from RFA resemble found in Belize Valley sites and most stylistically date to the Late Classic period with some Early Classic period material present.

## Unit 1

Unit 1 is a 1 m x 1 m square placed along the eastern wall of Chamber 1 directly in front of a small, low alcove (**Figure 4**). The area was chosen for excavation due to the dense ceramic scatter

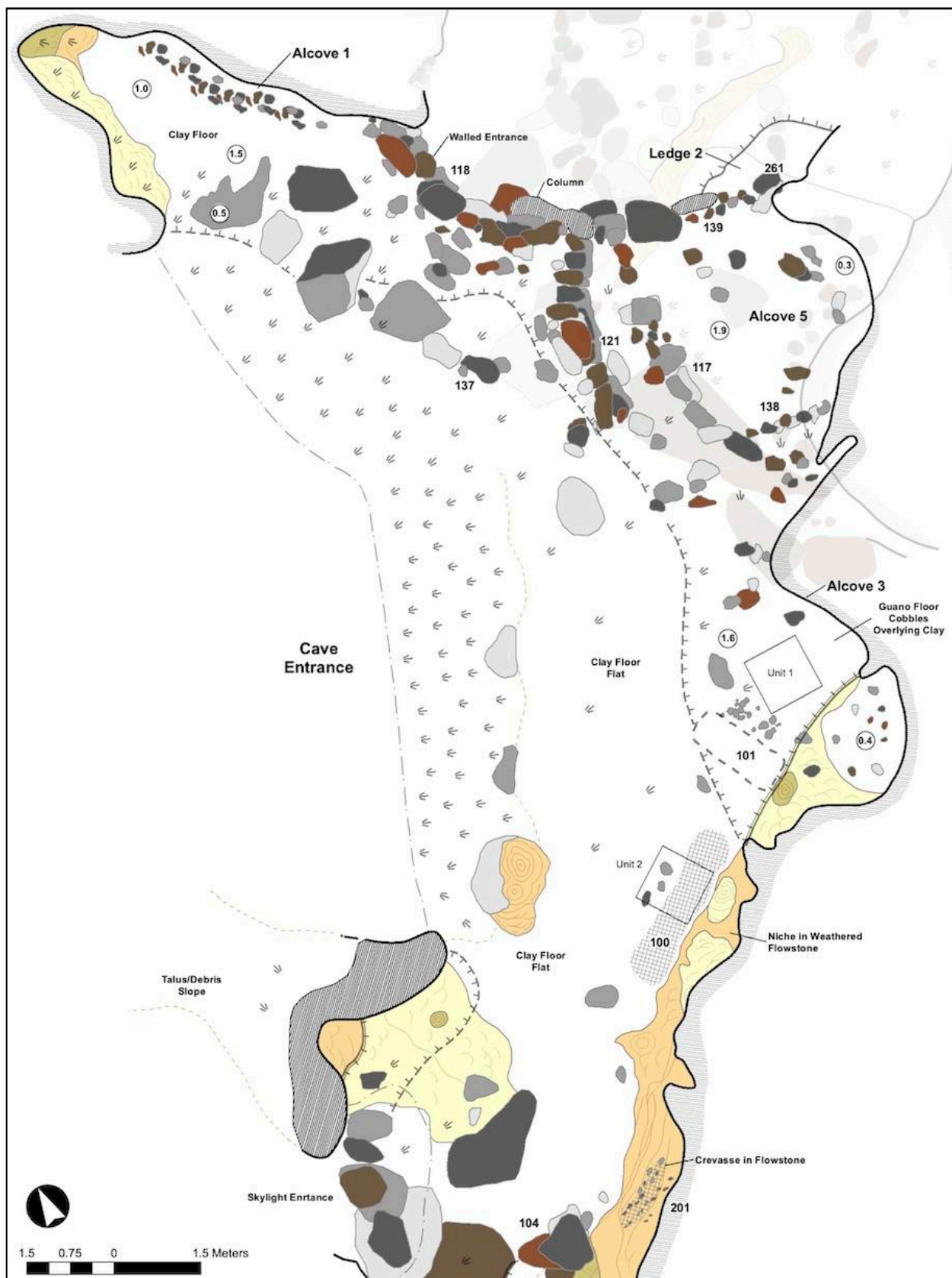


**Figure 2.** Image captured from 3D model of modified column in Rio Frio Cave A (left image; by M. Mirro); detail of modified columnar formation casting a zoomorphic shadow on the cave wall (right image; photo by J. Spenard).

recorded as Location 100 (Mirro and Spenard 2018). That scatter is unique in the entrance area, and thus held the most potential for collecting ceramic chronological data. The unit was also placed there because we aimed to understand the kinds of ritual activities that were performed in this part of the cave.

The matrix of level one is very dark brown (10YR 2/2) cave sediment mixed a high density of ceramic sherds. A large concentration of charcoal was uncovered along the northwestern wall at a depth of 3cm, and another in the southeast corner strewn between several large cobbles. The charcoal in the southeast corner was preserved in very large chunks suggesting little disturbance of the area since it was deposited. The charcoal in the northwest corner was significantly smaller. Once exposed, we pedestalled the southeast corner concentration of cobbles and charcoal in case they represented a feature. The remainder of the unit was excavated to 16 cm below surface where





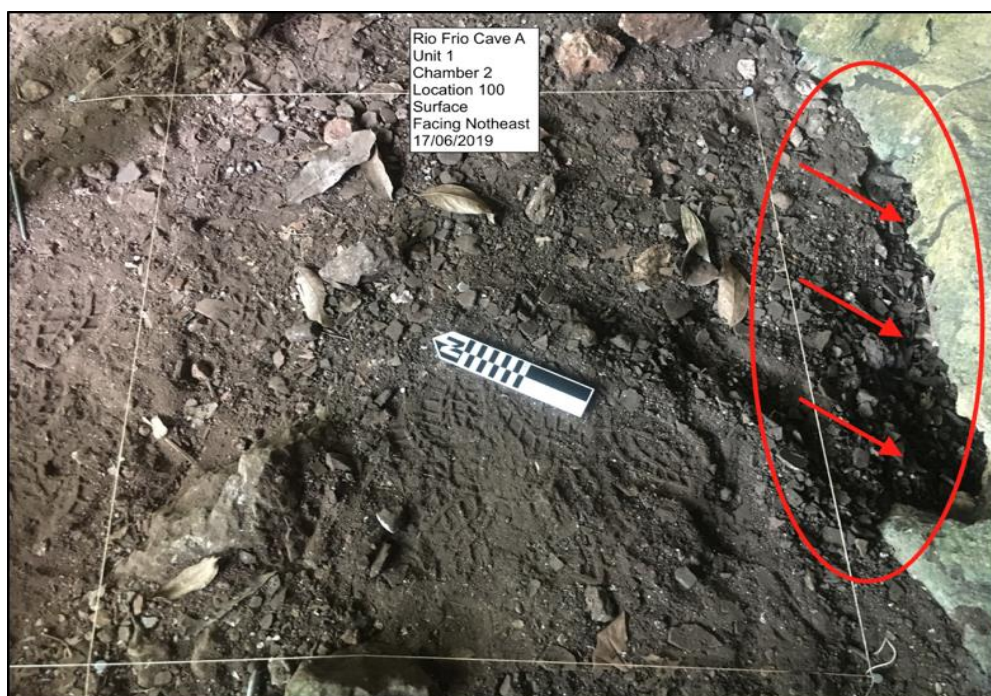
**Figure 3.** Map of Rio Frio Cave A entrance area showing location of excavation units.



we encountered a significant change in soil consistency, and drop in ceramic density, marking the end of the level.

Ceramics from Level 1 stylistically date to the Late Classic period and include specimens from Tumbac Unslipped and Peten Gloss wares, and the Mount Maloney and Garbutt Creek groups (**Table 1**), although one Aguila Orange dish rim dating to the Early Classic period was recovered. Drops of burned tree sap, likely copal, were noted in the bottom of the level and on a few of the ceramic sherds. The presence of the copal indicates ritual practice.

The makeup of Level 2 is complex. On the western side, the matrix and ceramic density remained relatively unchanged from the level above. But, in the eastern side, the ceramic density plummeted when the change in matrix consistency was encountered. From several cm into the southeastern corner to the approximate middle of the unit a significant portion of the matrix was a morass of hard, compact soil, charcoal, and a dense concentration of rodent and small mammal bones. A heavily polished bone fragment was recovered with that zoological material. In the baulked outeast corner, we uncovered a massive chunk of burned wood, identified by Javier Mai as Red Wood. Beneath that was a thick ash layer, similar to those uncovered in Unit 2, discussed below. The ash lens spread from the southeast corner and into the entire eastern half of the unit. On the edge of that lens, we uncovered a large undecorated jar sherd that may have been used to line a burn pit because the ash lens did not continue beyond. The ash lens was several cm thick, below which the matrix returned to the very dark brown (10YR 2/2) color encountered at the start of the unit. The level was terminated at 30 cmbs where we uncovered an ash lens throughout the unit. Collectively, the concentration of cobbles in the southeast corner of the unit and the underlying ash deposit covering the entire eastern half of the unit are referred to as Feature 1.



**Figure 4.** Unit 1 facing northeast showing the ceramic scatter on the surface and the slope of material funneling into the small alcove beneath the cave wall (Photograph by J. Spearnd).

**Table 1.** Identifiable ceramics recovered from Unit 1 Level 1.

Cave	Unit	Level	“Type”	Form	Comments	Time Period
RFA	1	1	Cayo Group	N/A	Punctations and incised	Late Classic
RFA	1	1	Cayo Group	N/A	Punctations and incised	Late Classic
RFA	1	1	Cayo Unslipped	Jar	Rim sherds	Late Classic
RFA	1	1	Tumbac Unslipped	N/A	Punctations	Late Classic
RFA	1	1	LCP Form	Globular Jar	N/A	Late Classic
RFA	1	1	Rubber Camp Brown	Bowl	N/A	Late Classic
RFA	1	1	UID Clinky	N/A	N/A	Indeterminate
RFA	1	1	Saxche-Palmar Polychrome	N/A	Punctations, red background with thin black line	Late Classic
RFA	1	1	LCP Form	Globular Jar	N/A	Late Classic
RFA	1	1	Cayo Group	N/A	Punctuation and incised	Late Classic
RFA	1	1	Cayo Group	N/A	Jar rims and neck	Late Classic
RFA	1	1	Tumbac Unslipped	N/A	Punctations and incision (waved)	Late Classic
RFA	1	1	Rubber Camp Brown	Bowl	N/A	Late Classic
RFA	1	1	Dolphin Head Red	Dish	N/A	Late Classic

Few diagnostic ceramics were recovered in Level 2, and all belonging to the Cayo group of the Late Classic period. Many of the sherds were decorated with punctations, incisions, and pinched applique bosses. In addition to several soil and ash samples, Feature 1 artifacts include *jute* riverine snail shells, ceramics, and an obsidian blade fragment. One of the *jute* shells was very large, while the others were small. Javier noted that the large ones live in the big rivers, like the Macal, and the smaller ones live in the smaller creeks like Rio Frio. Sourcing experiments, whether in the lab or by collecting specimens in the field should be developed to test this observation.

Level 3 excavations proceeded to uncover the ash lens prevalent throughout the unit exposed at the bottom of Level 2. Excavations proceeded for only a few centimeters from the start of the level until we exposed a tamped earth or possibly very poorly preserved plaster floor. The level was completed once the top of the tamped or plaster floor was uncovered at 35cm below the surface (**Figure 5**). Late Classic period unslipped ceramics belonging to the Cayo Group and Tumbac Unslipped wares were the only identifiable pieces of pottery recovered.



**Figure 5.** Unit 1 tamped or poorly preserved plaster floor encountered 35 cm below the surface. Note remnants of ash lens in eastern side of unit, and thick ash lens in profile of facing unit wall (photo by J. Spenard).

We collected samples from the floor them to determine if they were plaster and if there are any residues or charcoal tamped into them. This sampling strategy was developed because we encountered a few *jute* snail shells and an obsidian blade fragment on the surface of the floor. Beneath, the matrix was composed of a band of mottled microstratigraphy consisting of very thin dark brown (7.5YR 3/2) patches interspersed with very thin ash lenses, indicating heavy and regular ritual use. Artifactual materials recovered within the unit consist of *jute* snail shells, animal bone, and ceramics (**Table 2**). Very large chunks of charcoal were also encountered and collected for paleoethnobotanical identification and radiocarbon dating. Among the microstratigraphic layers, we encountered a pit filled with ash and mottled soil into which another smaller pit was excavated and filled with the same pattern. Because of the complexity of the stratigraphy below the floor, and to maintain control over the data coming out, we terminated the level after excavating 10 cm below the floor.

The matrix of Level 5 is identical to that of Level 4, consisting of mottled dark brown (7.5YR 3/2) soil and gray ash. We proceeded to excavate another 6 cm from the top of the level recovering nondiagnostic ceramics and charcoal. Unfortunately, while excavating, a good portion of the southeast wall in front of the small alcove in the cave wall collapsed. The materials from that collapse were bagged separately, but they include a complete obsidian blade and a nearly

**Table 2.** Diagnostic ceramic sherds recovered from level 4.

Cave	Unit	Level	“Type”	Form	Comments	Time Period
RFA	1	4	Cayo Group	N/A	Punctuation and incised	Late Classic
RFA	1	4	Tumbac Unslipped	N/A	Punctuation	Late Classic
RFA	1	4	Puncte Brown	Bowl	Basal flange and body	Early Classic
RFA	1	4	Pine Ridge Carbonate	N/A	Red slipped interior, flat, thick plate base	Late Classic

complete charred immature maize cob (**Figure 6**). After the contents of the collapsed side wall were sifted the unit was closed for the 2019 season at a depth of 48cm below the surface.

Undoubtedly, this unit should be reopened, and excavations expanded in future seasons. It was very productive and contains a rich stratigraphic and artifact record of activities performed in the cave. Should the unit be expanded in future seasons, it should include the small alcove in the cave wall. It should also move along the cave wall and join with Unit 2. To mark the bottom of the unit, we placed the unit string along the bases of the walls and placed three 2018 Belize coins down in the northeast and southwest corners and in the center of the unit. Additionally, the corner stakes were pushed down a few centimeters below the current cave surface

## Unit 2

Unit 2 is 1 m x 1 m pit oriented northwest-southeast and placed in Alcove 3 (**Figure 7**). It is just east of Locations 100 and 101, the dense surface ceramic scatter Unit 1 was set up on, and an alignment of small to medium limestone rocks that partially frame the alcove, making it a distinct space within the cave entrance (Mirro and Spenard 2019:Table 1). We placed this unit in that location because project co-director, Mike Mirro, mentioned that alcoves had ritual significance to the Ancient Maya (e.g. Spenard et al. 2020). Our goal with the unit was to determine if the alcove was used for ritual activities, and if so, what were their purpose? We also hoped to understand the relationship between the two locations and the alcove.

When we began our excavations in Unit 2, we planned to use arbitrary 10 cm levels; however, we quickly encountered cultural stratigraphy, which we used instead. The surface of Level 1 had medium compact, very dark gray brown matrix (10YR 3/2) and a very low artifact density. But within the first few centimeters of excavation we uncovered an ash deposit in the southeast corner that spread throughout the southern portion of the unit. We collected two, gallon bags of the ash for ethnobotanical analysis, appearing to effectively remove the “feature” from the unit, and then proceed with our excavations of the level. Directly below the ash deposit, we encountered a much thicker deposit of ash, while the matrix of the rest of the unit became mottled with ephemeral ash lenses and the same soil found on the surface of the unit but loosely compacted.





**Figure 6.** Immature maize cob recovered from Unit 1 (photo by J. Spenard).



**Figure 7.** Image showing location and context of Unit 2. Project members (from left to right) Andres Berdeja and Jessica Garcia are excavating the unit, while Javier Mai conducts a surface collection on a small ledge between units 1 and 2 (photo by J. Spenard).

Within the thicker ash deposit, we recovered a bell-shaped shell pendant (**Figure 8**), ceramics, faunal bone, and *jute* snail shells. A second, deeper ash deposit was uncovered in the northern side of the unit, but several cm below the original deposit in the south, which at the time suggested they were created during distinct events. We collected a 1L sample from this smaller ash deposit for ethnobotanical analysis.

After uncovering the second ash deposit, the western wall of the unit suffered a significant collapse, due to the loose compaction of the matrix. That material was screened and bagged separately. From it, we recovered some ceramic sherds and an obsidian blade fragment that may be part of one found in Level 1.

As excavations continued, we uncovered ash throughout the unit indicating the two deposits were not independent, but rather part of the same strata that spread beyond the walls of the unit. The level was terminated when a compact dark brown (7.5YR 3/2) matrix was exposed throughout most of the unit. Artifacts recovered from the level include ceramics, three obsidian blade fragments, large chunks of charcoal and a calcined, immature corn cob fragment.

Level 2 turned out to be relatively shallow, measuring only a few cm in depth, yet it was very productive. Pockets of ash continued to be present, but the artifact density increased greatly. Artifacts recovered include an obsidian blade fragment, a chert flake, ceramics, crab claws, a large quantity of charcoal, including another burned, juvenile maize fragment. The level was terminated when a poorly preserved plaster floor was uncovered in the northwestern corner of the unit (**Figure 9**).

After the plaster floor had been fully exposed (Level 3), we collected a sample of the material to test whether it is plaster or tamped earth. That sample is awaiting analysis. The matrix below the floor was dark brown (7.5YR 3/3), densely compacted and contained few cobbles, but pebbles were common. Excavations proceeded to go through the floor under which several large chunks of charcoal were encountered. These were collected for ethnobotanic analysis and radiocarbon dating. A few cm below the plaster floor, we uncovered another tamped earth floor at which point we ended Level 3 and began Level 4. In addition to charcoal, we recovered some ceramics, although they are non-diagnostic.

From the surface of this lower floor (Level 4), we collected a 1-L sample of charcoal to use for ethnobotanic analysis and radiocarbon dating. Coming from closed contexts, the charcoal collected from just below the plaster floor in Level 3 and on top of the floor in Level 4 can be used to create a detailed chronology. In addition to the charcoal, a single *jute* snail shell and ceramic sherd were collected from the surface. The matrix is similar in color and composition that that of Level three, it is very compact, dark brown (7.5YR 3/3) and relatively free of large cobbles although pebbles are common.

Below the floor, a dense concentration of small animal bones was uncovered in the southeast corner, the rear of the alcove. Whether this is cultural or natural remains unknown, though it is likely the latter. Small animals such as bats, birds, and a wide variety of small rodents live in and around cave entrances. Their presence is easily explained as small animals that crawled to an easy-to-reach secluded corner of the rockshelter at the end of their lives. Nonetheless, some





**Figure 8.** Shell pendant recovered from Unit 2 (photo by M. Mirro)



**Figure 9.** Possible plaster floor in Unit 2. The human remains discussed below were recovered from underneath this floor (photo by J. Spenard).

of the bones showed evidence of having been burned, though that too may be explained as their being in the ground in an area where past Maya peoples regularly burned offerings. Large to massive chunks of charcoal and ash scatters continued to be uncovered throughout the unit. Interestingly, mixed into the matrix of this level were small stalagmitic cave formations. There is evidence of formation breakage in the ceiling above, although those from the unit are smaller than the scars on the ceiling. Where the small formation in the unit came from remains currently unknown. Artifacts recovered in Level 4 were few but include *jute* shells, chipped stone lithics including quartzite shatter and chert flakes, and ceramics. The recovered pottery was nondiagnostic unslipped utilitarian wares.

The traces of pre-Hispanic Maya activities uncovered in Level 5 are complex, and we only have a partial understanding of how that space was used because much of them spread beyond the walls of the unit and time did not permit expanding the unit. Future research in this cave should focus on expanding investigations in this area.

The matrix of Level 5 changed drastically from that above. It maintained its dark brown (7.5YR 3/3) color, but it is heavily bioturbated being peppered with fossilized wasp nests and other insect burrows. These intrusions likely happened when the cave was used during pre-Hispanic times as there is no evidence of disturbance in the levels above.

Along the western wall of the unit, below the series of floors recorded in Levels 3 and 4, we uncovered human skeletal material in poor condition. Identified bones include rib fragments, teeth, vertebrae, and a sacrum. The sacrum was found anterior face up and shows partial epiphyseal fusion between S2 and S5. S1 was found separated 5 to 10 cm southwest. The state of epiphyseal fusion indicates the individual was late adolescent to young adult (roughly estimated 16 to 25 years). Due to their poor state of preservation, it was not possible to determine if they were bundled and part of an offering or cache of some kind, or if it was a primary burial disturbed in antiquity when the fire pits were dug. The latter is likely as pre-Hispanic Maya peoples regularly used rock shelters to bury their dead (Saul et al. 2005; Spenard 2006; Prufer 2002). Further exaction will be required to determine the burial position and type as well as age and sex of individual.

The human remains and artifactual material from inside and around the remains were collected as Feature 2. Many of the remains were recovered from beneath a cluster of rocks that may have been purposefully laid down and aligned. Unfortunately, only a small portion of these rocks and the remains were captured in the unit walls. Both continued into the western wall, and future excavations should expand in that direction.

In the center of the unit, our excavations revealed a dense ash lens reaching approximately 40 cm in diameter. Inside were burned and fragmented *jute* snail shells but very little charcoal. It remains unclear if this burning is related to the nearby human remains. Nevertheless, as discussed in further detail below, through the southern Maya Lowlands, *jute* snail shells and chert and obsidian flakes are often recovered in rock shelter burial contexts (Spenard 2006, 2014).

## A Preliminary Interpretation of the Maize Cobs (by Ariana Yanez)

Among the artifacts recovered during our excavations in Rio Frio Cave A were several immature, charred corn cobs (**Figure 6**). Here, I discuss the importance of maize to past and contemporary Maya peoples. Specifically, I focus on the symbolic importance of caves as the source of fertility and as homes of gods and other agriculturally-based supernatural beings. These data suggest that the cobs we recovered during our excavations of Cave A may indicate first fruit agricultural ceremonies were performed there.

Ethnohistoric and ethnographic data have long helped Maya archaeologists understand the symbolic significance of the material remains we study, especially related to maize. The Popol Vuh is the 16<sup>th</sup> century K'iche' Maya version of the origin story of Maya people (Tedlock 1996). According to that story, Maya people were made from maize found in a cave (Morehart 2011:18). Ethnographic data also reveal a close relationship between caves and corn. Among the Q'eqchi' Maya of Guatemala, *tzuultaq'a*, or mountain-valley are sacred mountains with caves inside them. (Adams and Brady 2005:301-303). Each Q'eqchi' Maya community recognizes 13 *tzuultaq'a* as their primary patron beings. Far from simple mountains, these mountain-valleys are considered to Earth Lords, the owners of the land and forests around them and everything found within them (Adams and Brady 2005: 301-303). Among K'iche and Tzotzil Maya people, mountains are considered to contain watery caves. Morehart (2011:18) notes that "The Mopan Maya of San Antonio, in southern Belize believe that the first maize was found beneath a rock or in a hole in a rock, stressing its subterranean origin," similar to the Popol Vuh. Even today, Maya people still emphasize that maize is related to something underneath such as caves. Javier, our local foreman who is Yucatec Maya mentioned that caves are very powerful since they are living entities. Towards the end of our field season, Javier informed us that you always have to give and make an offering if you take from a cave. This demonstrates a reciprocal relationship between people and caves.

Paleoethnobotanical research by Morehart (2011) has demonstrated that one of the ways the relationship between maize and caves was commonly expressed by Maya peoples of the Belize Valley was through first-fruit agricultural ceremonies performed in underground locations. He tested archaeobotanical data from seven caves in the region, Actun Nak Beh, Twin Caves 2, Tarantula Cave, Barton Creek Cave, Actun Chechem Ha, and Actun Chapat, and Actun Halal, and found maize remains in three of them. In Actun Chapat excavations recovered several carbonized, corn kernels in Terminal Classic period contexts (Morehart 2011: 55). Archaeologists at Chechem Ha Cave recovered 7 non-carbonized corn cobs from inside Late Classic period jars. There was evidence in the jars that others were originally placed within but had disintegrated (Morehart 2011:64). Further, Morehart (2011:109) notes that the cobs were undeveloped, or young ears of maize, identical to those found in Rio Frio Cave A. In Barton Creek Cave, archaeologists recovered complete corn cobs, ears, kernels, and stem fragments (Morehart 2011).

In his discussion of first fruit ceremonies, Morehart (2011) notes that many contemporary Maya groups leave their first crop as offerings in caves or local churches. The "first fruit ceremony" is an offering to the caves and the earth deity in order to provide sustenance for them. Mam Maya leave roasted ears of corn at local churches for patron saints (Morehart 2011:114) Yucatec and Lacandon Maya people offer unprocessed green ears to the earth forces (Morehart

2011:115). The relationship between Maya peoples and the underworld-dwelling Earth Lords is reciprocal. Maya people offer their first to the Earth Lords, who, in turn, provide food and sustenance. Given the similarities between underground settings and characteristics of the cobs recovered, we propose the rock shelter entrance of Rio Frio Cave A was used, in part, for first fruit agricultural rituals.

Moving forward, there remain plenty of avenues for future research on the maize from this cave and understanding first fruit ceremonies. Does the fact that some of the cobs were fragments and others whole represent intentionality by the Maya or are their states the result of taphonomic processes? Future research can determine the species of corn to learn if it is from the area or imported from somewhere else from Mesoamerica. The wood charcoal found within the same levels as the cobs are larger than in other levels. Was this simply the result of a fire, or was the wood part of the ritual offering of the first fruit ceremony? The relationship between the corn cobs and obsidian blades found within the same level would be something that can be investigated. Was there blood being offered as part of these ceremonies because of the evidence of obsidian blades within the units and found within the same level as the maize. What relationship, if any, did the immature cobs recovered from Unit 2 have with the human remains from the same unit?

### **Archaeological and Ethnographic Analogies for Use of *jute* in Rio Frio Cave A (by Andres Berdejea)**

Freshwater mollusks known as *jute* (*Pachychilus* spp.) are commonly found at Maya sites, and are consumed by contemporary Maya in Belize (Halperin et al. 2003; Healy et al. 1990). The appearance of the shells at other Maya ritual sites in the region, suggests the remains of *jute* in Rio Frio Cave A were deposited in a ritual context as opposed to remains of dietary subsistence. Throughout the 2019 field season important ethnographic data was offered to us about the contemporary use of *jute* in the town of San Antonio located in the Cayo District of Belize.

Intact, and spire-loped *jute* shells were recovered from Units 1 and 2 in Rio Frio Cave A, and in both, the shells were found with ceramic sherds, obsidian flakes, an obsidian blade, and in ash pits that held charcoal and faunal remains. The ceramics date stylistically to the Late to Terminal Classic periods. In addition to the artifactual material noted above, the shells were also associated with a shell pendant, charred maize cobs, a plaster floor, and human remains. Collectively, these data suggest the shells are associated with ritual actions, and in the case of Unit 2, those ceremonies were related to human interment or remembering the deceased. Although we have yet to tabulate the number of *jute* shells we recovered in the two units, our totals were much lower compared to other Maya cave sites where upwards of tens of thousands have been collected (**Table 3**). Nevertheless, the context they were recovered in and the archaeological materials they were associated with indicate they were deposited in the cave with ritual intent.

When we started encountering the shells in our excavations, our local Maya foreman, Javier, told us about how he collects *jute*, and the importance of following the prescribed ways. He noted that it is important to walk in a straight line and keep forward momentum when collecting the shells. During collecting, if one grabs a small shell, it must be collected and not put back. Turning around while collecting or replacing a small shell can cause the rest of the harvest to spoil.

Moreover, large *jute* are found in the Macal River, while the smaller animals are found in the creeks and streams. In San Antonio today, people still eat the gastropod, and after the animal is eaten, the shells are deposited in one spot in a house lot to protect people's feet from getting cut and scraped.

As noted above, Q'eqchi' Maya of Guatemala call cave-filled mountains and valleys, *tzuultaqa* or 'Earth God', and as owners of all natural things they believe the hills must be petitioned to and thanked whenever their resources are used (Adams and Brady 2005; Brady and Prufer 2005). In this sense, I believe the *jute* could have been purposely placed in Rio Cave A as an offering back to the cave in return for a good harvest in the following seasons. There is also evidence at Lake Atitlan in Guatemala, where the contemporary hunters perform rituals of thanks by placing the butchered remains of their prey in rock shelters. According to Brown and Emery (2008), contemporary Maya people who live near Lake Atitlan describe this process as the planting of the bones with the intention of returning the spirit of the animal to the Earth Lord so the spirit can be released again in the near future. These cultural insights into Maya ideology helps researchers understand how the ancient Maya might have perceived their natural landscapes as animate rather than nonliving.

Ethnographic data on food trends in San Antonio, Cayo in the 1980s (Healy et al. 1990) suggested that the use of *jute* was drastically declining and would likely disappear in the near future. That researcher specifically revealed that the majority of *jute* collection, preparation, and cooking was accomplished by the later generations, with about 80% of people 60 years of age or older having consumed *jute* in their lifetime (Healy et al. 1990:179). The perception of *jute* among the younger members of the community then was that snails are an inferior, poor person's food, and predictably, many informants seemed reluctant to admit having consumed them (Healy et al. 1990:179).

Our experiences during the 2019 field season at the Another Beautiful Day in San Antonio community celebration reveal those 1980s food trends have reversed. Another Beautiful Day in San Antonio is a community celebration of Maya lifeway with a focus on connecting the present and past through school projects, demonstrations of pok-ta-tok (the ballgame), contemporary Maya music, art, and food, and displays by archaeological projects, including RiFRAP, and the IA. One vendor had prepared *jute* soup, and she had sold out long before the day was over (**Figure 10**). In fact, the same vendor had prepared the soup the previous year and it had sold out in a few hours. The soup for the 2019 celebration only lasted a short time longer.

In conclusion, there is strong evidence suggesting that the *jute* shells uncovered in the Entrance Chamber of Rio Frio Cave A were associated with ritual behavior as opposed to being discarded as profane food waste. The possibility remains that Maya people could have eaten the *jute* as part of a ritual meal, and/or then transported the remains to the cave as a final destination after a ritual ceremony. There were both spire-loped and fully intact shells deposited with the human remains, obsidian bloodletting blades, and ceramics in Excavation Unit 2 that correlate with archaeological data recovered from cave sites such as Naj Tunich, and Cueva de los Huesos in Guatemala (Brady 1989; Sanchez 1993). The new ethnographic data suggests that the use of *jute* by the contemporary Maya community in San Antonio is on the rise, and it will continue to become popularized through celebrations of the rich cultural heritage of the Maya.



**Table 3.** Distribution of *jute* from Cave Contexts (after Halperin et al. 2003: 210).

Cave Site	Cave Type*	Amount Recorded	Intact or Spire-lopped	Source
Abrigo Camcum	D	4,338 kilos	spire-lopped	Lee and Clark 1988
Actun Balam	D	1,000+	spire-lopped	Pendergast 1969
Actun Chechem Ha	D	24	NA	Ishihara 2000
Actun Nak Beh	D	1,339	spire-lopped (89%)	Halperin 2002
Actun Tunichil Muknal	U	457	spire-lopped (majority)	Griffith 1998
Actun Uayazba Kab	D	4000+	spire-lopped (majority)	Gibbs 1998; Ferguson and Gibbs 1999
Actun Yaxteel Ahau	U	1848	spire-lopped (92%)	Halperin 2000; Mirro and Awe 1999
Balam Na Cave 1	D	7	spire-lopped (43%)	reported here
Balam Na Cave 4	D	28	spire-lopped (78%)	reported here
Candelaria Cave	U	many	NA	Carot 1989
Caves Branch Rockshelter	D	1000+	spire-lopped (majority)	Bonor 1995; Stanchly and Song 1995
Cueva de el Duende	D	1	not spire-lopped	reported here
Cueva de las Aranas	D	few	spire-lopped	Brady et al. 2000
Cueva de los Huesos	D	240	spire-lopped	Sánchez 1993
Eduardo Quiroz	D	1	NA	Pendergast 1971
Footprint Cave	U	219	spire-lopped (100%)	Graham et al. 1980
Hokeb Ha	D	2	spire-lopped (100%)	Palacio 1977
Indian Creek (Cave)	D	100+	NA	Gann 1929
Jolja' Cave	D	100 +	spire-lopped (50%+)	Halperin 2001; Bassie 2002
Mayahak Cab Pek	D	10000 +	spire-lopped (50%+)	Goldstein and Prufer 1999
Mohibal Kanchi	D	1000+	spire-lopped (50%+)	Goldstein and Prufer 1999
Naj Tunich	D	522	spire-lopped (90%)	Brady 1989
Petroglyph Cave	D	1,000,000+	spire-lopped	Macleod and Puleston 1978
Saki Tzul	D	1000+	spire-lopped (50%+)	Prufer 1999
San Pablo Cave	D	248	spire-lopped (many)	Lee and Hayden 1988

\*U = presence of underground river or stream, D = dry cave, may or may not have drip water activity.



**Figure 10.** Photo of *jute* soup served at the community celebration in San Antonio (photo by A. Berdeja).



## **Preliminary Interpretations of the Human Remains from Rio Frio Cave A (by Jessica Garcia)**

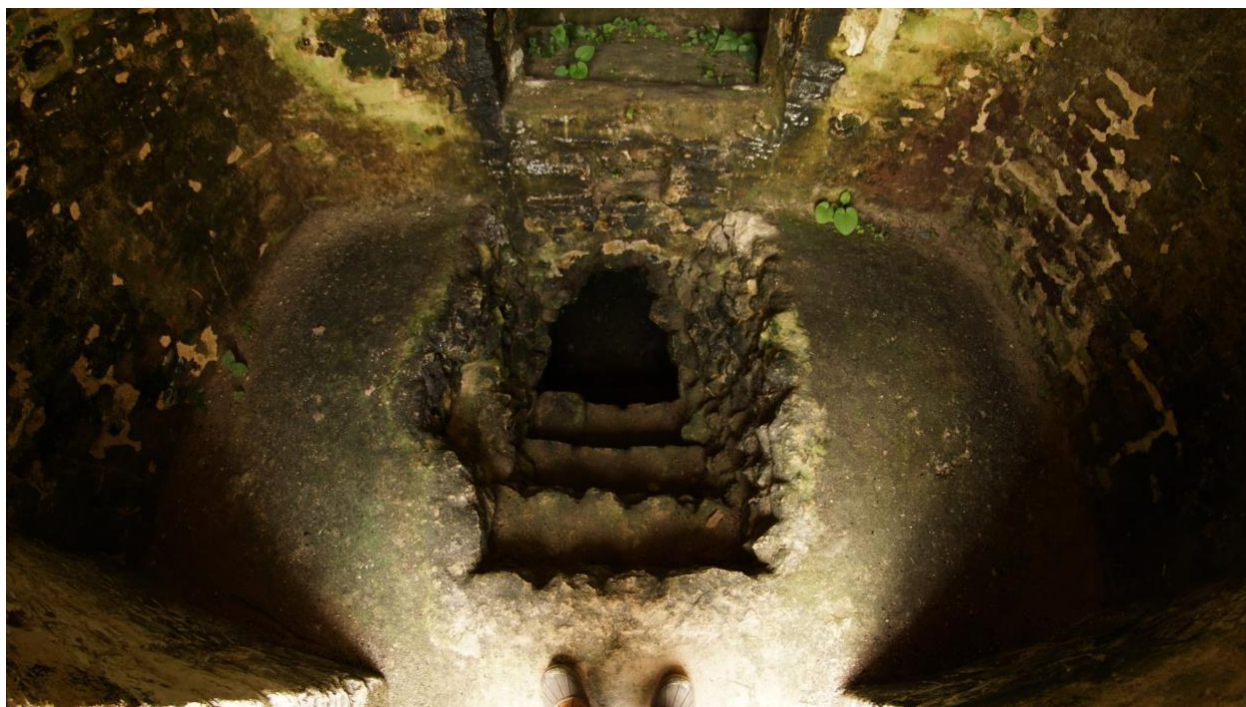
Caves hold significance for various reasons to the Ancient Maya. While debate still surrounds who was allowed to access the dark-zones of caves, rock shelters were undoubtedly used and visited by people of all social classes. Cave entrances tended to be used for public ritual ceremonies, while interior areas were for more private audiences. With this in mind, I discuss the human remains recovered from Rio Frio Cave A Unit 2.

In Unit 2, we recovered chert flakes, obsidian prismatic blades, jute snail shell, crystal fragments, animal bone, and a shell pendant. Ceramic sherds were found throughout the entirety of the unit, dating primarily to the Late Classic period. Approximately 50 cm from the current surface of the cave, we uncovered the edge of a plaster floor. Below that was a series of disarticulated human bone and teeth.

Human remains recovered throughout the Maya region have been interpreted widely from victims of sacrifice to venerated ancestors (Owen 2002, 2005; Scott and Brady 2005; Spenard 2006). In rockshelters, Maya people would scatter human remains as secondary burials, and in other cases, the crania and long bones of prominent ancestors were removed and placed on altars (Wrobel et al. 2017). However, I do not believe this is the reason the remains in Unit 2 were in disarray.

Through visiting nearby sites, I started to notice the similarities between tombs and caves. **Figures 11 and 12** are from a tomb at the site of Caracol, 40 kilometers southwest of the Rio Frio Caves. The tombs there quite literally resembles a cave. Walking down into one of them gave the impression that anyone descending these stairs were walking down into Xibalba, the Maya underworld. Once down there, the space was small. At Caracol, many tombs were used to house more than one burial (Chase and Chase 1994). The archaeological record shows that when an individual was buried within one, the bones of the previous interment were simply swept to the side when the new body was laid to rest (Healy et al. 1998). Investigating the aesthetic similarities of these tombs and caves lead me to realize a few patterns between the two kinds of places.

Ancient Maya people regularly buried many individuals in rock shelter entrances within Belize. Some examples range from 20 to presumably 500 individual burials depending on the different rock shelters due to their size, their significance, and their placements within the landscapes (Wrobel et al. 2017; Saul et al. 2005; Healy et al. 1998). It is important to note that all these burials similarly had jute snail shells, obsidian prismatic blades, and chert flakes found within them. Though most of these sites were used for generations, precise locations of the buried individuals seem to have been forgotten. Excavations often reveal the skeletons were disturbed in antiquity when a new burial pit was excavated. Bones from the former burials were simply mixed in with the backfill after the new body was laid to rest. Given these data, there is a good possibility that the remains from Unit 2 were disturbed by other pre-Hispanic burial activity yet to be uncovered.



**Figure 11.** Tomb in Caracol (Photo by: A. Berdeja)



**Figure 12.** Tomb in Caracol (Photo by: A. Berdeja)

In conclusion, there is a strong patterning of artifacts related to the interment of the deceased in rock shelters throughout Belize. These landmarks were places where many individuals were buried over time. Jute snail shells and chert and obsidian flakes were involved in rituals, perhaps symbolically related to the watery underworld. As for the chert flakes, I'm still unsure of the connection. Our excavations in Rio Frio Cave A Unit 2 appear to be uncovering a similar pattern. Given this pattern, I believe that future excavations in the alcove will lead to the unearthing of more burials. As for the individual we have begun to unearth, we know little more than how old the person was, further studies including comprehensive osteological and multi-isotopic studies will teach us much more about this person and their life.

## **Summary of Results for the 2019 Field Season**

Two excavation units were placed in the rock shelter entrance of Rio Frio Cave A. Overall, these activities revealed evidence that successive and regular burning events took place there. Based on pottery styles, most of which are closely related to ceramics produced in the Belize Valley, much of the ceremonial activity occurred during the last two centuries of the Late Classic period (AD 700-900), although some occurred during the Early Classic (AD 250-600). Through a discussion of the artifacts recovered and comparisons with similar sites in Belize, we have preliminarily identified two types of ritual activities that were performed there, first-fruit agricultural ceremonies, and burial of the deceased.

Though we have gained a basic understanding of how the entrance of the cave was being used, many research questions remain unanswered and many more have arisen from our investigations. For future research at the site and with the archaeological materials recovered from there, we suggest the following:

1. Expand Unit 1 to the southeast to incorporate the low alcove immediately adjacent to it.
2. Expand Unit 2 in order to chase the plaster floor and test multiple-burial hypothesis.
3. Conduct palaeoethnobotanical analysis and radiocarbon dating on the vast quantities of charcoal recovered from the units. Radiocarbon dating efforts should prioritize charcoal recovered from below the plaster floor.
4. Source the obsidian used to make the prismatic blades recovered to determine what highland Guatemalan source they came from.
5. Compare the obsidian sourcing data to other sites in the region to understand long-distance trade.
6. Conduct osteological and isotopic analyses, and radiocarbon dating on the human remains recovered in Unit 2 to determine if the deceased was local, what kind of diet did they consume, did they have any diseases, and what was their cause of death?
7. Are the ritual activities recorded in our excavations this year representative of alcoves throughout Rio Frio Cave A and other caves in the Rio Frio valley?
8. What is the purpose of the uncut stone wall that sits between Units 1 and 2? Was it related to either of the ritual activities we recorded?
9. What is the relationship, if any between the first-fruit agricultural ceremonies and interments?

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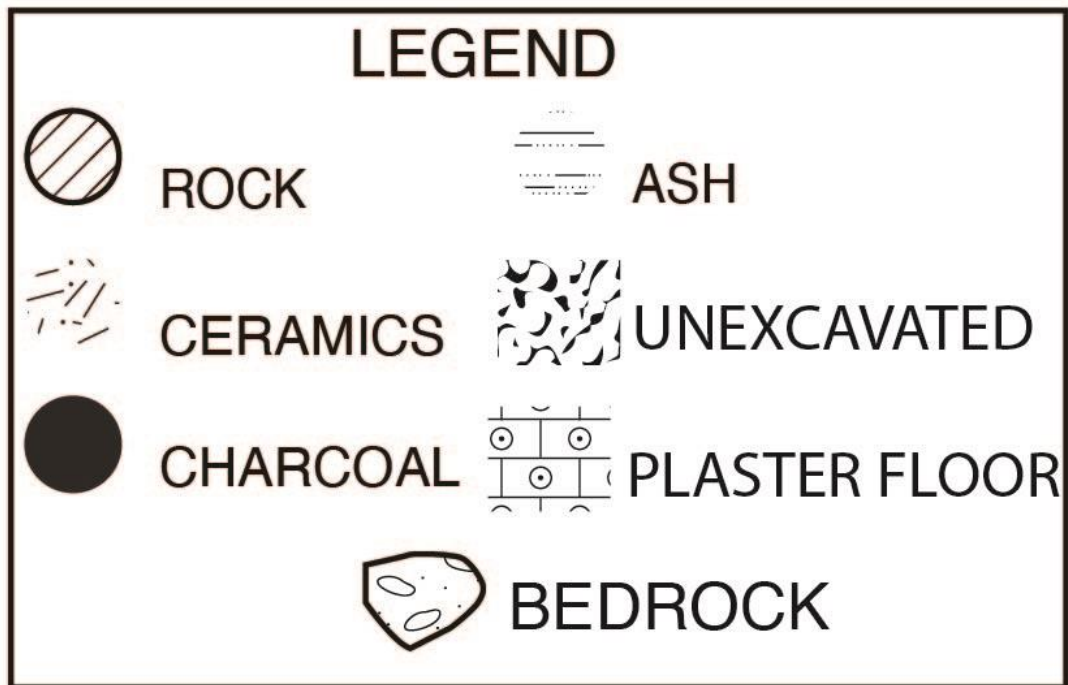
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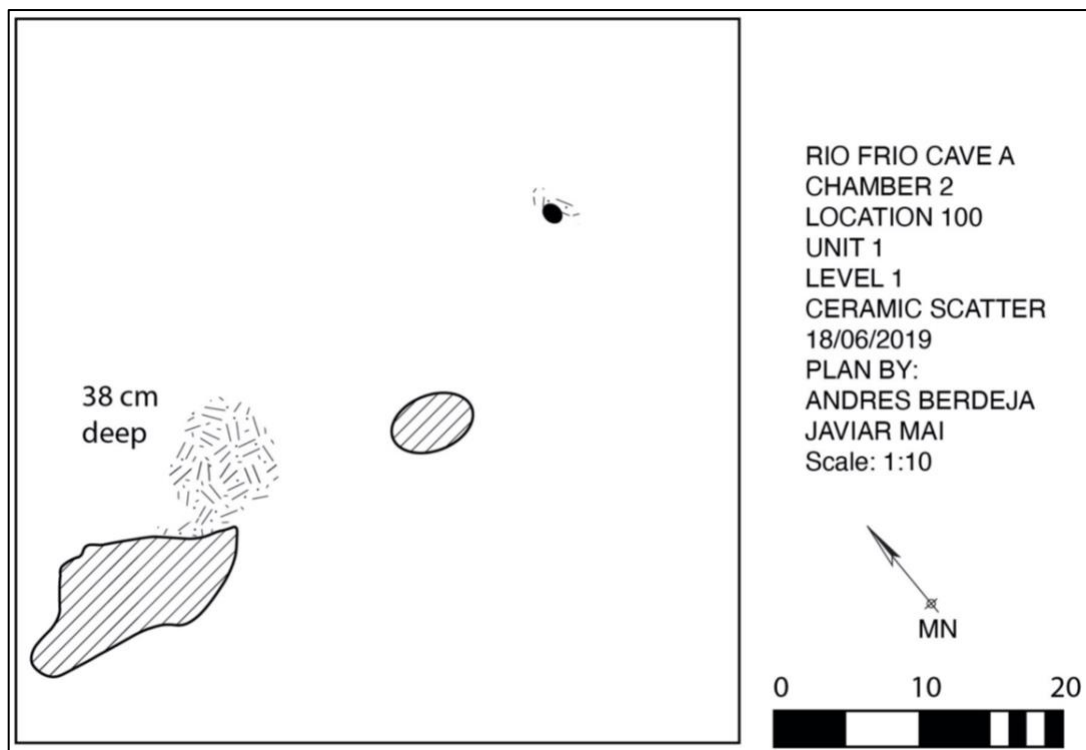
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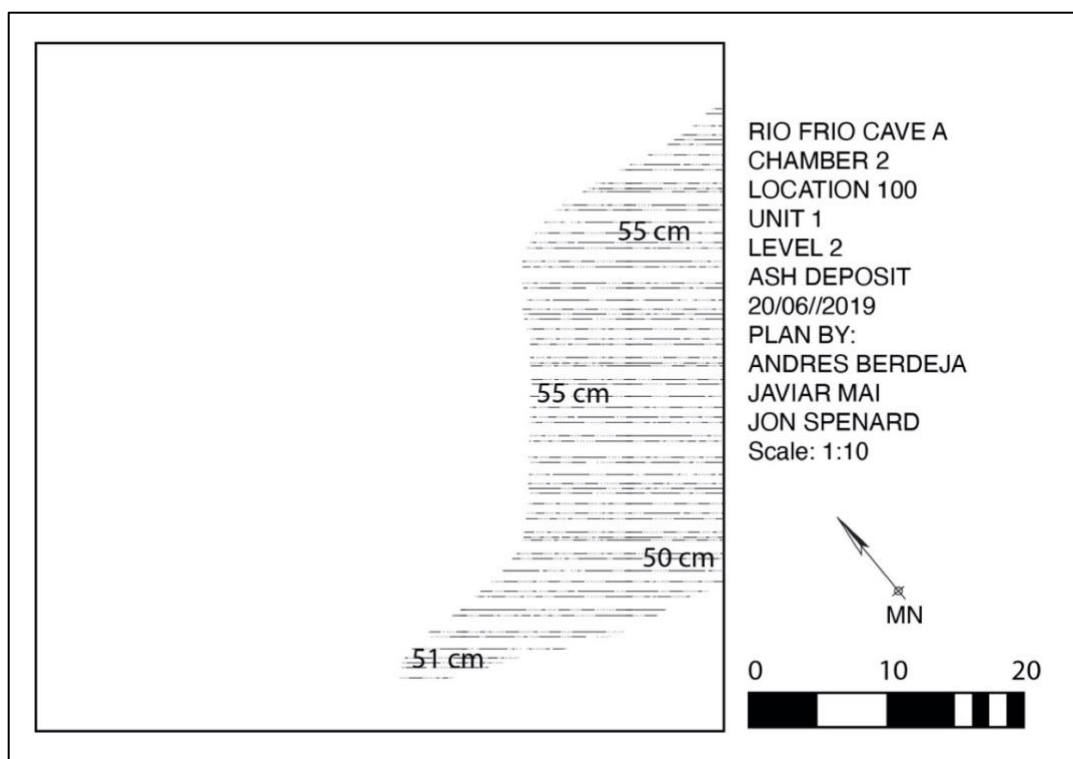
## Appendix A: Plan and Profile Drawings Appendix



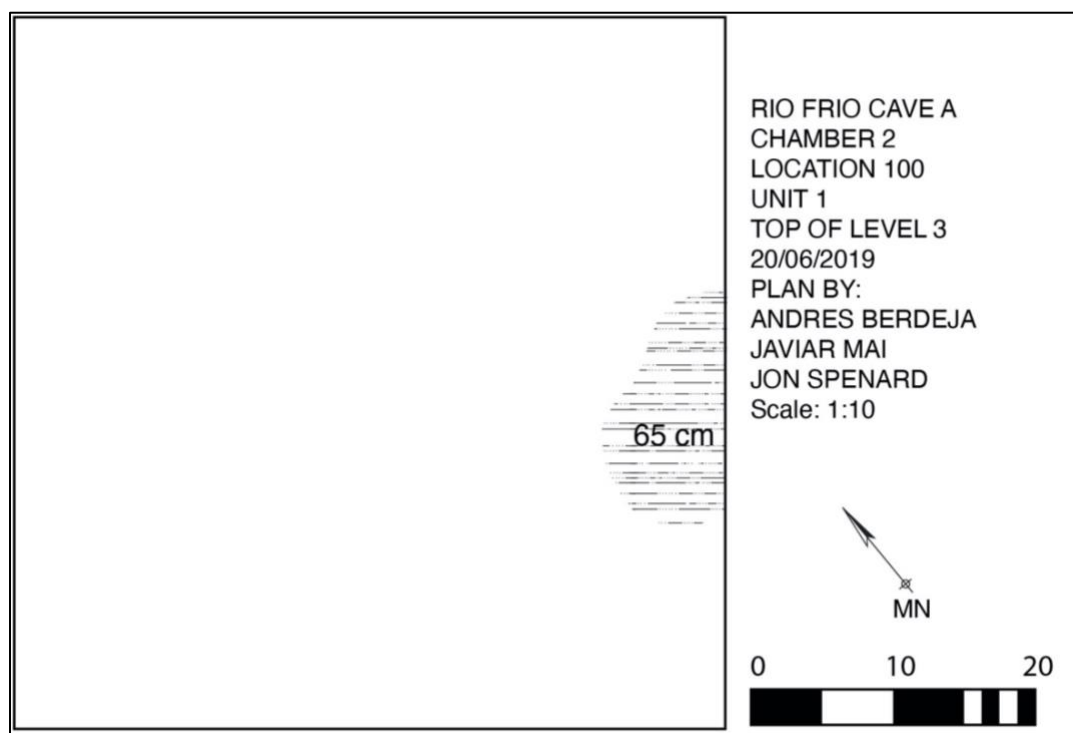
A-1. Plan and profile map legend.



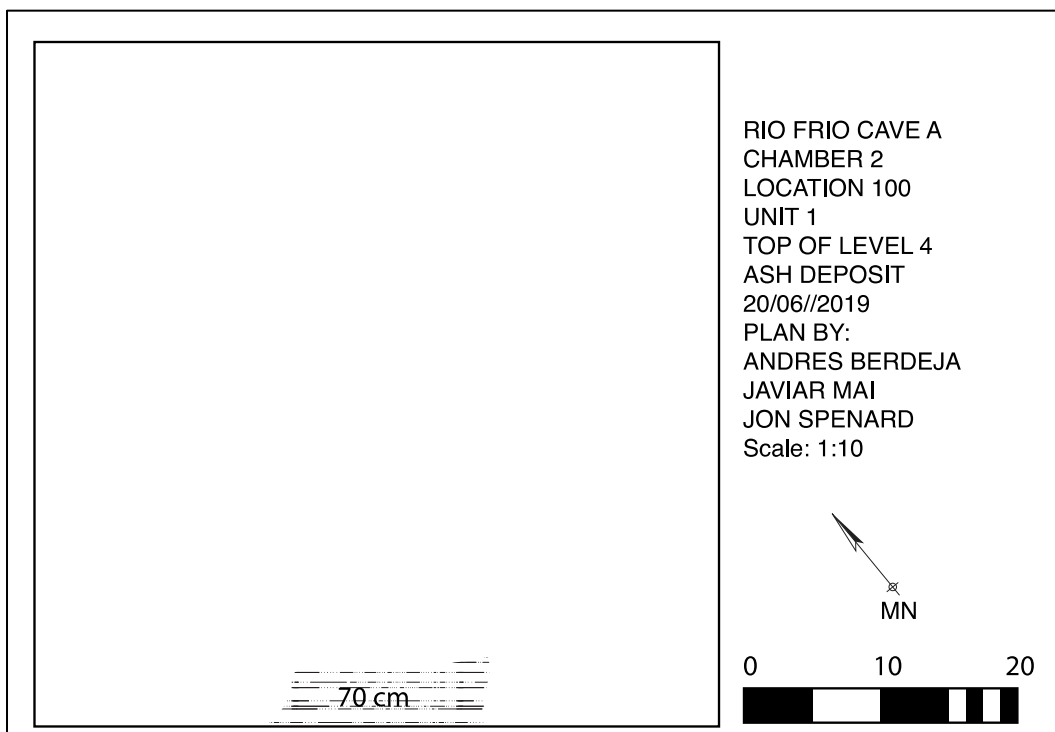
A-2. Plan Map, Unit 1 Level 1 ceramic scatter.



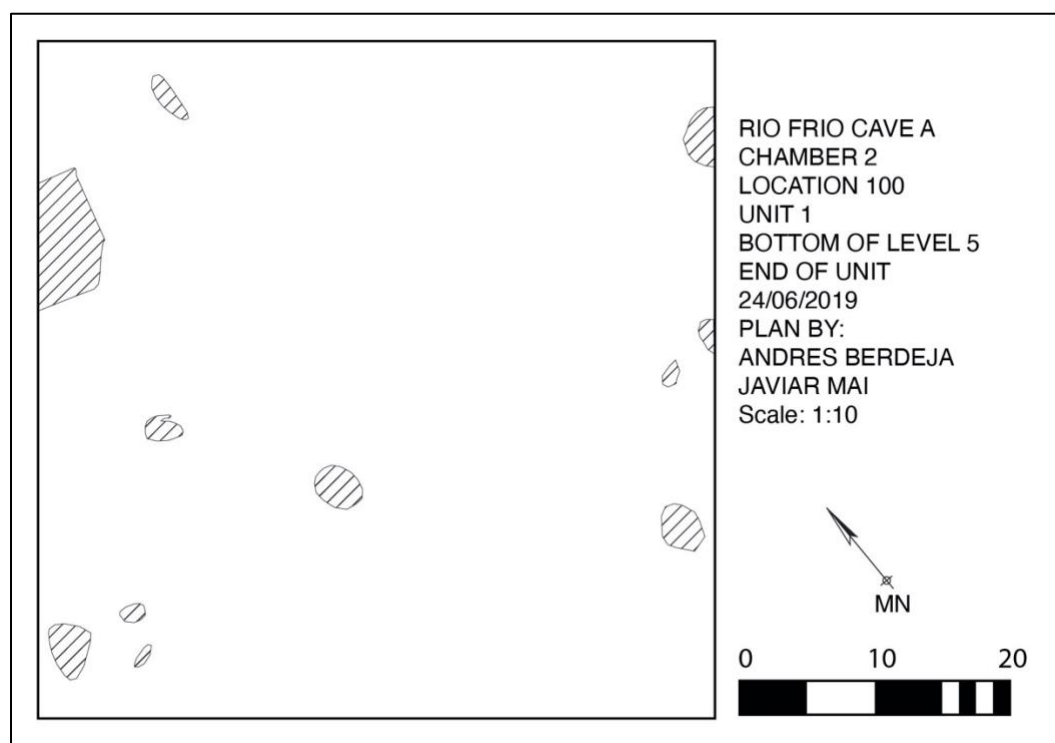
A-3. Plan Map, Unit 1 Level 2 ash deposit in southeast wall.



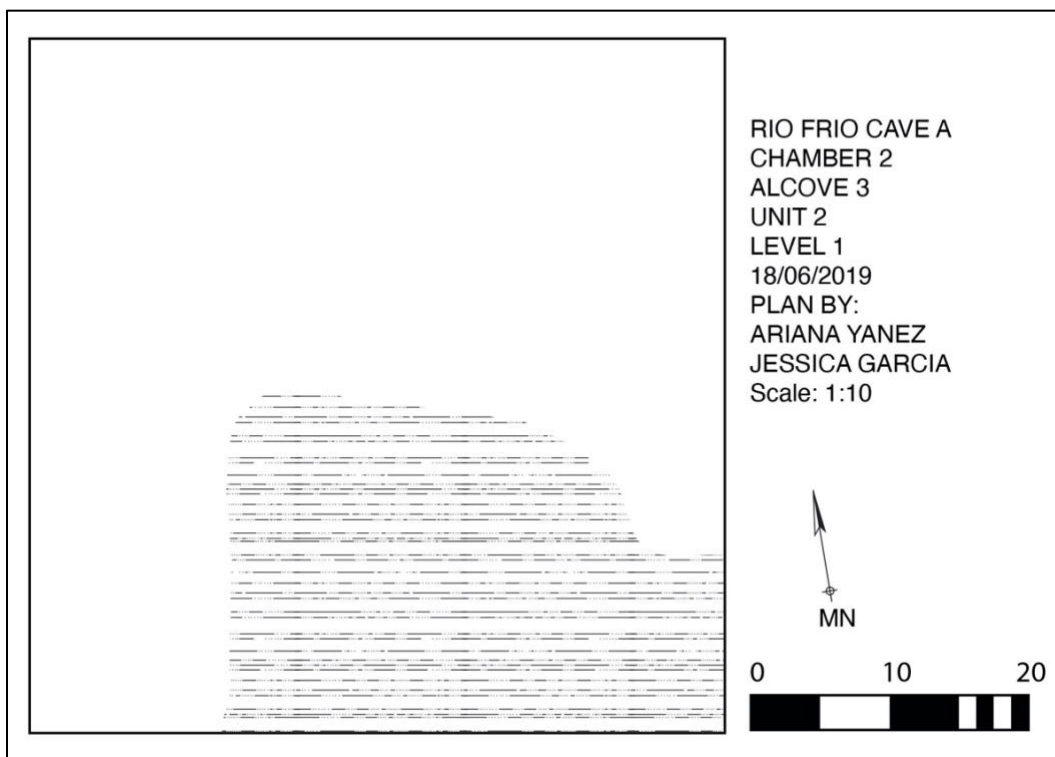
A-4. Plan Map, Unit 1 Top of Level 3.



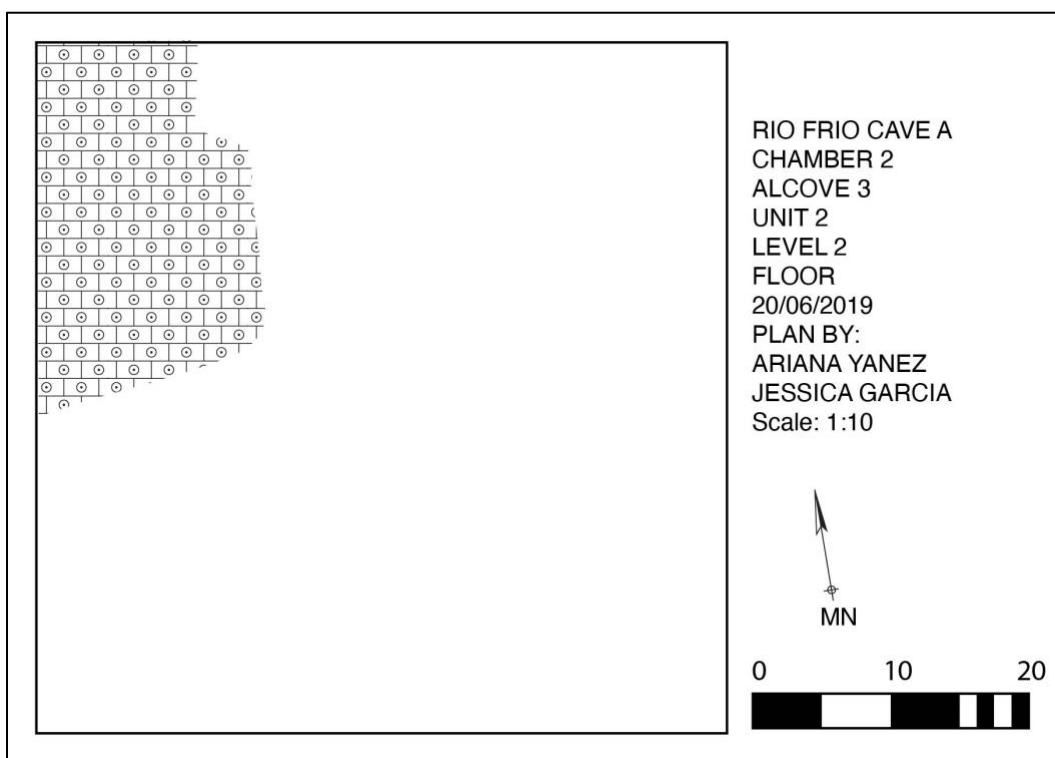
A-5. Plan Map, Unit 1 Top of Level 4.



A-6. Plan Map, Unit 1 Bottom of Level 5.

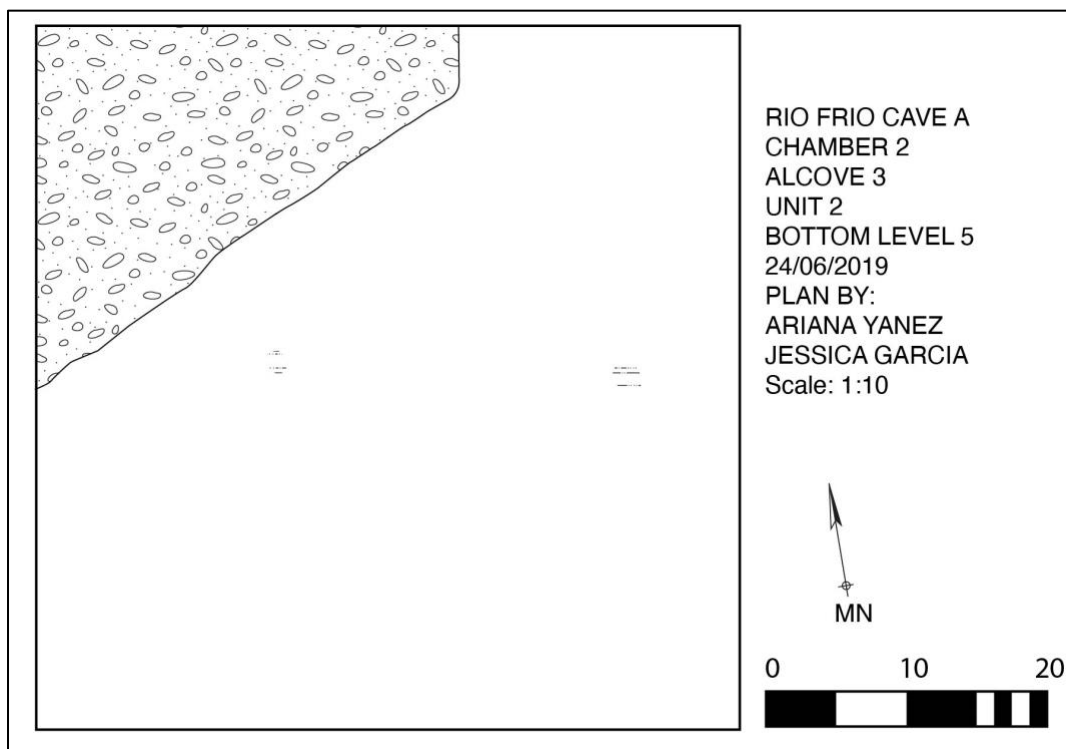


A-7. Plan Map, Unit 2 Level 1. Ash lens

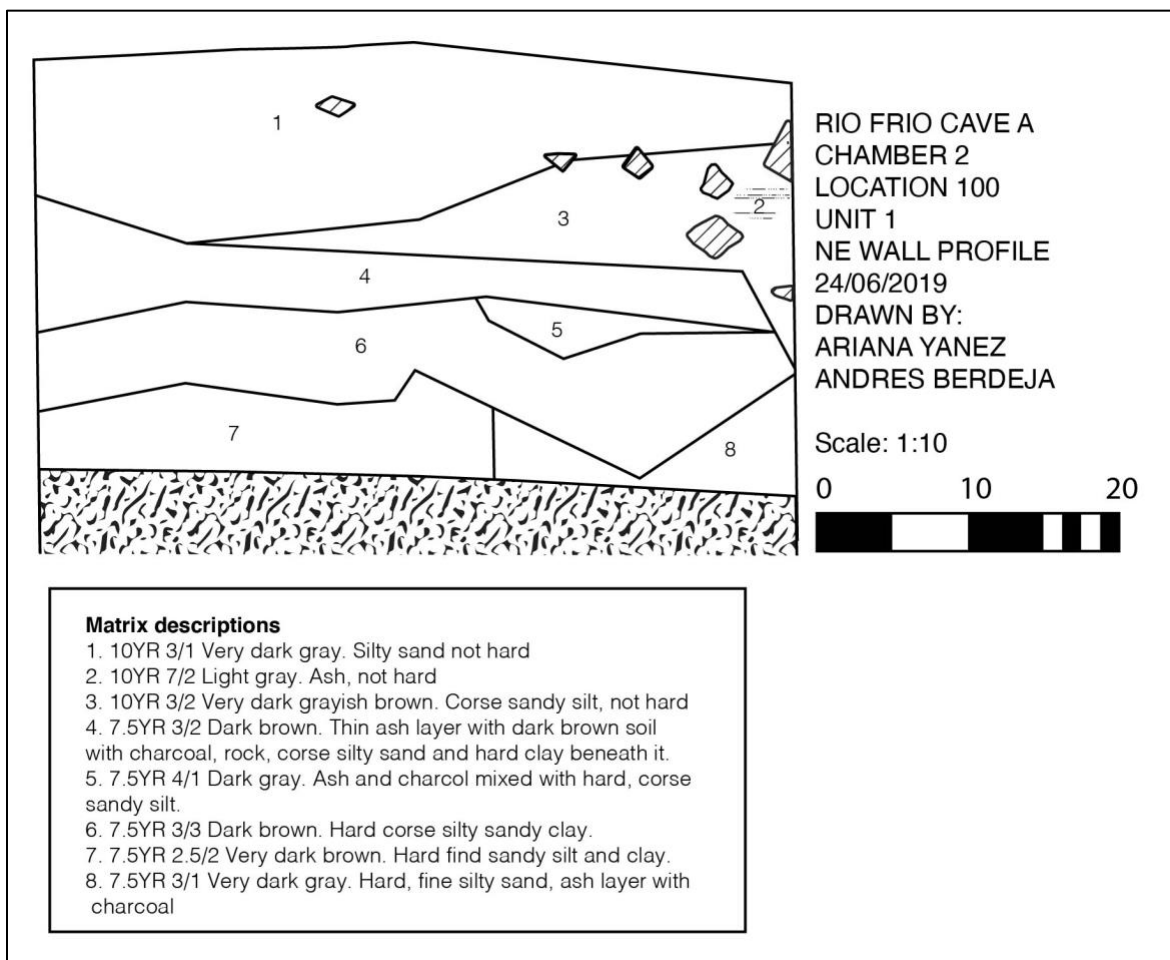


A-8. Plan Map, Unit 2 Level 2, plaster floor

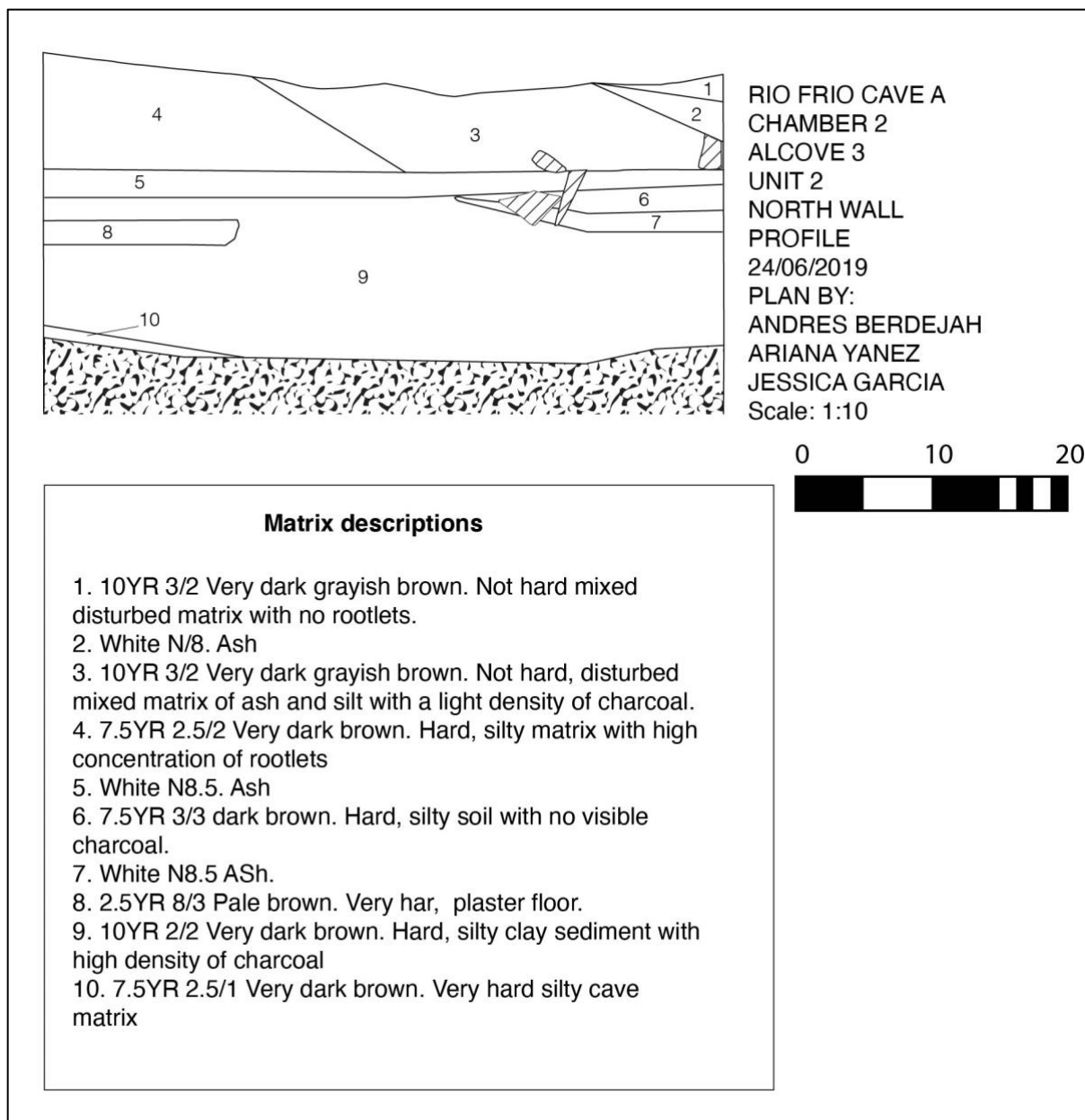




A-9. Plan map, Unit 2 bottom of Level 5.



**A-10.** Profile map, Unit 1 northeast wall.



**A-11.** Profile map, Unit 2 north wall.

## Chapter 3: Rio Frio Cave A Mapping and Inventorying Operations during 2019 Field Season

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Operations in Rio Frio Cave A (RFA) during the 2019 field season were focused on completing a general map of the cave, exploring the breakdown area, and excavating the entrance area. Two excavation units were placed in the Entrance Chamber of the cave to begin developing a temporal sequence and understanding the types activities that took place there. In addition to the excavations, the Breakdown Area was mapped and inventoried for cultural features, that latter work is the focus of this report. For discussion of the excavations, see Chapter 2 in this report. The Breakdown Area was discovered to be much more complex than anticipated and areas within and below the top of the breakdown will require mapping and inventory next field season. This chapter discusses mapping and inventorying efforts of 2019 field season.

Mapping focused on the space above the top of the breakdown and below the ceiling of the cave as well as the breakdown tunnels branching off Chamber 4 into the lower breakdown. These areas of the cave are located beyond Chamber 4, which is where the 2018 field season's mapping efforts concluded. A total of 85 cultural locations (including features, sherd concentrations, points of cave modification, etc.) were inventoried (including a few in Chambers 2, 3, and 4 that were overlooked during the 2018 season). Mapping included approximately half of the Upper Breakdown Chamber, which measures 67 by 32 meters and approximately 60 meters of tunnels within the lower portions of the breakdown at and below the level of Chamber 4. The Breakdown Tunnels include an area roughly the same elevation as Chamber 4 and a lower area (Lower Breakdown Tunnels) that connects to Area 6 above the breakdown. **Table 1** lists all cultural locations documented during mapping efforts this season. In addition to these areas, mapping was finalized for Chambers 1 through 4 (See **Map Appendix** at end of chapter).

### Upper Breakdown

Spaces in the Upper Breakdown that were highly modified, open, had flat floors, and showed signs of extensive use were subdivided into Areas 4, 5, 6, and 7, and Alcove 6 (**Maps 7 and 8**). The ceiling of this area was solid bedrock and roughly dome shaped curving downward from horizontal in the center of the chamber to roughly 70 to 90 degrees (vertical) along the chamber margins. Formations were common on the ceiling forming areas dense with large stalactites and columns. A large 10 to 15 meter diameter column of flowstone formed between the ceiling and several very large boulders were present in the central part of the breakdown. Several small chambers showing signs of cultural modification are within this formation; however, time did not permit full inventorying or mapping them. The Upper Breakdown floor varied considerably with areas of large stacked boulders, 20 to 30 meters in size, wide areas covered by flowstone and stalagmites, and naturally flat clay and guano filled areas. Traversing this area is often difficult requiring navigation of sloping flowstone and clambering over large boulders. The Upper

**Table 1.** Cultural locations identified in Rio Frio Cave A in the 2019 field seasons.

Loc. #	Feature	Context	Description
104	Wall	Chamber 2	Wall
121	Wall	Chamber 1	Wall Niche, Stone wall
126	Area	Chamber 3	Breakdown Tunnels
111	Stone Feature	Chamber 2	The feature includes 5 to 6 intentionally broken bacon flowstone formations. Two flowstone fragments are situated beneath the breakage.
219	Artifact scatter	Upper Breakdown, Area 5	A circular depression in flowstone containing sherds, cobbles, and charcoal, and possibly wood fragments.
212	Artifact scatter	Upper Breakdown, Area 4	Obsidian, sherd, and formation fragment located at the base of a formation. There may be ash located below the gauno covering the surface.
283	Artifact Scatter	Upper Breakdown, Area 5	Artifact Scatter
224	Artifact Scatters	Upper Breakdown, Area 5	The location is two circular depression with wood fragments, stones (n=3), charcoal, and mixed sediments.
239	Artificial Terrace	Upper Breakdown, Area 6	The lower of two terraces.
245	Ash	Upper Breakdown, Area 4	small ash lens approximate 60 x 30 cm.
213	Ash lens	Upper Breakdown, Area 4	Ash lens that is adjacent to location 210. The ash lens sits on a flat area but with a low gradual slope towards location 210. The ash lens is heavily disturbed and spread out due to heavy pedestrian trekking thru the cave. The ceiling above is 5.5m in height.
Ash	Ash Lens	Chamber 2	A small pile of ash representing in situ burning.
210	Carved formation	Upper Breakdown, Area 4	The Feature is a carved 5.5 meter column. The column is covered with graffiti. The southern end of the modified speleothem is 1m in height. Above this location there are multiple smaller stalactites on the ceiling with a ledge overhead that continues. This column is located on top of a flow stone where there are 2 burned ceramic sherds on the southern end. The height for the smaller formation is 70cm and 2 x 1 meter in plan.
278	Clay Cut	Upper Breakdown, Alcove 6	This feature is 5 to 10 cm high cut in the clay to create level space at the entrance to an alcove.
230	Cluster of sherds and cobbles	Upper Breakdown, Area 5	Cluster of sherds and cobbles located behind a formation against the cave wall.



205	Cobble Cluster; Sherds	Chamber 2	Feature consists of a cluster of cobbles covering the floor. No more than 5 sherds observed. Possible excavation location. Extends into two niches formed under formations and open floor outside.
206	Hearth	Chamber 4	The Feature is a possible buried hearth. A 2 x 1.5 m debris cone collapsed from side walls covers the feature. Charcoal and wood are present. Above collapse is circular eroded feature in rock.
261	Isolated Needle; Ash lens	Chamber 3	Ash, Needle
222	Sherd and cobble cluster	Upper Breakdown, Area 5	The feature is a cluster of sherds and cobbles in a depression against the cave wall between two formations.
229	Sherd and cobble scatter	Upper Breakdown, Area 5	Sherds and disturbed stone feature located against the cave wall
247	Sherd and stone cluster	Lower Breakdown	Cluster of approximately 100 sherds and cobbles in a small niche under a large breakdown boulder.
249	Sherd and stone cluster	Lower Breakdown	Cluster of approximately 50 sherds and 30 cobbles in a small niche under a large breakdown boulder.
227	Sherd and stone feature	Upper Breakdown, Area 5	Disturbed stone feature with sherds and charcoal. The feature is located under a formation cluster hanging from the ceiling forming a low area. There is a pit excavated into the back of the feature.
248	Sherd Cluster	Lower Breakdown	Sherd cluster at the base of a large breakdown boulder
207	Sherd Cluster	Upper Breakdown, Area 7	This location is a cluster of sherds located around the base of a cluster of stalagmites.
226	Sherd Concentration	Upper Breakdown, Area 5	Sherds on formation in secondary context
292	Sherd Concentration	Lower Breakdown	Concentration of jar sherds consisting of 1 or 2 vessels in low breakdown chambers
293	Sherd Concentration	Lower Breakdown	Concentration of jar sherds consisting of 1 or 2 vessels in low breakdown chambers
294	Sherd Concentration	Lower Breakdown	Concentration of jar sherds consisting of 1 or 2 vessels in low breakdown chambers
295	Sherd Concentration	Lower Breakdown	Concentration of jar sherds consisting of 1 or 2 vessels in low breakdown chambers
296	Sherd Concentration	Lower Breakdown	Concentration of jar sherds consisting of 1 or 2 vessels in low breakdown chambers
298	Sherd Concentration	Breakdown Tunnels	Sherd Concentration. possibly secondary context.
281	Sherd Scatter	Upper Breakdown	Dense Olla Sherds

251	Sherd Scatter; Wall	Lower Breakdown	A low small chamber beneath a breakdown boulder with approximately 40 sherds and charcoals that was possibly walled based on the scatter of cobbles outside and inside the chamber.
282	Sherd, Charcoal, and cobble scatter	Upper Breakdown	Alcove with C14, Stones, Sherds, disturbed
201	Sherds	Chamber 1	10 sherds in crack mixed with small cobbles. Crevasse goes back into the wall about 1.5 meters where sherds and cobbles continue. The crevasse has formed from formation separating from wall. Dried stalactites above and few stalagmites below.
242	Sherds	Upper Breakdown, Area 7	Sherd cluster adjacent to stalagmite
209	Sherds and Wall	Upper Breakdown, Area 7	The feature is a wall built from a large fallen formation and several boulders. The wall is 2.5 meters long and spans between a formational and breakdown boulder. The terrace supported by the wall is relatively flat and a cluster of sherds is located upon it adjacent to the wall.
241	Sherds; Charcoal	Upper Breakdown, Area 7	The location consists of charcoal and burned sherds adjacent to several stalagmites.
244	Sherds; Charcoal	Upper Breakdown, Area 7	Cluster of charcoal and sherds at the base of a formation.
243	Sherds; Charcoal; Stones	Upper Breakdown, Below Area 4	This location has 3 large fragments of broken formation with fragments of burned ceramic in the surrounding area. There are also charcoal fragments within the surrounding flow rock of this location. There are also 3 large sized broken formation fragments within a hole with burned ceramic found within the terrace. The area is heavily disturbed. 2 ceramic fragments where collected one bowl fragment and one rim fragment.
280	Sherds; Stone Feature	Upper Breakdown	Sherds and Stone Feature
225	Stone feature	Upper Breakdown, Area 5	Stone feature with sherds and charcoal
203	Stone Feature	Chamber 2	Stone feature consisting of 3 stones partially buried in sediment washed in from the entrance. Stones include one formation fragment and two limestone clasts.
252	Stone Feature	Lower Breakdown	Small ledge with a stone feature. The ledge is actually an eroded area of a breakdown boulder.
270	Stone Feature	Upper Breakdown	This stone feature is located in a circular depression.

272	Stone Feature	Upper Breakdown	What appears to be a circular stone feature against the cave wall in a open muddy area. The feature consists of approximately 12 limestone rocks and the feature measures 150 x 75 cm.
273	Stone Feature	Upper Breakdown	Stone feature consisting of 4 limestone rocks adjacent to the cave wall on a clay floor. At the east end of a muddy open area where the space narrows. Possibly disturbed
275	Stone Feature	Upper Breakdown	A 2x3 meter terrace supported by wall (276) adjacent to cave wall.
279	Stone Feature	Upper Breakdown	Stone Feature
220	Stone Feature	Upper Breakdown, Area 5	Stone feature with sherds and charcoal
214	Stone Feature	Upper Breakdown, Area 5	Cluster of at least 10 stones measuring 10 to 25 cm in size on the surface terrace 285.
238	Stone Feature	Upper Breakdown, Area 6	Cluster of stones piled beneath an overhanging portion of a boulder. Generally consists of smaller fist sized rocks.
240	Stone Feature	Upper Breakdown, Area 6	This feature is a dense wall or platform of stones (over 100 stones) forming a level area above a drop down to the lower breakdown tunnels. The feature measures 1.2 x 1.7 meters and is about 1 meter high. Ash was observed on top of the feature.
287	Stone Feature	Upper Breakdown	This feature consists of several stones placed on the clay floor of this naturally level area of the cave.
231	Stone Feature	Upper Breakdown, Area 6	Stone structure with roughly 50-60 cobbles used as fill along center surrounded by boulder sized fill topped with tabular stones 0-3 layers high. Largest boulder 55cm wide x 50 cm deep x 24 cm tall. All sitting on top of heavily weathered natural cave formation. Whole structure is 140cm wide x 90 cm deep x 77 cm tall. Small tunnel with ledge under small alcove behind structure. Whole structure placed along breakdown.
232	Stone Feature	Upper Breakdown, Area 6	Stone structure made of tabular stones ranging from 3-50cm long stacked 0-4 layers high. Located to right of feature 231. Could have previously been at same height as 231.
265	Stone Feature	Chamber 3	Disturbed Stone Feature
204	Stone Feature	Chamber 2	Seven stones stacked at the northwest base of a column. Stones consist of one formation fragment and six limestone. Largest is 45 cm by 25 cm. One group of three stones still stacked in pyramid directly at formation base. Actively dripping formations above and flowstone forming within. Sediments from outside cave washing in and covering lower stones suggesting more may be present.
290	Stone Feature	Upper Breakdown, Area 6	A stone feature located against the base of a breakdown boulder in a flat space. the boulders appear to modify the breakdown in such a way as to create a pathway for easier walking.
291	Stone Feature	Upper Breakdown	Modification to breakdown creating a "pathway" consisting of a few stacked rocks forming flatter surface that is easier to walk on.

297	Stone Feature	Upper Breakdown, Area 7	A stone placed across a crevasse to facilitate access to the other side.
274	Terrace	Upper Breakdown	A 2.8 x 2.8 meter terrace between boulders. Not fully documented. Adjacent tunnel beneath large boulder that contains several unmapped stone features.
284	Terrace	Upper Breakdown, Area 5	This feature 2 x 4 meter terrace supported by wall 221 and below wall 217 and 215.
285	Terrace	Upper Breakdown, Area 5	This feature is a 5.7 x 2.0 meter terrace divided into two areas. The upper area is separated from the lower area by a single coarse stone wall (216). The terrace is supported by wall 217 and 215.
286	Terrace	Upper Breakdown, Area 5	This area is the lowest area of Area 5 and appears to be a leveled area between a large breakdown boulder to the south, the cave wall and several alcoves to the north, a formation to the west, and wall 228 to the east.
233	Terrace	Upper Breakdown, Area 6	Terrace surrounded by features 231, 232 to the west, 234 to the northeast, 235 to the east, and other more natural features like flowstone to the south.
289	Terrace	Upper Breakdown, Area 6	This feature is 2.9 x 4.2 meter terrace supported by wall 235.
264	Wall	Chamber 3	Possible Wall spanning the middle portion of chamber 3 consisting of 6 to 8 boulders. The southern part of the wall is blown out and knocked down. The wall appears to be part of a series of walls forming a stepped/terrace slope.
263	Wall	Chamber 3	Possible Wall forming a terrace in Chamber 3 below the pit that was possibly Mason's excavation. It is one of a series of walls terracing the slope in this chamber. The wall consists of three stones on the north side of the chamber and three stones on the south side with the middle portion blown out.
202	Wall	Chamber 2	Partial wall retaining terrace. The feature is constructed of one boulder and at least 7 cobbles, all limestone located adjacent to a collapsed fallen formation. There is an intact portion on east side of passage while west side no longer extant, although there may be a few stones against the west wall buried in sediment. Floor is sediment mixed with organic from outside. Subject to active modern cave traffic.
262	Wall	Chamber 3	Possible Wall spanning the flowstone formation below the entrance wall (118). The feature measures approximately 1.6 meters and consists of seven small boulders.
250	Wall	Lower Breakdown	A possible wall feature and terrace
271	Wall	Upper Breakdown	The feature is 86 cm long wall between two large boulders in the breakdown area. The wall consists of at least four limestone rocks.
276	Wall	Upper Breakdown	approximately 2.4 meter single coarse retaining wall supporting terrace (275).

277	Wall	Upper Breakdown, Alcove 6	this feature is one to two coarse stone wall approximately 4.4 meters in length spanning between the cave wall and a large boulder in the central part of the alcove. There is a slight terrace built behind the boulder.
228	Wall	Upper Breakdown, Area 5	This feature is a cut or knocked down stone wall formerly consisting of a single coarse of stones. The wall spans between a formation and breakdown boulder measuring approximately 1.3 meters in length.
221	Wall	Upper Breakdown, Area 5	The feature is a 3.7 meter long wall that incorporates a formation and spans between a breakdown boulder and a formation. Some of the stones making up the wall measure greater than 50 cm in length. The has been partially knocked down.
216	Wall	Upper Breakdown, Area 5	Feature 216 is a broken single coarse wall spanning between a breakdown boulder and wall 215 forming the northern end of the upper part of terrace 285. the wall consists of at least three stones and the middle portion has been knocked down.
217	Wall	Upper Breakdown, Area 5	A 1.6 meter long wall built between two formations supporting the lower part of terrace 285. The wall is two to three courses high and lower boulders are large measuring up to 80 cm in length. The northern part of the wall has been knocked down.
237	Wall	Upper Breakdown, Area 6	Stone wall retaining terrace built of 7 to 8 rocks. The largest stone measures 70x75 cm and rocks are either weather formation covered with black manganese patina or limestone. The feature measures 1.3 x 1.6 meters and consists of 10 to 12 rocks. Formerly connected to 235.
235	Wall	Upper Breakdown, Area 6	Eastern part of this feature is a possible wall made by tabular stones stacked 3 layers high on top of white and black natural flowstone. Wall most likely separates feature 233 from next terrace down below. Central portion of wall knocked down wall. The western part of the wall consists of manganese covered formation fragments
260	Wall	Chamber 2	Partial wall retaining terrace. One boulder and at least 7 cobbles, all limestone. Adjacent to collapsed fallen formation. Intact portion on east side of passage while west side no longer extant, although there may be a few stones against the west wall buried in sediment. Floor is sediment mixed with organic from outside. Subject to active modern cave traffic.
234	Wall	Upper Breakdown, Area 6	Stone feature- possible wall surrounded by white natural breakdown to the north and black natural flowstone to the east.
215	Wall	Upper Breakdown, Area 5	Retaining wall supporting terrace (285) consisting of large boulders chinked with a number of smaller boulders. Approximately 3 meters long spanning between a large breakdown boulder and flowstone. The largest stone measures 1.2 x 0.6 meters.
208	Wall and Terrace	Upper Breakdown, Area 7	Collapsed stone feature and terrace near a crawl way to the lower level.



236	Wall or stone feature	Upper Breakdown, Area 6	Stone feature consisting 7 to 8 rocks, possible wall with fill. Breakdown to SE with sherd found. Fill of wall seems to have fallen down into interstices between the blocks. Defining east side of terrace (feature 239).
211	Walled passage	Upper Breakdown, Area 7	The location is an opening under a boulder that was previously walled up with approximately 12 to 15 small boulders. The opening is a vertical entrance to the upper level.
223	Walled Passage	Upper Breakdown, Area 5	This location is the opening to the tunnel connecting chamber 4 to the upper breakdown. The wall consisted of approximately 10 to 15 stones, which are now scattered around the opening.
218	Walled Passage	Upper Breakdown, Area 5	This feature is the opening to a small passage that was once walled with 10 to 15 limestone boulders. The wall has been knocked down the stones are scattered near the opening.

Breakdown is approximately 15 to 20 meters above the floor of Chamber 4 and in the rear of the chamber the breakdown slopes steeply down approximately 20 to 25 meters to a creek.

The creek forms the lowest known part of the cave and is interesting in that it flows through a narrow canyon carved into granite bedrock. Similar to Rio Frio C, located several hundred meters away, the base of the cave is at the contact with the underlying granite of the Pine Ridge Formation. It is not clear if this is culturally significant; however, it does require scientific inquiry from a speleogenesis perspective.

Along the northern wall of the chamber the space between boulders has been filled with mud. This filling appears to be the result of natural processes, although the source of the mud is currently unknown. The ancient Maya took advantage of the leveled areas as ritual space. While few artifacts were observed there, several stone features were constructed against the wall and between boulders (Locations 270 to 276). In the east part of this area is a well-constructed wall supporting a terrace that directly overlooks the drop to the river.

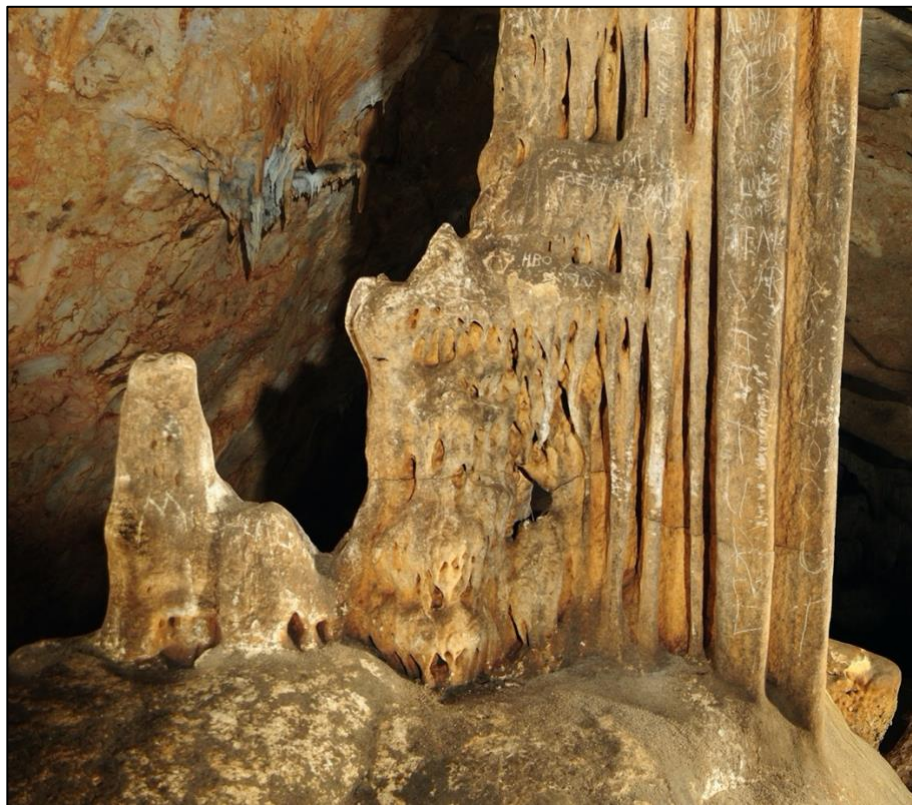
Along the southern wall of the Upper Breakdown Chamber at the base of a flowstone slope is an area leveled by more flowstone, rocks, and clay filling in the space between boulders. This area has a dense deposit of jar sherds, charcoal, wood fragments, and cobbles (Locations 281 and 282). It is partially covered by guano suggesting additional artifacts may be buried there. A single stone feature that appears to have been knocked down is in the eastern side (Location 279). Several openings in the breakdown near this area open into the Lower Breakdown Tunnels.

Area 4 is in the western half of the Upper Breakdown and is a relatively flat space bordered by flowstone on the west and south and by breakdown to the east. The area measures roughly 8.5 by 7.0 meters and the ceiling about 6 meters above. The floor is flowstone overlying breakdown covered by a thin layer of clay and guano. On the western side is a 5 m tall column with a cluster of stalagmites at its base. The column was modified prehistorically in such a way that it resembles a zoomorphic figure, possibly a bat (Location 210). Several ash deposits are located on the floor (Locations 212, 213, and 245), one of which includes an obsidian blade. Area 4 opens to the south

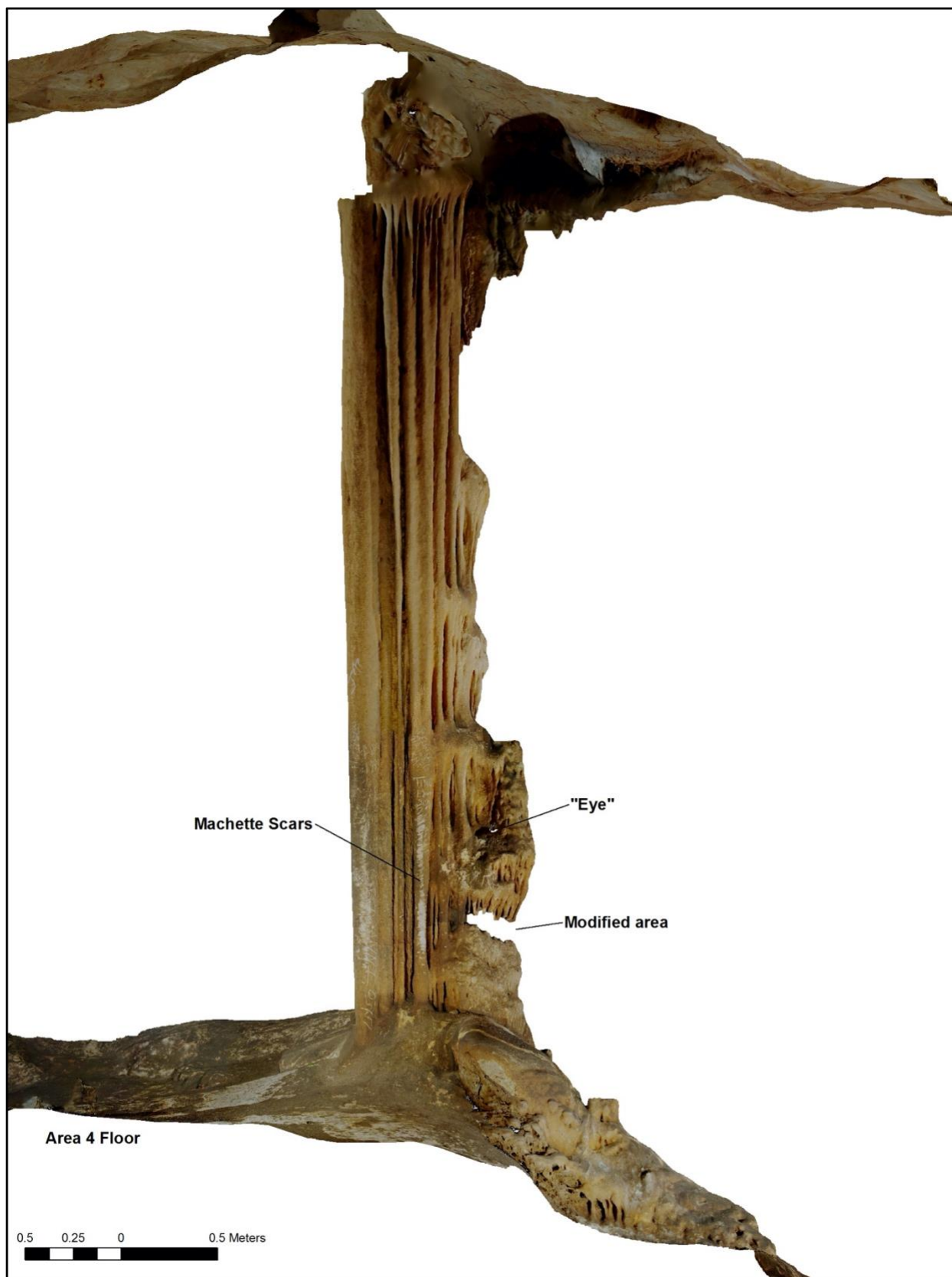
onto a flowstone formation that slopes down to Area 7 and east further into the breakdown. A large boulder overhangs the eastern quarter of the room and in the back of this space, there are several openings to lower portions of the breakdown.

This area is part of a natural pathway to the back of the cave and has unfortunately been heavily disturbed. The ground surface, where sediments are found, is highly compacted and sherds are crushed or pressed deeply into the mud. Graffiti and machete chopping scars cover much of the lower part of the column (Location 210; **Figures 1 and 2**). Graffiti is also carved into the large boulder in the east part of the area.

Area 5 is located north of Area 4 and the floor of this space is about 3 to 4 meters below. The floor was prehistorically modified into six levels, or steps, with the treads consisting of roughly level areas built of clay fills retained by stone walls ranging in height from the 15 to 20 cm to the 60 cm multicourse wall. Terraces are 3 to 4 meters long and 1.5 meters wide and conform to the cave landscape incorporating flowstone formations and breakdown into their form. Several tunnels branching off this area appear to have been walled and blocked, including the tunnel that connects down to Chamber 4 providing access to this area. Sherds are common along the margins of the area, including along the cave wall, behind formations, and boulders. The western side of the area is covered by a lot of flowstone and drops directly down (approximately 10 meters) to Chamber 4. Looting in this area is extensive and excavations are common along the walls and under boulders. Tourist traffic has caused sediment compaction and resulted in knocking down portions of the walls.



**Figure 1.** Graffiti and machete marks on column (Location 210; photo by M. Mirro).



**Figure 2.** Orthorectified photograph of north side of modified column (Location 210).

Area 6 is in the eastern side of the Upper Breakdown area east and below the large central column. The area is flanked by several very large boulders and overlooks the drop to the river. The northern half of the area consists of two artificial terraces supported or defined by stone walls. Along the western margin of the upper terrace are two large stone features, including one stone pile (possibly stacked stones that were knocked down) and a pile of stacked flat stones chinked by smaller cobbles forming a low surface like a bench. Piles of stone were clustered under overhanging boulders or against the cave wall and might have represented constructed features. The area measures roughly 6.5 by 7.0 meters with a vertical extent of 50 centimeters.

The southern part of that area is separated from the terraces by a long boulder, and consists of a naturally flat area, possibly modified, and a modified drop to the Lower Breakdown Tunnels. The drop consists of a 5 to 6 meter vertical opening between several breakdown boulders. On the west side of the drop a 1 by 0.5 by 1 meter high by wall was constructed (Location 240). The top of the wall is flat and covered with ash suggesting a significant amount of burning occurred at this area (**Figure 3**).

Beneath Area 6 is the Lower Breakdown Tunnels, accessible by several vertical and horizontal openings between boulders. Though technically not part of the Upper Breakdown, it is mention here as it is directly linked to Area 6. This area was not formally mapped as it was discovered during the later part of the season; however, it consists of about 10 to 15 small chambers between boulders at a level about 4 to 8 meters below the top of the breakdown. Clay fills the space between boulders forming a bottom. Artifacts there include large jar and bowl sherds that show signs of recent and prehistoric breaks (**Figure 4**). Kill holes were observed. The assemblage appears to represent vessel caches like those from other caves throughout the region where several complete jars and bowls (usually killed) are clustered in tight crawl spaces (Mirro 2007; Moyes 2006). There are at least 10 to 12 small chambers that contained such ceramic caches in RFA.



**Figure 3.** Wall feature (Location 240) with ash on its upper surface (photo by M. Mirro).





**Figure 4.** Stacked jar sherds in Lower Breakdown Tunnels showing signs of recent breakage (photo by M. Mirro).

The caching may have a temporal component and be much more complex as in a few areas there were dense piles of sherds showing prehistoric breaks. The prehistorically broken sherds may represent “swept” artifacts where artifacts are cleared from an area prior to reuse. Further study in this area may provide data supporting some well-established cultural patterns observed in caves of this region and provide comparative ceramic data (**Figure 5 and 6**).

Area 7 is located south of Area 4 and includes the surface of a flowstone formation covering the breakdown that slopes both to the east and west and an area west of this flowstone that has been prehistorically modified. There are five stalagmites, or clusters of stalagmites, on the flowstone that measure about 10 to 20 centimeters in diameter and between 50 to 120 centimeters high. Ceramic artifacts were concentrated around their bases (locations 207, 241, 242, and 244). Location 244 is the most complex and includes stones, ceramics, charcoal, and possibly ash covered by guano. The lower part of this area to the west is 4 to 5 meters lower than Area 4 and is a roughly 7 x 7 meter “T” shaped space.

Cultural features documented in this area include two leveled surfaces, or terraces, separated by wall (Location 209) and two walled entries into the breakdown (Locations 208 and 211). The wall is constructed from a fallen speleothem, is about 30 centimeters high by 2.4 meters long, and a cluster of sherds is located on its upper terrace. The blocked entries into the breakdown have both been knocked down in recent times by looters or tourists. Both entries provide access to the Breakdown Tunnels that are directly beneath this area. In the western most part of this area is



**Figure 5.** Nearly complete large jar in Lower Breakdown tunnels (photo by M. Mirro).



**Figure 6.** Jar and bowl sherd scatter in the Lower Breakdown Tunnels (photo by M. Mirro).



a 50-centimeter-wide crevasse between two large boulders that opens to Chamber 4 below. A large rock has been placed over the crevasse to create a safe pathway over the crevasse (Location 297).

Alcove 6 is a 12 by 9 meter solutional cavity along the north cave wall in the eastern Upper Breakdown chamber halfway down the slope to the river area. The ceiling near the opening of the alcove is about 2 meters dropping to less than 50 centimeters in the back and the floor is mostly clay. A boulder sits in the entrance to the alcove and a column makes up the west side of opening. No artifacts were observed in this area; however, the floor was modified into artificial terraces. There is a one to two coarse stone wall between the boulder and the wall that is roughly 20 to 30 centimeters high (Location 277) with the terrace on its interior side. Just outside the mouth of the alcove is a cut in the clay about 1.6 meters from the 277 that is roughly parallel defining space in front of the wall. There are several stones that may be stone features in the interior of the alcove; however, there were not recorded at the time.

## **Breakdown Tunnels**

The Breakdown Tunnels (**Map 9**) are accessed via an opening in the breakdown in the southeastern side of Chamber 4. The opening was formerly blocked by a well-constructed wall (location 130) that has been partially knocked down (**Figures 7 and 8**). The area in general consists of open spaces between several large boulders. The space has roughly level clay floors and mostly high ceilings; however, there are several small tight tunnels going deeper into the breaker branching from this area. From most places within the Breakdown Tunnels, it is possible to climb upward and access the Upper Breakdown.

Cultural locations in this area include five sherd concentrations (Locations 247, 248, 249, 251, and 298). These concentrations are located against the walls or in low tight spaces beneath boulders. Two stone features (Locations 250 and 252) were also documented in this area. The eastern part of this area has a dense concentration of formations with flowstone cementing the breakdown. Between formations and boulders is vertical climb down leading into the Lower Breakdown Tunnels.

## **Discussion**

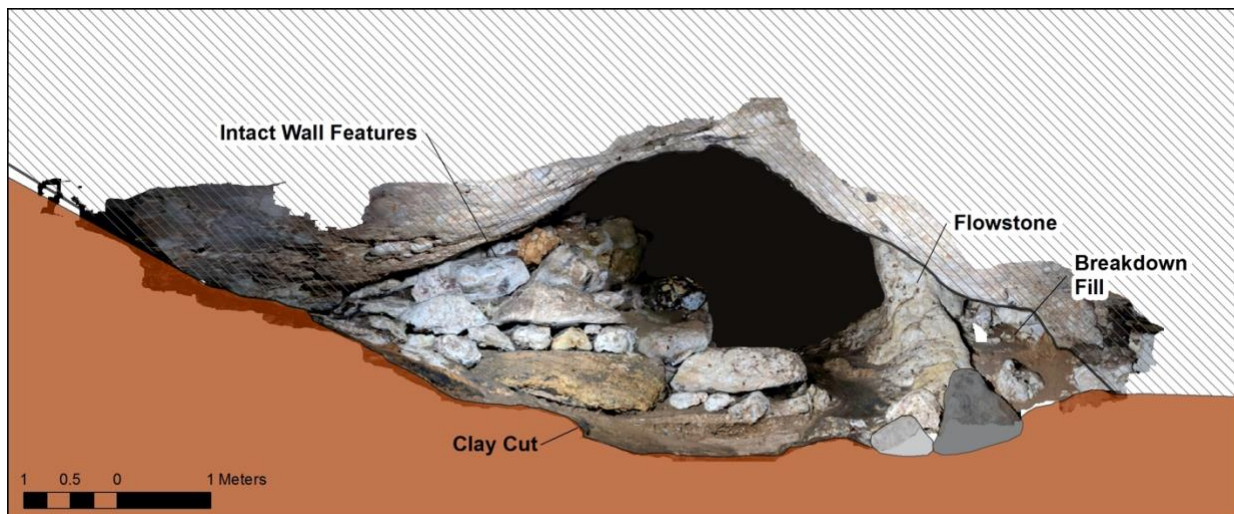
Results of the 2018 and 2019 investigations in Rio Frio A indicate that the cave has been extensively utilized by the ancient Maya. Unfortunately, because of this cave's history of visitation in more recent times, many of the features evidencing this use have been disturbed and there has likely been a significant loss of artifacts. The cave was investigated by Mason in the late 19<sup>th</sup> century during a time when archaeological practices were less focused on preserving a site during after operations. Since then, the cave has been subject to intensive tourism traffic and looting.

Stone features are common throughout the cave and entrance area. It was possible to differentiate stone features from naturally occurring stone by identifying stone placement that falls outside normal cave taphonomic processes. Typical stone features observed in the region include walls, supports for ceramic vessels, piles of stones that might support a long vertical stone forming





**Figure 7.** Remnants of wall blocking entrance to Breakdown Tunnels.



**Figure 8.** Orthorectified profile view of Location 130.

part of shrine, piles stones that may form a level surface as part of an altar, walled passages, and other unknown configurations. While many walls remain intact, other stone feature types have been significantly disturbed.

One of the most common features observed in the cave is the modification of floor space by the construction of low one to two coarse walls (or cuts into the clay) forming flat terraces or steps separated by a stone-faced riser. These features were observed in nearly all chambers throughout the cave except the River Area. Interestingly, no terraces or walls were identified within the breakdown. In Chamber 3 below the entrance, the terraces and walls may have been quite large with risers of nearly 1 meter forming a series of steps up the slope of the chamber; however, disturbance covers many of the wall remnants and it will require excavation to expose the full dimensions of these features.

Walled or blocked passages and openings were also very common in the cave. A huge wall constructed of heavy large boulders (with dimensions up 1 meter in size) blocks most of the entrance into the cave. Many entries into the breakdown were also walled or blocked by stones. These constructions were less formal, in most cases, consisting of piled stones and cobbles preventing access into these tunnels. In nearly all cases, these types of features have been disturbed and the tunnels have been opened up. Not all blocked passages are large enough to permit human entry. There were a few instances in this cave, and caves throughout the region, of the blockage of small crevasses and openings with stones.

Two large stone constructions remain in the cave creating elevated flat space. Location 240 is a meter-high pile of stones creating a relatively flat 100 by 50 centimeter surface. Thick deposits of ash and charcoal cover this surface indicating extensive burning. A second feature (Location 231) is a similar construction of tabular stones stacked nearly 1 meter high with a flat upper surface. No ash was observed here. While we often refer to these features as altars, their exact function is not truly known and interpretation or comparison with other sites is beyond the scope of this report.

Several interesting patterns were observed in the breakdown areas of the cave. Above the breakdown and in the area of Chamber 4 the cave surface is modified with terraces and stone features. Openings into the breakdown are often blocked or modified and burning is common in these areas. Inside these tunnels artifact density is much higher consisting of broken jars and bowls.

## **Conclusion**

Future studies in Rio Frio Cave A should include the conclusion of mapping efforts in the Breakdown area, Breakdown Tunnels, and any newly discovered chambers encountered during future work as top priority. Extensive excavation in Chamber 3 is required to further understand the architectural structure of the terrace system. Other excavations throughout the cave are necessary to collect charcoal for dating, particularly where there might be potential for stratified deposits. Additionally, collection of floral remains from ash lenses, hearths, and sediment samples will provide better understanding of offerings brought into the cave.

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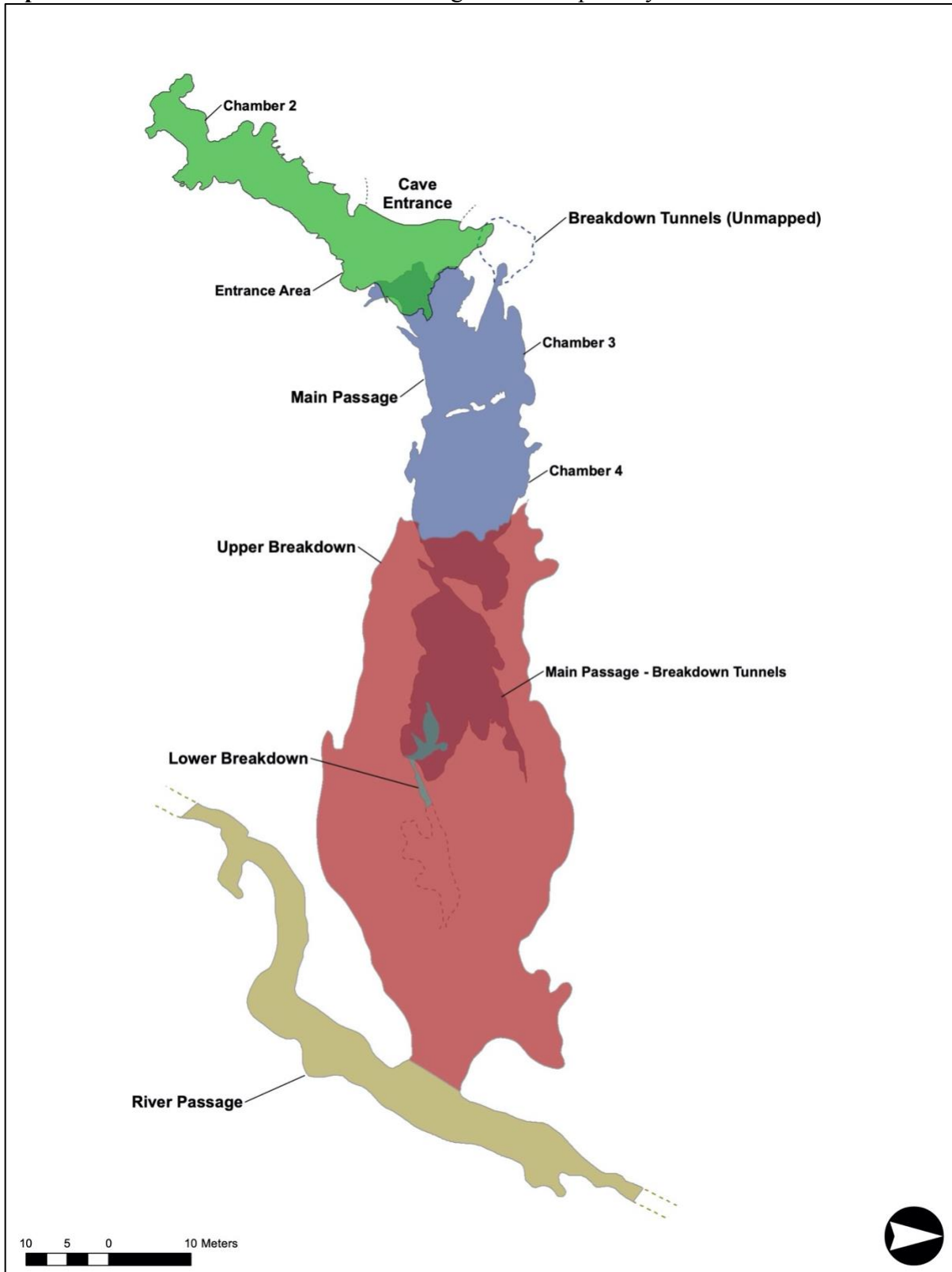
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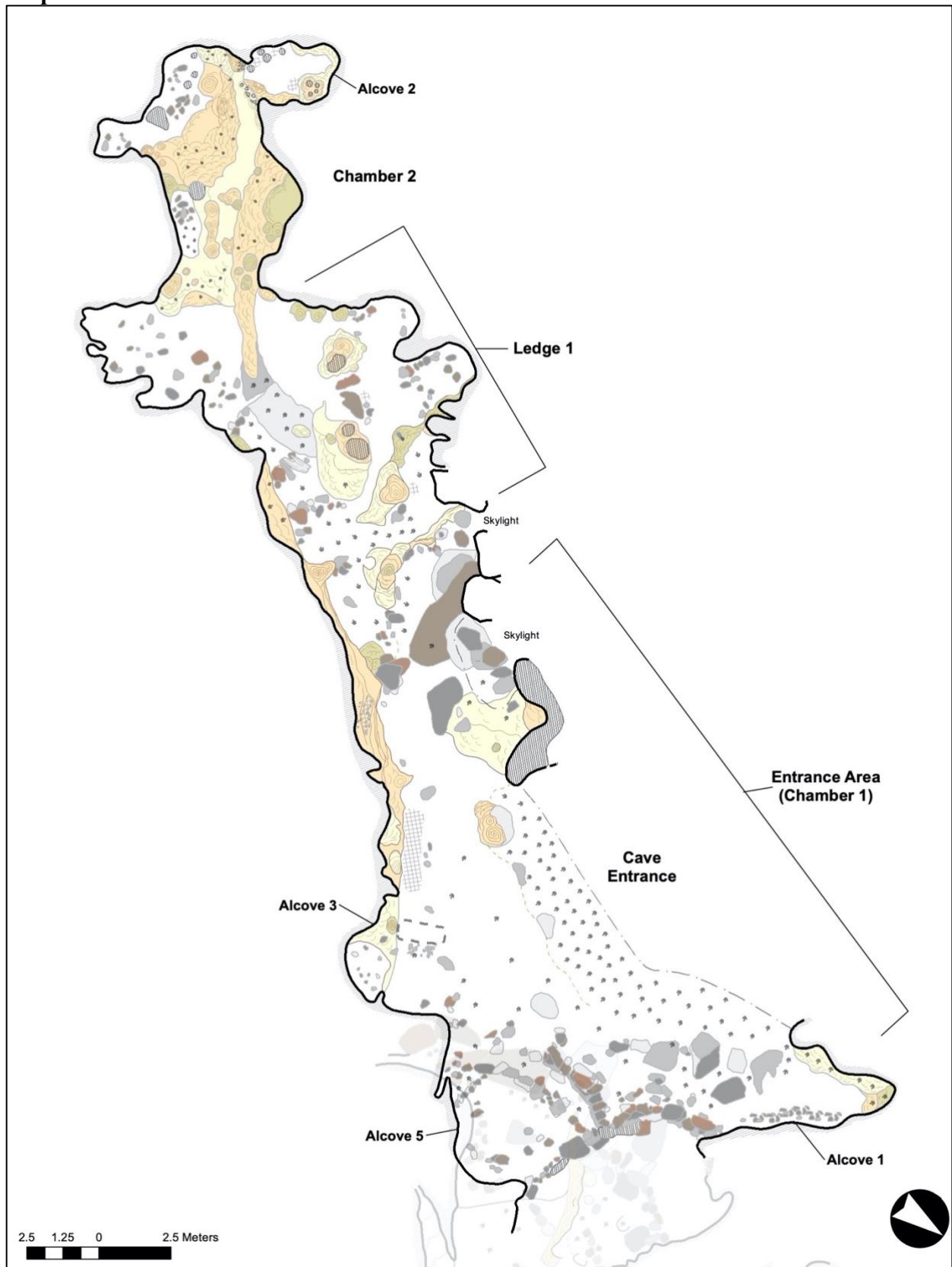
## Map Appendix

**Map 1.** Overview of Rio Frio Cave A showing levels and primary areas.

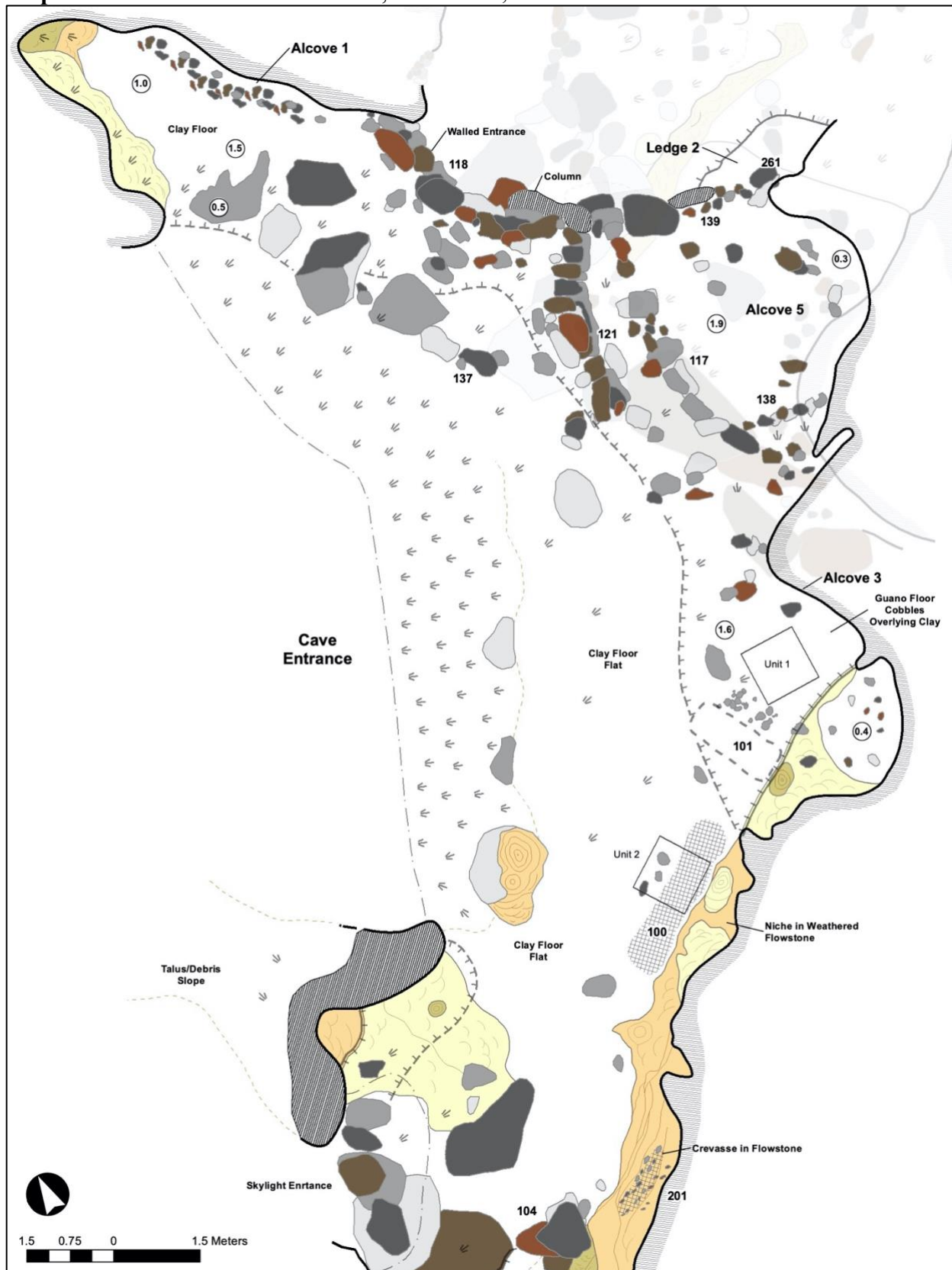




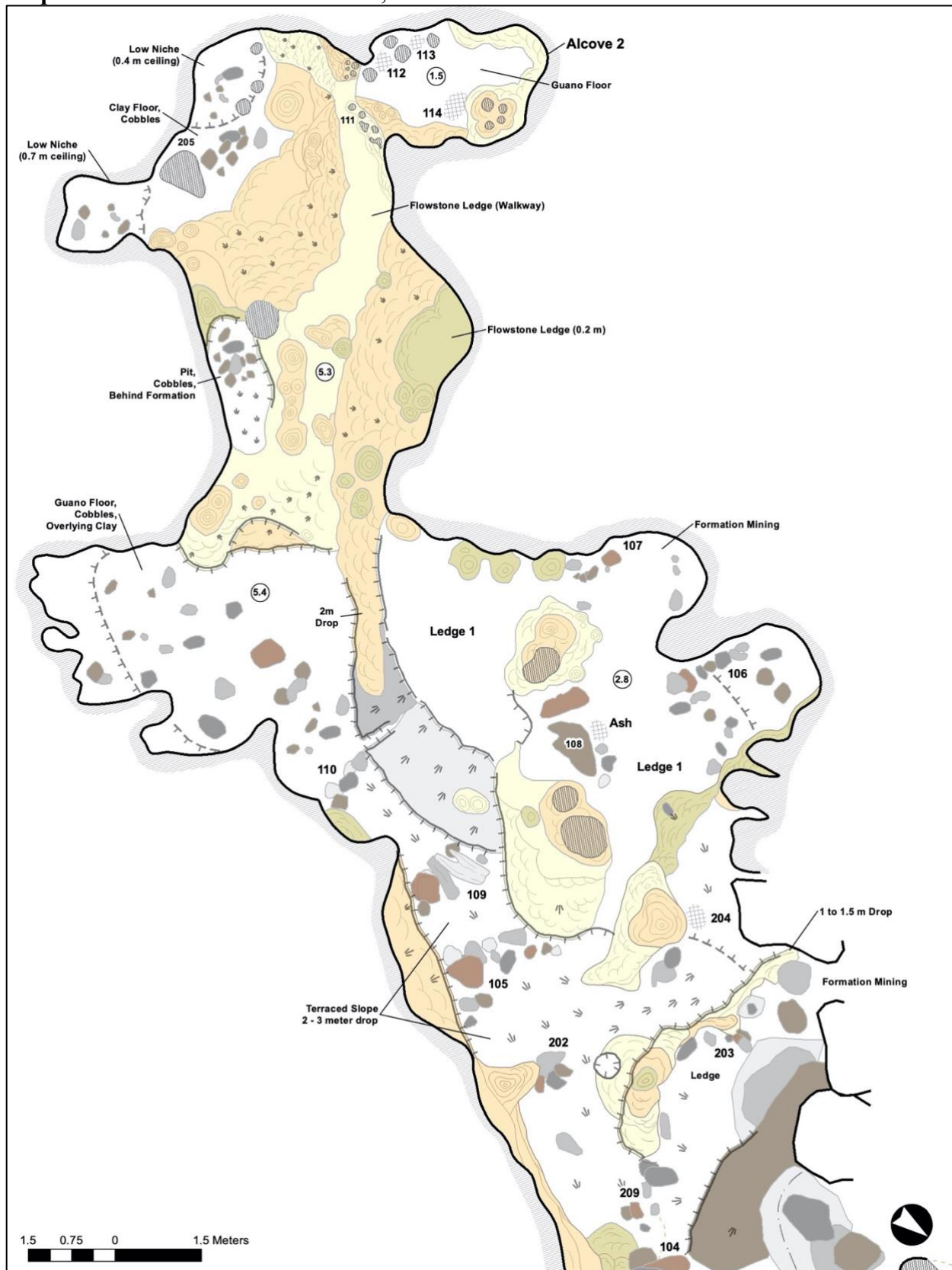
**Map 2.** Overview map of Rio Frio Cave A Entrance Area.



**Map 3.** Plan View of Rio Frio Cave A, Chamber 1, the “Entrance Chamber.”

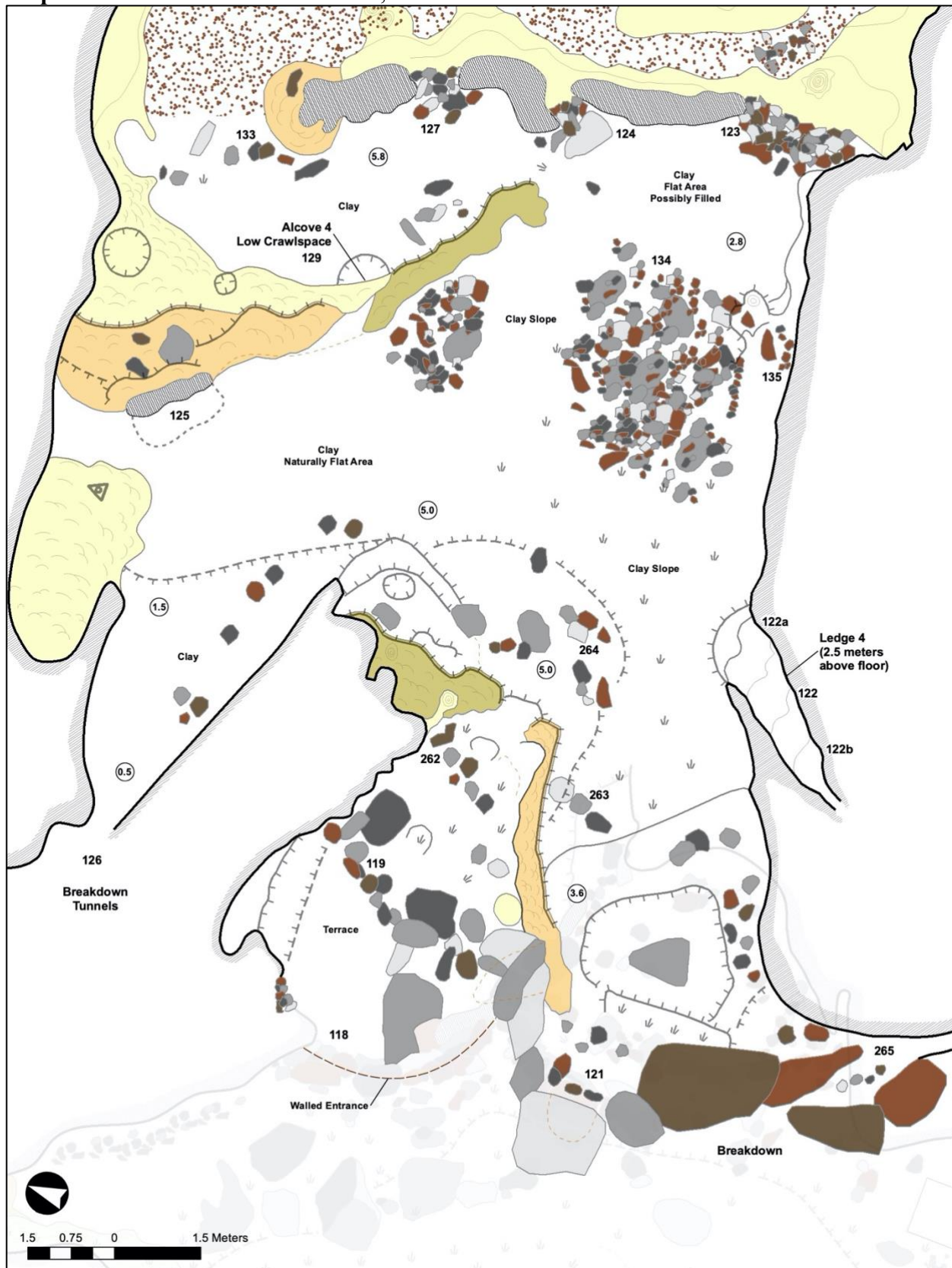


**Map 4.** Plan View of Rio Frio Cave A, Chamber 2.

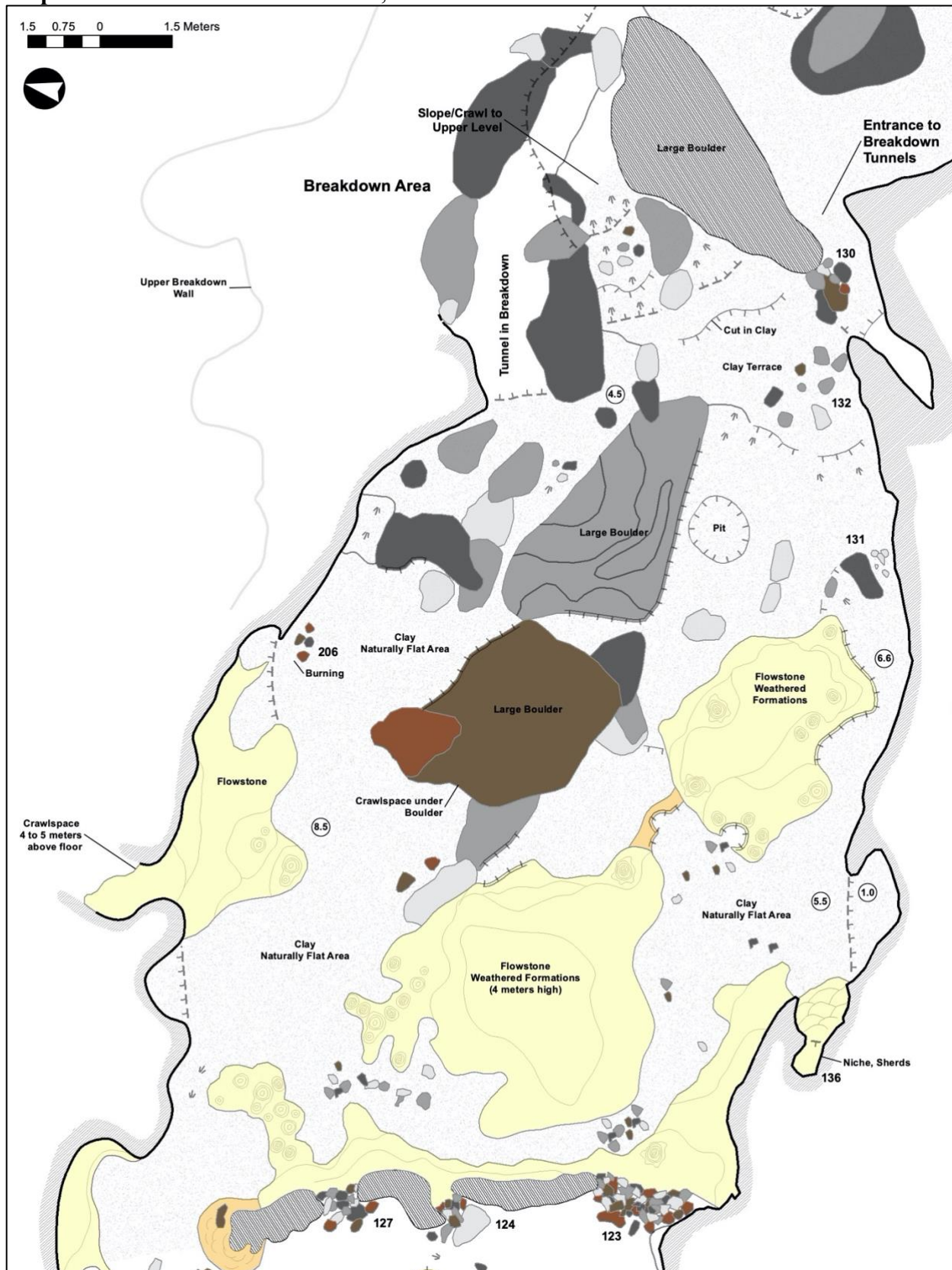




**Map 5.** Plan View of Rio Frio Cave A, Chamber 3.

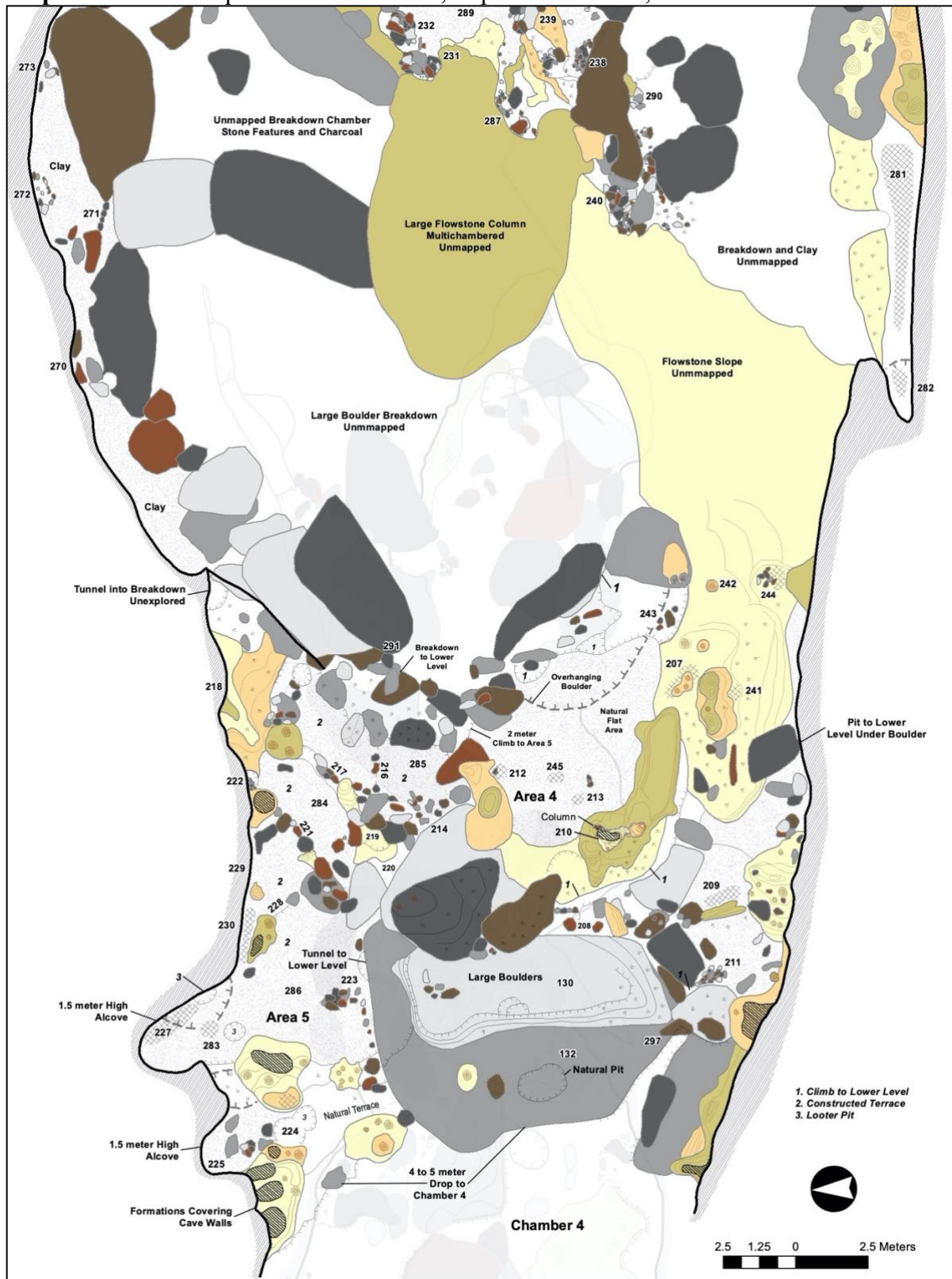


**Map 6.** Plan View of Rio Frio Cave A, Chamber 4.

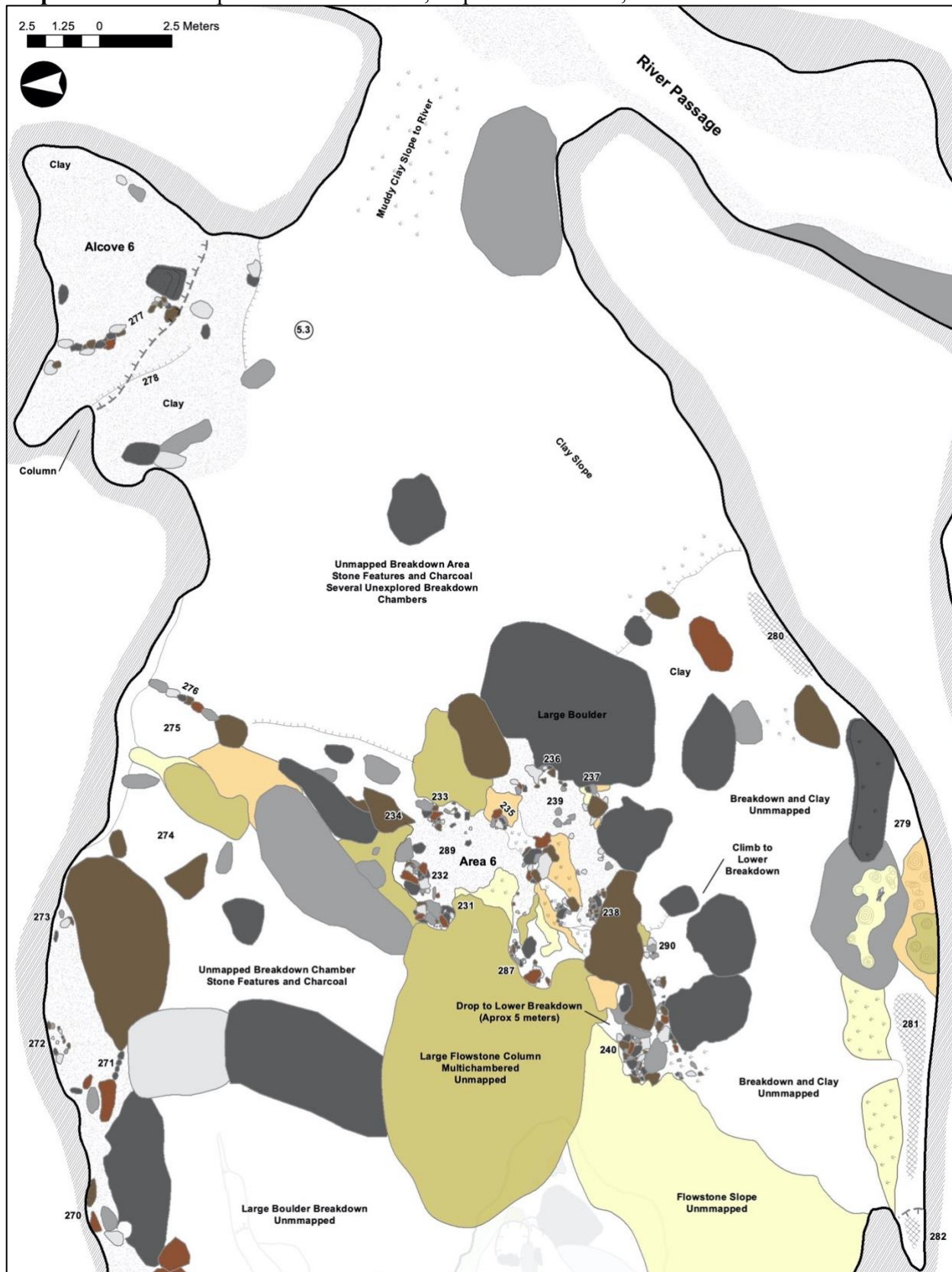




**Map 7.** Plan view map of Rio Frio Cave A, Top of Breakdown, west side.

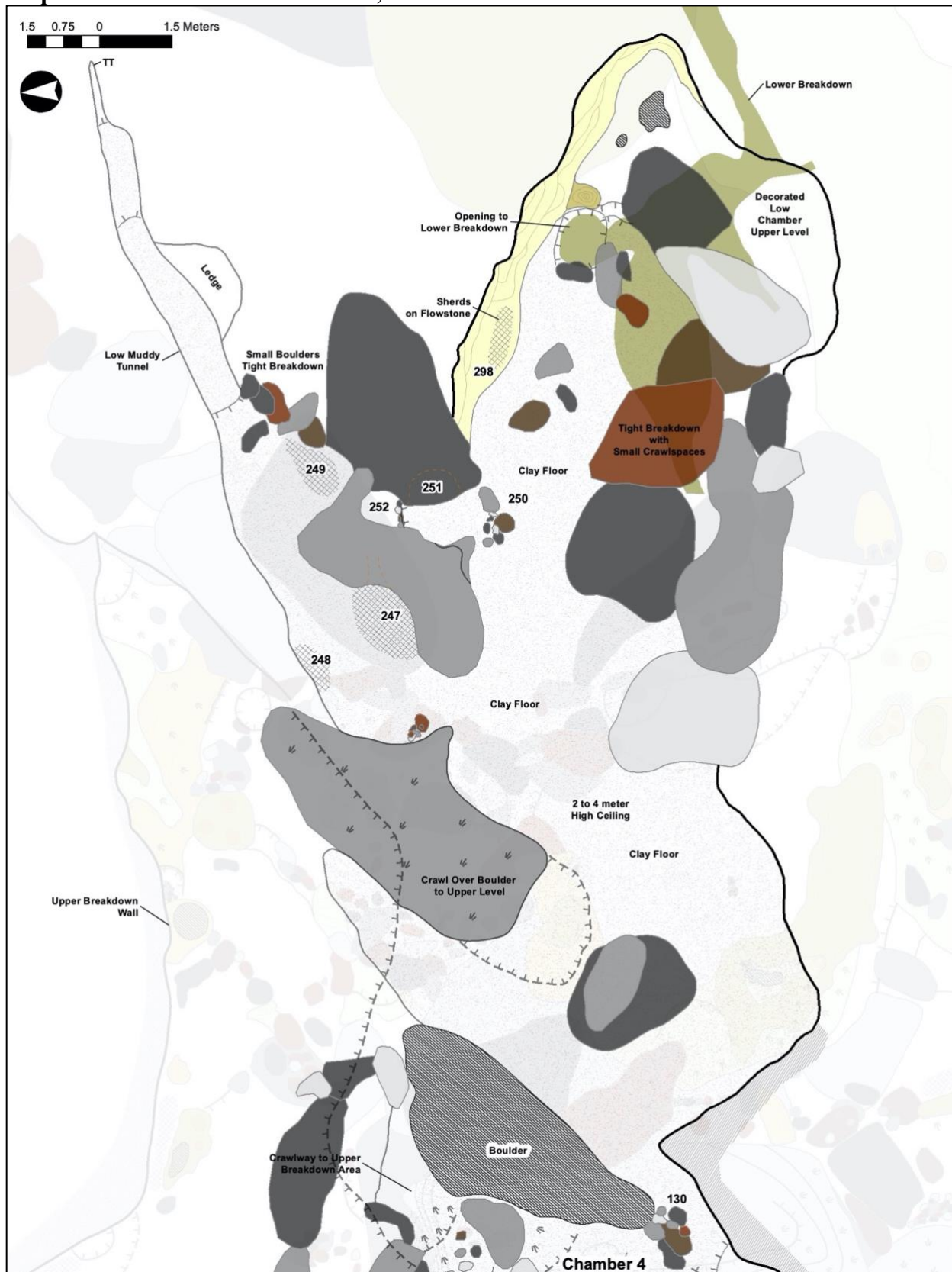


**Map 8.** Plan view map of Rio Frio Cave A, Top of Breakdown, east side.





**Map 9.** Plan view of Rio Frio Cave A, Breakdown Tunnels.



## Chapter 4: Archaeological Investigations in Rio Frio Cave C

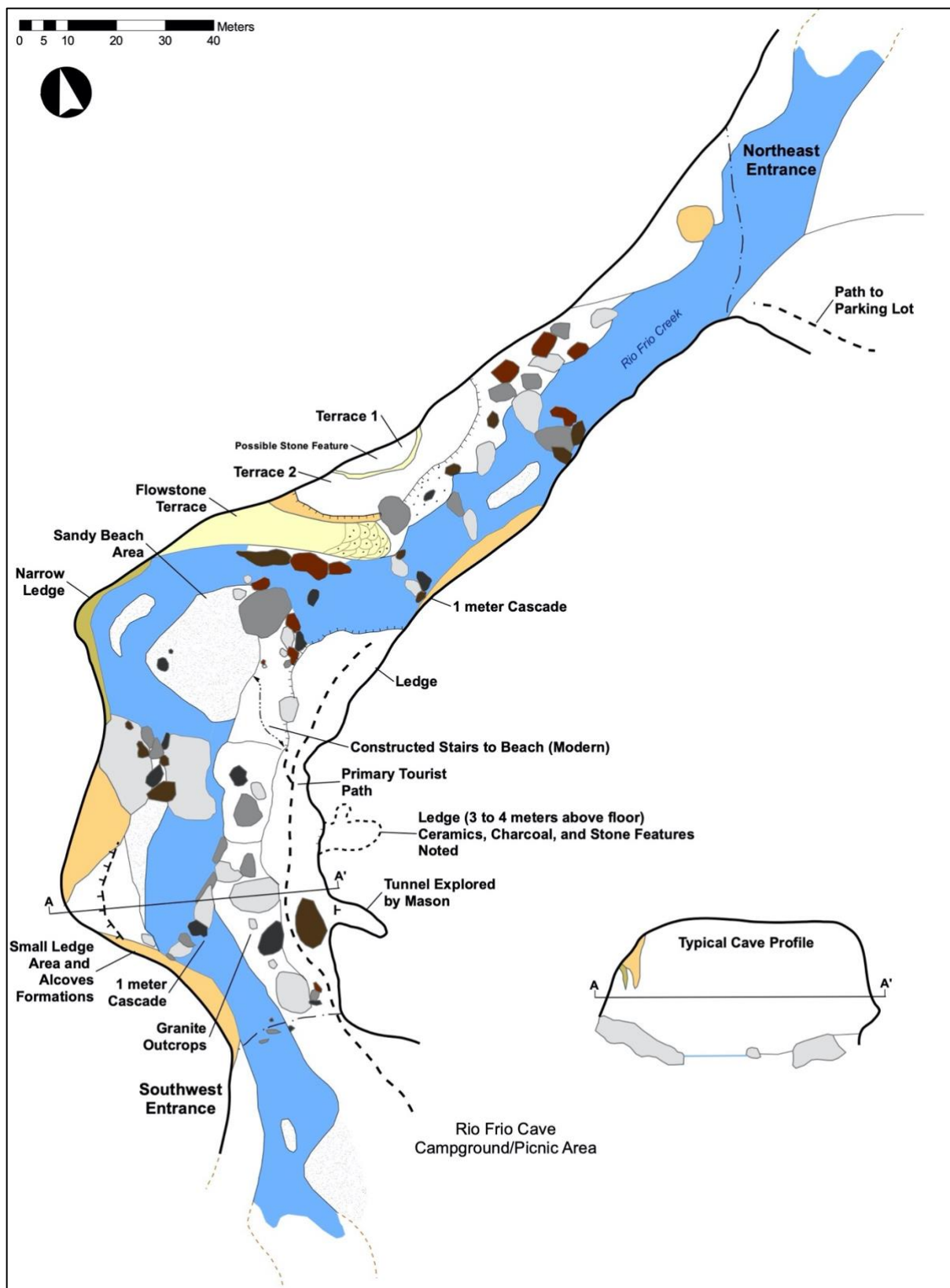
Michael Mirro  
(PaleoWest)

Limited time was spent documenting the prehistoric use of Rio Frio Cave C (RFC) during the 2019 RiFRAP field season. However, a basic map (**Figure 1**) was prepared showing the general layout of the cave, and photography was completed to create a series of spherical panoramic photographs for a virtual walk through of the cave. The cave is heavily trafficked by tours en route to Caracol and has suffered much damage and loss of cultural material as a result. Very few artifacts and cultural features remain on the surface; however, during mapping efforts a few items and features were recorded.

RFC is an exceptional cave due to its large passage size, two entrances, and the creek with several small waterfalls and pools flowing through (**Figure 2**). The cavern is 220 meters long, the passage width is 25 to 55 meters, and ceiling varies between 25 to 30 meters high. RFC consists of a single trunk passage serving as a conduit for the Rio Frio, which drains over 6 square miles of the Pine Ridge surface. This creek is subject to flooding affecting the lower extent of the cave. Sand bars are present in the major pools (**Figure 3**) and the area two to three meters above river level has been subject to scouring. Organic matter, including branches, leaves, and humus wedged up into crevasses and alcoves along the river indicate that severe floods have occurred at least in the last decade; although the actual interval is not known.

The Mountain Pine Ridge (MPR) is a massive formation of uplifted granite that has pushed through Tertiary and Cretaceous limestones of the Vaca Plateau and Belize Valley and these limestones rest unconformably on the granite (Bateson and Hall 1977; Steiner and Walker 1996). Major drainages of the MPR, such as Rio Frio and Rio On, have eroded through the limestone and into the underlying granite formation. Valleys in the vicinity of RFC have granitic outcrops along the valley floor flanked by cliffs and outcrops of limestone embedded into their side slopes; however, limestone in this area generally mantles the surface. East of the Rio Frio caves most of the limestone has been eroded away; however, isolated remnant hills of limestone are still present. The Rio Frio drains the granite surface of the central part of the MPR funneling into a relatively narrow blind valley cut into the limestone draining into the northeast entrance of RFC.

The cave has formed along the contact between the granite and limestone conducting the entire river. Where the river flows, the floor of the cave consists of eroded granite outcrops where water has carved a course along joints in the bedrock (**see Figure 2**). Along the river and passage margins are massive flowstone deposits and large blocks of limestone breakdown. Two large relatively flat and open areas of flowstone and breakdown infilled with sediments are in the southern and central part of the cave. The banks in the northeastern end of the cave are breakdown infilled with sediments and are sloped. Dense active formations are against the western wall of the cave from the southern entrance to the cave center (**Figure 4**). A long narrow ledge is present through this area as well as several small chambers formed between flowstone deposits and the cave wall.



**Figure 1.** Map of Rio Frio Cave C.





**Figure 2.** Southern entrance of Rio Frio Cave C with 2019 RiFRAP crew at bottom of photo for scale. Note the large granitic outcrops and flowstone and breakdown on the right side (east) of the passage (photo by J. Spenard).



**Figure 3.** Fluvial sand deposits and ponded portion of Rio Frio in the central part of Rio Frio Cave C (photo by M. Mirro).

Along the eastern wall of the cave are several ledges and two small tunnel systems. In the central part of the cavern the ledge runs from the flowstone terrace surface to several meters high and is approximately one meter wide. Other ledges can be seen higher up the cave wall near the entrance but have not been accessed by our team. At the southern entrance of the cave is a narrow tunnel extending 10 to 20 meters partially closed by snapped formations. They were likely those broken by Mason (1928, 1940) during his exploration of the cave beyond which he recovered human remains as well other cultural deposits. A second opening in the cave wall is located 5 meters above the flowstone terrace 20 meters north of this tunnel. This opening actually consists of two parallel tunnels about 10 meters deep and no more than 2 meters high. Small limestone rocks can be found covering much of the floor.

Cultural remains in the main trunk passage of the cave are rare and only a few areas evidencing possible prehistoric remains have been recorded. A stone feature was identified at the highest area of the large flowstone formation along the western wall in the central part of the cave. The feature consists of five to six stones in a small tight cluster. That area has extensive deposits of sediment and guano and buried deposits may exist. Ceramic sherds were on several ledges above this area as well.

Ceramic sherds were also identified in the formations along the western wall near the southern entrance. Density was very low, sherd size was small, and many have fresh breaks indicating they have been crushed recently by cave visitors. Ceramics were also observed on the



opposite side of the cave on the low long ledge in the center. Most of these ceramic specimens lack diagnostic qualities and therefore temporal and functional data from the deposits is limited. The small tunnel that Mason possibly explored by the entrance has not been explored at this point, and its full extent and the cultural deposits within are unknown. The ledge 5 meters above the terrace was explored and several sherds making up about 70 percent of a small bowl were observed. This artifact has not yet been analyzed or further documented at this point. It remains in the cavern.

Planned future work in RFC includes the excavation of several units in areas where sediments may retain stratigraphic integrity such as the flowstone terraces along the west wall in the central part of the cave. As well the tunnel near the southern entrance will be explored, mapped, and cultural remains will be documented. A surface collection of ceramics on ledges and terraces throughout the cave will be conducted in an attempt to find diagnostic material. Also, a virtual tour will be created using spherical panoramic photographs, mapping, photographs, video, and 3D model will be created soon.



**Figure 4.** Southern entrance with formation area and ledge on left (west) side. Terrace surface is in the foreground and tunnel possibly explored by Mason (1928, 1940) on the right.

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## **Chapter 5: Investigations in Domingo Ruiz Cave**

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We first visited Domingo Ruiz Cave during December 2018 and begun our investigations a year later during the short December 2019 field season. The research goals for the cavern were to conduct surface collections of diagnostic artifacts, place testing excavations for developing a site chronology and understanding how it was used, digitally document Maya architectural features, and experimenting with low-cost 360° photography for recording it. Results were mixed. Two excavation units were placed although few diagnostic ceramics were encountered. Nonetheless, worked and cut bone were recovered from possible Pleistocene age deposits suggesting this cavern may be a prime location for future studies about the earliest people of Belize. Diagnostic artifacts were sparse on the surface even though nearly the entire floor of the cavern holds a very low-density ceramic scatter. Nevertheless, we recovered a cached biface, possibly from the Early Postclassic period, and a few sherds stylistically dating in the Belize Valley to the last two centuries of the Late Classic period. Lastly, although the use of the low-cost 360° camera for photo and video efforts is significantly easier and quicker than the use of a dSLR camera placed on a tripod mounted 360° head, the results are incomparable. The output of the low-cost option is insufficient for archaeological precision, but they can still useful for teaching and public outreach.

This cave was targeted for investigations because it had been opened for tourism by the Forest Department (FD) sometime between June and December 2018. Signs leading to it had been posted on the Caracol Road, and the road leading to it improved. At the end of the road a large palapa was constructed, and a foot trail continued beyond to the cave entrance. Inside, cultural, fragile travertine areas, and living formations had been marked off with flagging tape. Remarkably, the cave showed little sign of disturbance or pot hunting, although whole and fragmented vessels were absent. Nonetheless, as noted above, the entire cave floor contained a very low-density ceramic scatter and jute shells were common near the entrance. Due to the presumed intact nature of the archaeological record there, and the threat to it by increased tourism, the RiFRAP decided to make it a high research priority. Although only recently opened to tourism by the FD, a quick internet search using the terms, “Doming Ruiz Cave Belize” reveals tourists have been visiting the cave since at least 2013.

### **What’s in a Name?**

Domingo Ruiz Cave is named after the Forester who first discovered it. Nevertheless, what led to his discovering it remains uncertain as we have been told many stories about it. They are summarized here for historical interest but also because it may help shed light on future investigations in the cavern. What all of the stories share in common is that Domingo Ruiz and his family lived there while trying to escape some catastrophe. How long they stayed there remains

uncertain, some of the stories say the Ruiz family stayed there for no more than a few days, while others suggest a few weeks. In the coming seasons, the RiFRAP will reach out to Mr. Ruiz to learn about the discovery directly.

One of the stories tells that in the 1970s or 1980s a radio station named Radio Belize played for part of the day. Once it went off air, a Guatemalan station would broadcast over the same frequency. One day, the Guatemalan station began broadcasting earlier, disrupting the Belize programming. Instead of the typical broadcast, the Guatemalan station began speaking of an invasion of Belize. Having no quick solution to verifying the account, Mr. Ruiz gathered up his family and all of their things to leave Augustine. They fled into the forest where they eventually stumbled onto the cave where they stayed until they were certain the crisis had ended.

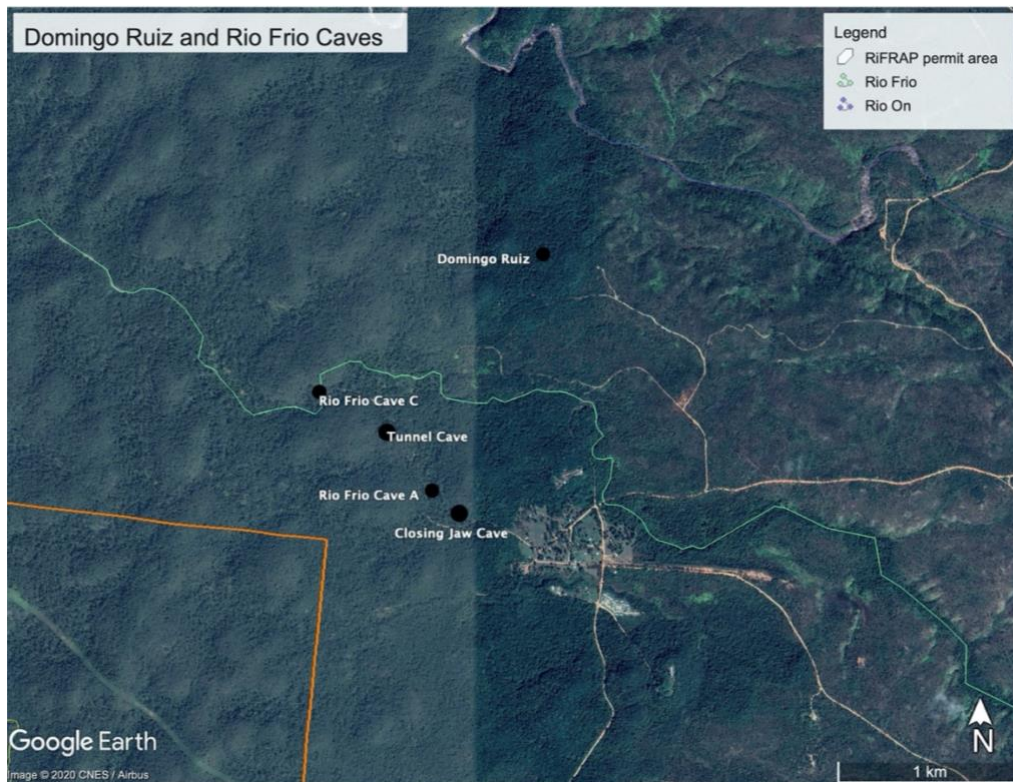
Two other accounts of his discovery of the cave are weather related. One tells that Mr. Ruiz was assisting with a wildfire in the Mountain Pine Ridge, he was cut off from his team and about to be overtaken by the fire causing him to flee into the forest where he stumbled upon the cave. He stayed there until the fire had passed. The other weather-related account states that Mr. Ruiz found the cavern and brought his family there to escape a powerful hurricane.

### **Preliminary Site Description**

Domingo Ruiz Cave is located in a south-facing hillside 750 m south of Rio On (**Figure 1**). Its UTM coordinates are: 16 Q 1879068.45 m N 287593.96 m E and it is at 1,680 ft asl. It is a dry, fossil phreatic passage cave, meaning it was originally formed by percolating water dissolving all sides of the feature, but it is no longer subject to erosion (Miller 1996; Palmer 2007). Instead, it is now being shaped by deposition and formation growth. It consists primarily of two intersecting straight passages 123 m in total length, between 6 to 7 m tall and 13 m wide. Entrance is by means of a shallow 21 m-wide sinkhole in the hillside that is naturally divided by a portion of still-standing bedrock face (**Figure 2**). The rockshelter averages 2.5 m wide with a ceiling height of up to 3 m. The rear of the rockshelter is defined by the tops of a series of flowstone formations that stretch approximately 5 m down to the main passage below. Uncut limestone rocks and walls were placed presumably by Maya people in the gaps between the back wall of the rockshelter and the tops of the formations (**Figure 3**). Overall some of the openings are too small for people to enter, and all lead to a steep, unclimbable drop into the passage below, suggesting those walls serve no other purpose than blocking ambient light from entering the cave interior.

Entrance to the main passage is by way of a natural stepped drop of 3 m in center rear of the rockshelter floor that has been further modified with a series of retaining walls and platforms seemingly serving as steps. They lead to the only true chamber in the cave, Chamber 1, an ovicular-shaped, steeply sloping room 13 m east-west by 7 m north-south. The entire floor of the chamber is covered in flowstone and boulders, some of which may be architectural remnants now destroyed (**Figure 4**). The cave continues along an azimuth of 100° for another 35 m at which point it bends sharply to the northeast. From that bend, the passage continues straight for 75 m along a 75° azimuth with no indication of a way forward. No other side passages have been located. Beyond Chamber 1A, the floor of the northern side of the cave is largely dirt with some small pockets of dripstone formations. The floor on the southern side is largely rock with significant travertine pool





**Figure 1.** Satellite image showing location of Domingo Ruiz Cave to other Rio Frio Caves. Blue line is Rio On, green line is Rio Frio, and Orange polygon in bottom left corner is RiFRAP permit boundary.



**Figure 2.** Domingo Ruiz Cave entrance. Entrance 1 is to the left of the photo, and Entrance 2 is behind the vegetation in right center (Photo by J. Spenard).





**Figure 3.** Small rock walls used to fill gaps between rockshelter rear wall and tops of formations stretching down into the main passage (photo by J. Spenard).

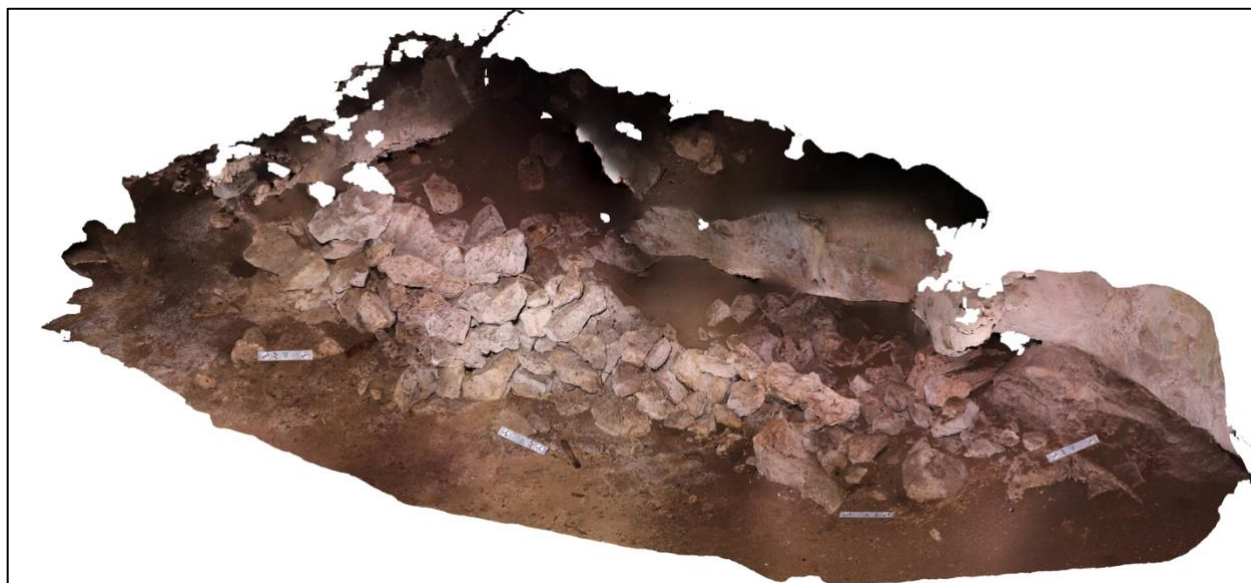


**Figure 4.** View of Chamber 1 looking toward cave entrance, and unblocked entrance to Chamber 1A to image right (photo by J. Spenard).

covered area discussed below, past which are breakdown boulders.

Directly to the north of Chamber 1 is a smaller sub-chamber, labeled Chamber 1A. It is a 3 m north-south by 7 m east-west room with variable height from 2.5 m to 0.5 m tall. A significant portion of the ceiling is covered in formations; however, they have all been harvested in the past. The small room is naturally separated from Chamber 1 by a portion of low-hanging ceiling that Maya people further delineated as a separate, distinct space by constructing a limestone cobble wall in the void beneath the ceiling (**Figure 5**). The wall is 6 m long and currently stands 1 m at its highest although rubble lines the cave floor on either side suggesting it was taller in the past, and perhaps completely filled the void. Unlike Chamber 1 that is covered in flowstone and rocks, the floor there is almost purely dirt, although littered with ceramic sherds and *jute* shells found in the highest concentrations near the wall. We placed excavation Unit 1, discussed below, in this sub-chamber to determine how it was used and why the wall was constructed.

The southern wall of the first portion of the cave is dominated by a series of massive flowstone formations beyond which is a large area of travertine pools, many of which contain ceramic sherds. Some of them have been heavily cemented in flowstone indicating they were placed in those locations as pieces in antiquity. Abutting the travertine pools are large boulders, likely naturally occurring, in front of which are several ash deposits. One of the deposits was selected for excavation to collect charcoal for radiocarbon dating. That was the second unit placed and was named Unit 2. The travertine ends where the cavern turns to the northeast. At that point, the floor makes a slight incline at the foot of which is a 2m-long buried speleothem, intended possibly to be a step. Adjacent to the northern wall at the bend is a 1.5 m-tall stalagmite in front of which is a series of small travertine pools. Within the largest pool, we recovered a cached laural-leaf-shaped biface that resembles others dating to the Early Postclassic period in northern Belize (**Figure 6**; Shafer and Hester 1983:Figure 10). The cave floor is naturally horizontally divided over the last 75 m of the cave with the northern portion being between 1.5 to 2.5 m higher than the



**Figure 5.** Orthomosaic of standing architectural wall separating Chambers 1 and 1A, looking north from above into the sub-chamber.





**Figure 6.** Bifacially worked laurel-leaf shaped point recovered from travertine pool at major bend in cave (photo by K. Martinez).

southern side. The overall appearance of the southern section is that it was carved out by swift water flow, but the cave is dry and evidence of water having ever flowed through it is absent.

### **Excavations**

Two, 1m x 1 m excavation units aligned to the magnetic cardinal directions were placed in Domingo Ruiz Cave. The first is Unit 1 is located in sub-Chamber 1A. The second is Unit 2, placed over an ash lens in front of travertine pools near the center of the cave. Neither unit contained much cultural material and both were relatively shallow. All cultural material recovered from these activities are still undergoing processing and classification, although a cursory study of them revealed few diagnostics.

### *Unit 1*

We placed Unit 1 about mid-way along the eastern wall at the entrance of the sub-chamber (**Figure 7**). As with the whole chamber, *jute* snail shells are abundant, and a few sherds are scattered about. Matrix is a dark brown powdery soil with small pebble inclusions. Excavations recovered many of the snail shells, but only a few ceramics. In fact, cultural material was relatively absent from sub-surface deposits there. The unit was terminated after culturally sterile matrix was reached at 18 cmbs. Neither a plan nor profile drawing was made of this unit because it lacked stratigraphy and any significant mappable features. Upon completion of the excavation, the unit string was placed at the bottom, 3x5 plastic bags were situate in each corner, and the center of the unit was marked with a 2016 Belize nickel. After infilling the unit, orange capped roofing nails were placed just below the surface in the four corners to allow the unit to be plotted accurately when the cave is surveyed (**Figure 8**).

### *Unit 2*

Unit 2 was placed directly over one of two adjacent surface ash lenses near the bend in the main passage (**Figure 9**). The surface matrix is a light gray ash mixed with cave sediment, some charcoal, and a few ceramic shreds (**Figure 10**). That matrix was 2-3 cm deep after which it transitioned to an orange-yellow clayey soil, and then another ash lens was uncovered around 8 cmbs throughout the unit except for the northwest corner. Few ceramics and a paleoethnobotanical sample were



**Figure 7.** Unit 1 in context in sub-Chamber 1A (photo by J. Spenard).





**Figure 8.** End of Unit 1 showing markers placed at bottom of unit just prior to backfilling (photo by J. Spenard).



**Figure 9.** Area of Unit 2 prior to unit set up. Note the ash in lower center left, and photogrammetry scale bars and north arrow surround the location the unit was set up (photo by J. Spenard).





**Figure 10.** Unit 2 surface showing ash lens excavated (photo by J. Spenard).

collected from that top level. The northwest corner was an infilled 5 cm-deep pit with loose dark orange, pebbly soil. Material from the pit was collected as Feature 1 although it was limited. Possible ungulate teeth were recovered from the bottom of the pit, but no artifacts were encountered. Elsewhere in the unit, below the second ash lens and the pit, the matrix was orange-brown mottled clayey dirt. Few ceramics were recovered in the first level of the unit after which only small charcoal flecks and animal bone was recovered. The animal bone was recovered in the screen but the dirt was from several cm below the bottom of the Level 1 matrix. All of it appeared to be polished and one, a medium-sized mammal scapula had possible cutmarks on it. The unit was terminated at 20 cmbs after several cm of culturally sterile soil was encountered.

The recovery of the bone is potentially very significant because it was found in yellow-brown mottled matrix, which in cave contexts typically indicates Pleistocene-age strata. No mixing of the levels was obvious, and although the bone was recovered in the screen, it was well within the mottled matrix offering the tantalizing possibility that Domingo Ruiz Cave may have been used by the earliest inhabitants of Belize. Should this turn out to be the case, then large-scale horizontal excavations should be conducted in that area of the cave. Unit 2 was terminated in the same manner as Unit 1.

### **Digital Modeling and Virtual Tours**

Digital models were made of the excavation units, the wall separating Chambers 1 and 1A, the terrace-like steps leading down from the rockshelter into Chamber 1, and the stalagmite where

the biface was recovered. They are still being processed, and the models will be made available to the Institute of Archaeology as soon as possible. The scenes were photographed in .jpg and raw formats using a tripod mounted Canon EOS80D dslr camera with two LED video lights mounted to a bracket on top of the camera. When conditions allowed, photos were taken with between 30% to 60% overlap between images and from varying heights. Models are being processed using the software Metashape Pro. As we have done in the past, orthophotos and DEMs will be made of each model and plan and profile views will be drafted from them (Spenard et al. 2018).

Our experiments with capturing spherical panoramas and videos with a low-cost 360° camera provided mixed results. Throughout the December 2019 trip, including in Domingo Ruiz cave, images and videos were captured using an Insta360 ONE X camera. That camera takes spherical photographs of up to 18 MB resolution and 3, 4 or 5.7 k videos using 2, ultra-fisheye lenses each with 200° range of sight. Undoubtedly, the compact nature and ease of using the camera make it desirable for archaeological research in remote areas. This is especially true compared to our previous efforts that require carrying a sturdy tripod, panorama tripod head, the dslr camera, and a variety of lenses in addition to other gear (Mirro and Spenard 2018). Nevertheless, the two end products are incomparable. The dslr-produced photospheres are clear, crisp, composed of multiple overlapping photos and show only the scene. The photospheres taken on the Insta360 are made from only two photos shot with fish-eye lenses, the stitching is at times suspect, and photos are often visually noisy. The lack of manual settings and ability to control options such as the ISO, f-stop, and shutter speed add to the difficulty of shooting archaeologically acceptable photographs with the camera (**Figure 11**). Added to that, the fisheye effect of the lenses is not corrected in the processing software, Insta360 Studio, making interpreting scale difficult, even when a person is in the image.

Although our current equipment limitations have not allowed for making a 360° video on a dslr, our experiments with the Insta360 resulted in videos that are not acceptable for archaeology. Nevertheless, the quality is sufficient so that they can be used as teaching tools and for public outreach. For example, we have used the videos to teach our university students about ancient Maya cave use in Belize. The experience is particularly heightened when using virtual reality (VR) goggles to watch the films as the user can look around in any direction as the film is playing and experience what walking through the cave is like. Here is a web link to a walking tour of [Domingo Ruiz Cave](https://www.youtube.com/watch?v=SoiB6-BxPfo) (<https://www.youtube.com/watch?v=SoiB6-BxPfo>), and [Rio Frio Cave C](https://www.youtube.com/watch?v=5scFHYaVQPA&t=94s) (<https://www.youtube.com/watch?v=5scFHYaVQPA&t=94s>).

Those above considerations aside, our experimentation with this technology in Domingo Ruiz Cave has revealed some benefits. Even a low-cost camera such as the Insta360 ONE X can produce videos of sufficient quality to “bring” tourists to remote sites that may be otherwise inaccessible. Their use coupled with VR goggles may also serve to protect sites because they could provide sufficient experience for some who may then chose to go elsewhere.

## Conclusion

Although to date we have only dedicated a few days of study to Domingo Ruiz Cave, we have gained much insight from it. To its first possible use toward the end of the Pleistocene, to



**Figure 11.** Screenshot from Insta360 ONE X spherical panorama of Unit 2 area in Domingo Ruiz cave (photo by K. Martinez).

its last possible use during the Early Preclassic, a great deal of history has yet to be revealed here, and much work remains to be done. Over the next few seasons, we will map the cave, and include Units 1 and 2 on it, expand excavation efforts around Units 1 and 2 to better understand why Maya people chose to wall off Chamber 1A, and to better understand the possible Paleo/Archaic use of the cavern. Future efforts must also be focused on the rockshelter entrance of the cavern and the area outside it. The cave is located at the rear of a small U-shaped valley, a shape that holds deep symbolic significance in Mesoamerica related to ancestral emergence and community identity (Garcia-Zambrano 1994). Several possible small mounds have been noted in the forest edge along the rim of the valley, although time has not permitted verifying them.

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## Chapter 6: Reconnaissance in the Mountain Pine Ridge: The 2018 and 2019 Seasons

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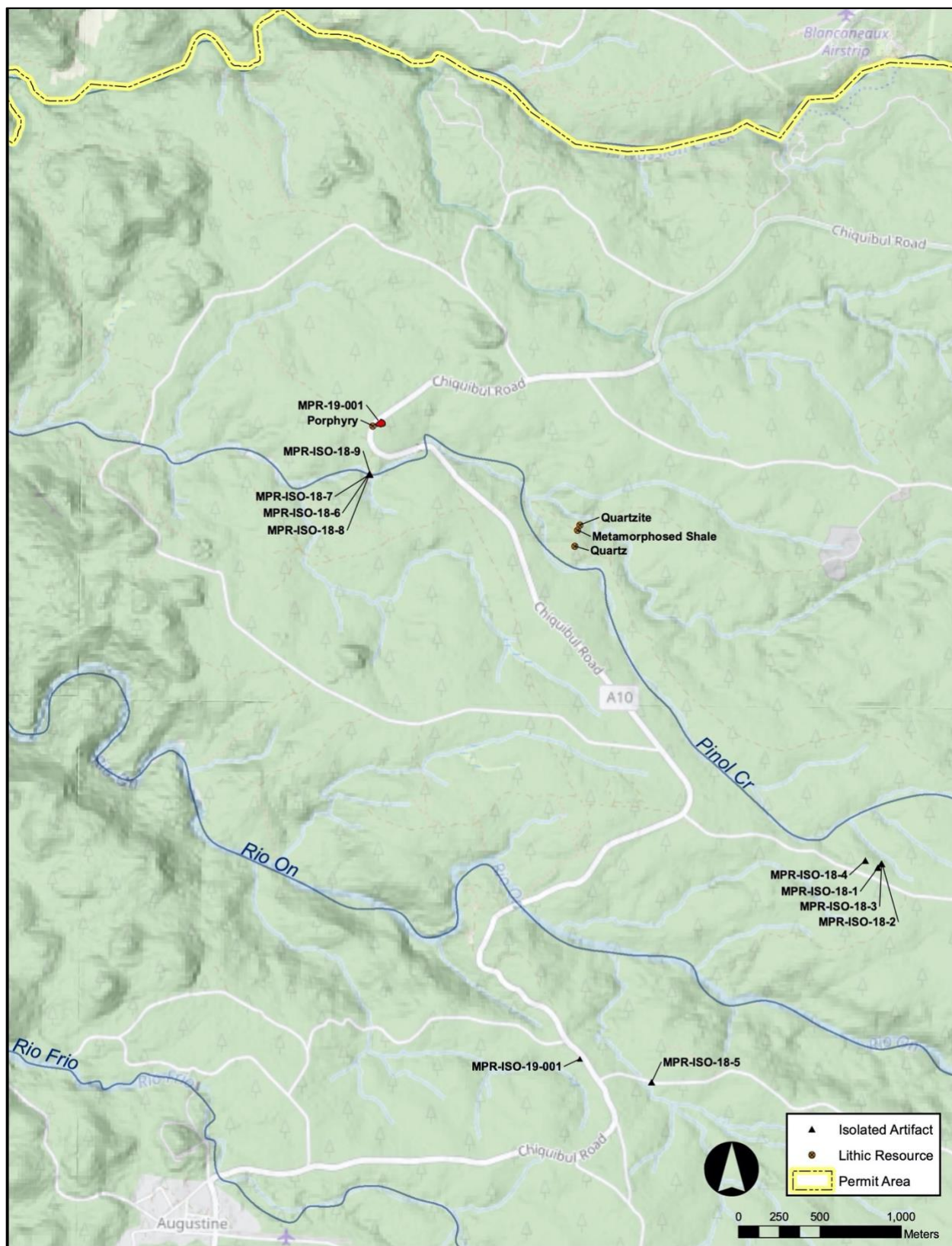
Direct evidence for pre-Hispanic Maya use of the Mountain Pine Ridge (MPR) is unknown beyond one possible structure and several cairns documented on the pluton (Bullard 1963; Thompson 1938). While several studies have recognized the region as a source of granite, slate, pine, and other raw materials (Graham 1987; Healy et al. 1995; Healy and Blainey 2011; Lentz et al. 2005; Morehart 2011), no systematic archaeological studies have been conducted and only recently have efforts been made to identify quarry locations (Skaggs and Powis 2014; Tibbits 2016, 2020). Project reconnaissance in the MPR included mapping and sampling of raw geologic materials including the identification of slates associated with the Santa Rosa Formation and an intrusive porphyry formation, and the collection and mapping of various grades of granite. Further, approximately 8 to 12 hectares were systematically surveyed for cultural resources resulting in the discovery of several isolated artifacts and a sparse lithic scatter representing the first recently documented prehistoric evidence in the region. Artifacts in most cases were located on deflated hilltops and no associated features were observed making dating difficult.

### Methods

Survey of the Mountain Pine Ridge was conducted at the beginning and end of workdays and consisted of opportunistic, mixed systematic-random survey largely along the Caracol Road, our primary route of transportation between our lab and the Rio Frio caves. We also surveyed a ridgetop and hillside above Pinol Falls. Areas selected for survey were largely dictated by the presence of metamorphic rock veins and unusual landscape features such as waterfalls and other vistas that commonly invoke of awe and majestic beauty (**Figure 1**; Taçon 1999:36-37).

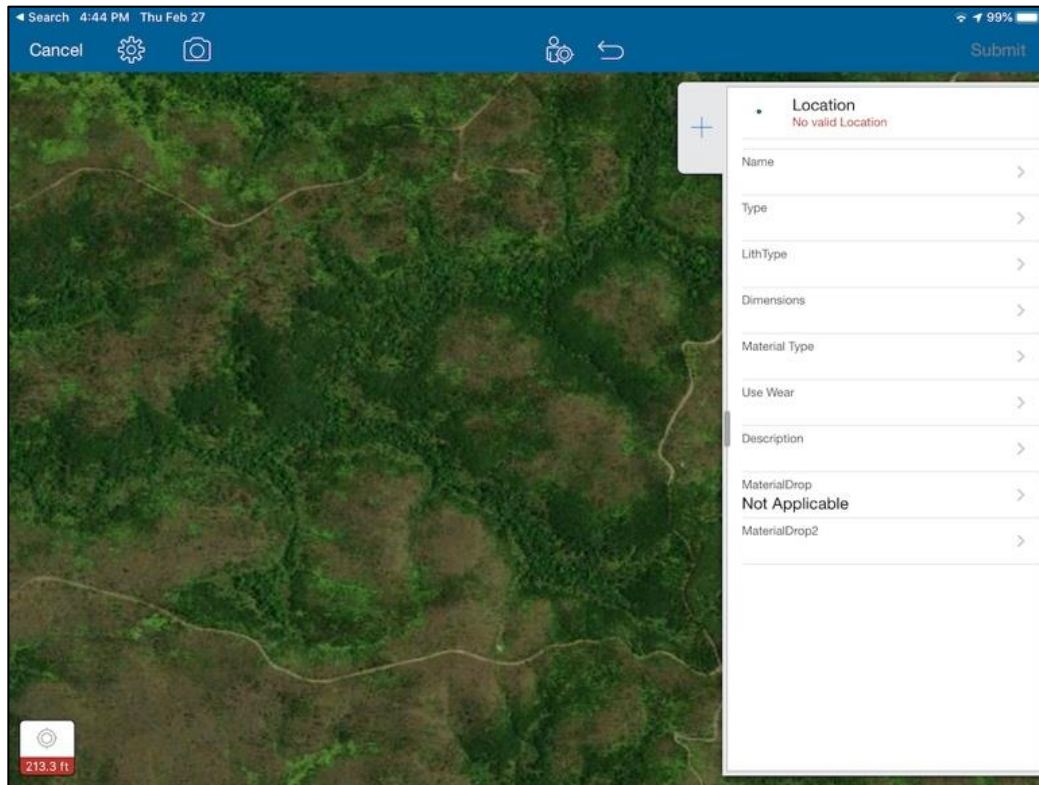
Project members fanned out in groups of two from the project vehicle and walked parallel transects along the road. When an artifact was encountered, its location and physical characteristics were recorded on tablets into the project GIS using ESRI's Collector App (**Figure 2**). Photographs of the in-situ object(s) were taken, and then they were collected for future analysis. The entire team then would gather at the location of discovery and conduct a more thorough survey of the area around the object (**Figure 3**). If another object was found, a second 10 m buffer around the new object was fully surveyed. That procedure would continue until no more artifacts were located. Beyond the 10 m buffers, project members conducted a 20-percent coverage survey for an additional 5 m. If no further objects were located, members returned to their original transects and the survey continued.





**Figure 1.** Map of Mountain Pine Ridge showing locations of lithic sites and metamorphic rock outcrops located in the 2018 and 2019 field seasons.





**Figure 2.** Screen shot of Collector app showing types of data collected for isolated artifacts.



**Figure 3.** RiFRAP team members conducting full coverage survey around located object.

## Site and Isolated Find Descriptions

A typical hunter-gather definition of an archaeological site was employed for survey in the MPR. A site was defined as a location of past human activity with three or more artifacts within 50 m of each other. This definition has been adapted from our team's personal experiences working in California archaeology where lithic scatters make up a significant portion of the archaeological record. In many ways, soil taphonomy in MPR is similar to that in the desert areas of California. In particular, thanks to wind and water action, smaller grains of sand and soil have eroded away leaving behind larger pebbles and grains of matrix. These processes have caused surfaces to deflate, creating a compressed surface chronology, and over millennia they have transformed into natural pavements.

With a broad definition of "site," we have adopted the following naming convention to label them, MPR-YR-####. MPR is the acronym for Mountain Pine Ridge; YR is the two-digit year the site was recorded; and the #### portion of the label represents the order in which the site was located. The first site is labeled 001, the second site 002, and so on. For example, site MPR-19-258 would be the 258<sup>th</sup> site located in the Mountain Pine Ridge in the year 2019. Isolated artifacts received a similar, but independent naming convention for which "ISO" (for isolate) is placed between "MPR," and the two-digit year. For example, MPR-ISO-19-258 would be the 258<sup>th</sup> isolated artifact recorded in the Mountain Pine Ridge in the year 2019.

The 2018 results of the MPR survey are included on the results map (see **Figure 1**) and listed in **Table 1** below, which provides a short description of the artifacts. In 2018, nine artifacts were identified during reconnaissance surveys along roads in the MPR. All artifacts located included relatively unpatterned flaked tools, cores, and debitage. Much of the debitage had use-wear.

Table 1. Artifacts identified during 2018 reconnaissance in the MPR.

Name	Description
MPR-ISO-18-001	Shatter; a small piece of white and gray shatter; 2 cm
MPR-ISO-18-002	Flake; purplish white; 10 cm
MPR-ISO-18-003	Flake; undescribed
MPR-ISO-18-004	Core; undescribed
MPR-ISO-18-005	Core; white and great mottled core; 6x7x3 cm
MPR-ISO-18-006	Flake; white rose gray flake fragment distal edge utilized; 1.5 x 1 cm
MPR-ISO-18-700	Core tool; crushed edge; scraper 4x5cm
MPR-ISO-18-008	Flake; quartzite; reddish brown; secondary; cortex on one side; modified river cobble
MPR-ISO-18-009	Flake; undescribed

### *Site MPR-19-001*

This site is a lithic scatter located on the east side of the Chiquibul Road on a flat-topped ridge 250 meters north of Pinol Sands. The collected assemblage includes 35 flakes and one piece of shatter. Material types include various cherts, quartz, quartzite, and fine-grained quartz (**Figure 5**). Although analysis is still underway, preliminary observations indicate that some of the flakes show signs of wear and use. The site area is approximately 1500 square meters and flake density is low consisting of one item for every five meters.



**Figure 5.** Field photograph of lithics recovered from MPR-19-001 (photo by M. Mirro).

The site appears relatively deflated with a thin crust of small pebbles covering much of the surface left behind as fine material has eroded downhill. Recent fires have burned most of the vegetation, and the organic humic layer covering the surface is absent. Living vegetation includes grasses and small shrubs. Several low granitic outcrops were observed within and near the site; however, there appeared to be no cultural modification to them. A linear outcrop of porphyry less than 1-meter wide oriented east-west is located several meters south of the site. A plow scar transects the western portion of the parallel to the Chiquibul Road and the road forms the site's western extent. No artifacts were observed on the opposite side of the road.

#### *MPR-ISO-19-001*

This isolated artifact is a semi-translucent microcrystalline quartz flake showing evidence of use. It was found west of the Chiquibul Road above the Rio On Valley (**Figure 6**).

#### *Lithic Resource Sites*

Several geologic raw material sources were noted during reconnaissance efforts in the MPR. They include strata of the Santa Rosa and Pine Ridge formations and were observed as layers ranging in width from half a meter to over 10 meters. Porphyry, as previously noted, was observed in the Chiquibul Road. The volcanic material is moderately fine grained and has been noted elsewhere in the Pine Ridge. On a ridge above Pinol Creek about 1 km east of the Chiquibul Road is an outcrop of metamorphosed shale that grades into quartzite. Crystal quartz was also observed in this same area.





**Figure 6.** Field photograph of MPR-ISO-19-001 (photo by M. Mirro).

## Discussion

The stone artifact assemblage identified as a result of reconnaissance efforts during the 2018 and 2019 field seasons include only chipped stone artifacts, specifically flakes evidencing utilization (visual inspection), unutilized flakes (not subjected to microwear analysis), cores, a core tool (most likely a scraper), and shatter. While some material types are local to the Pine Ridge, the location of the artifact is distant from the source. Other material types, including chert, were brought up to Pine Ridge from the limestone areas where those materials naturally occur.

No artifacts show signs of patterning that can be associated with a temporal period. Though we assume these artifacts were deposited by Maya traversing the area, they may have also been left by preceramic people. Dating will require more analysis of individual artifacts and the discovery of features with datable stylistic elements or carbon.

It is also unclear how the artifacts were used and why they were distributed in low density across the MPR. Visual inspection of some artifacts indicates heavy crushing along the distal and lateral margins of some flakes suggesting the cutting of wood or other hard material. The Pine Ridge is home to numerous plant resources, especially pine, which have been identified in various lowland sites in the Belize Valley. Preserved burned pine needles were observed in Barton Creek Cave in a large hearth that was buried by wall collapse (Morehart et. al. 2004).

Further systematic survey is required to better understand the distribution of isolated artifacts and sites in the MPR, and to identify datable features or deposits to associate them with a time period. These activities should include soil and geomorphology studies to determine the evolution of the landscape, its effect on sites, and to better predict where intact landforms that are not deflated may be buried and preserved. Microwear analysis, protein analysis, and lithic sourcing should be conducted to understand why these artifacts were transported to the MPR and how they were used. With these additional data, we can begin to understand how the MPR was exploited as a resource base, what types of materials were being harvested, and possibly better understand how the Pine Ridge fits into the economic and politics of prehistoric Western Belize.

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## **Chapter 7: Rio Frio Valley Reconnaissance: Discovering Nohoch Batso'**

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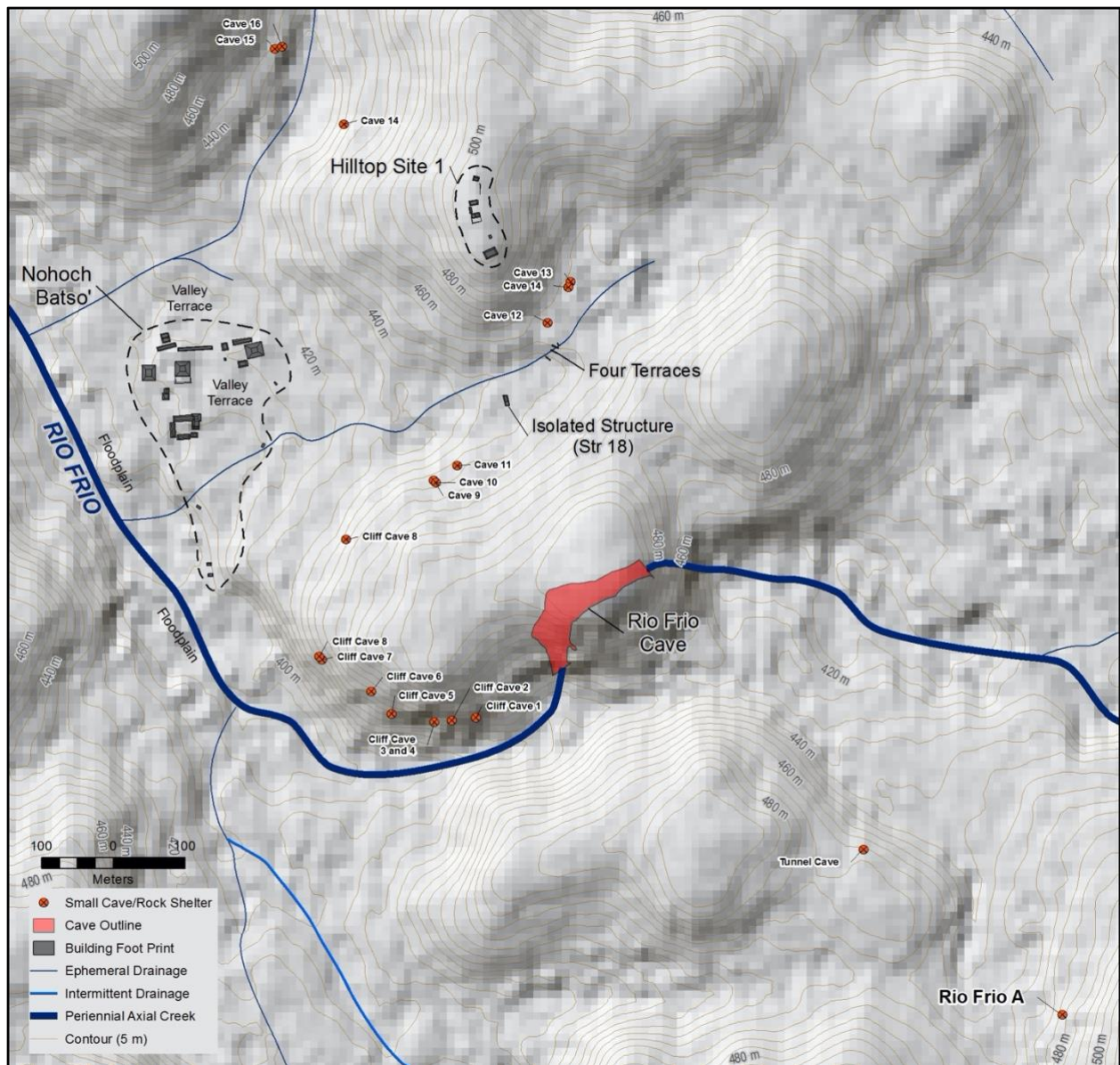
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### **Introduction**

During the June 2019 field season, reconnaissance was conducted in the Rio Frio valley to relocate Rio Frio Cave E, reported by Anderson in the late 1950s (Anderson 1962; Pendergast 1970). Yet, these efforts were marred from the outset as uncertainty ruled over its location. The only in-depth publication of the site stated it was approximately 2 miles from Augustine (Pendergast 1970), but the official quad map of the valley had only one cave listed on it, which was on the northwest side of the hill Rio Frio Cave C penetrates. There had been a trail along the Rio Frio to the Macal River that passed near the cave, but hurricanes that have struck Belize over the years, coupled with a hands-off management strategy of the forest by the Forest Department resulted in the disappearance of that passage. Given the uncertainty of the cave's location, we decided our most prudent option was to look for it at the closest of the two possibilities. Although we were unsuccessful in that endeavor, we located approximately 15 previously undocumented karst features, mostly shallow rockshelters no more than a few meters in depth, width, and height, and nearly all showing minor signs of cultural activity. More importantly, during that trip, we also encountered a previously undocumented Classic period middle-size settlement, named Nohoch Batso', meaning Big Spider, two settlement clusters in its periphery, and terracing that may be related to agriculture or hydrological control (**Figure 1**).

We returned to the site during the December 2019 field session to conduct further reconnaissance of the valley. A representative of the Institute of Archaeology (IA), Mr. Josue Ramos, joined us on one of the two trips made to the site, confirming that the site had not been previously recorded. It was discussed that a site card should not be completed at that time because the full extent and layout of the larger settlement remains unknown. The site card will be completed and submitted once the site has been sufficiently surveyed during our planned 2020 field season.





**Figure 1.** Preliminary regional map showing Nohoch Batso', surrounding peripheral settlement, landscape modifications, and rockshelters. Note that the large range structure and additional terraces leading to it located in December 2019 do not appear on this map.

## Preliminary Site Description

Nohoch Batso' is located above the eastern floodplain on a valley terrace of the Rio Frio between two tributary creeks draining two southwest trending valleys. Our efforts described herein focused on the southern tributary creek. Time and a lack of adequate supplies prevented reconnaissance of the northern tributary creek. The valley terrace is approximately 250 meters wide near the settlement narrowing considerable both up and down stream. The valley bottoms are both relatively flat and minimally sloped extending north and east of the site 500 and 800 meters, respectively. This flat bottom land is surrounded by moderate to steep sloped limestone ridges

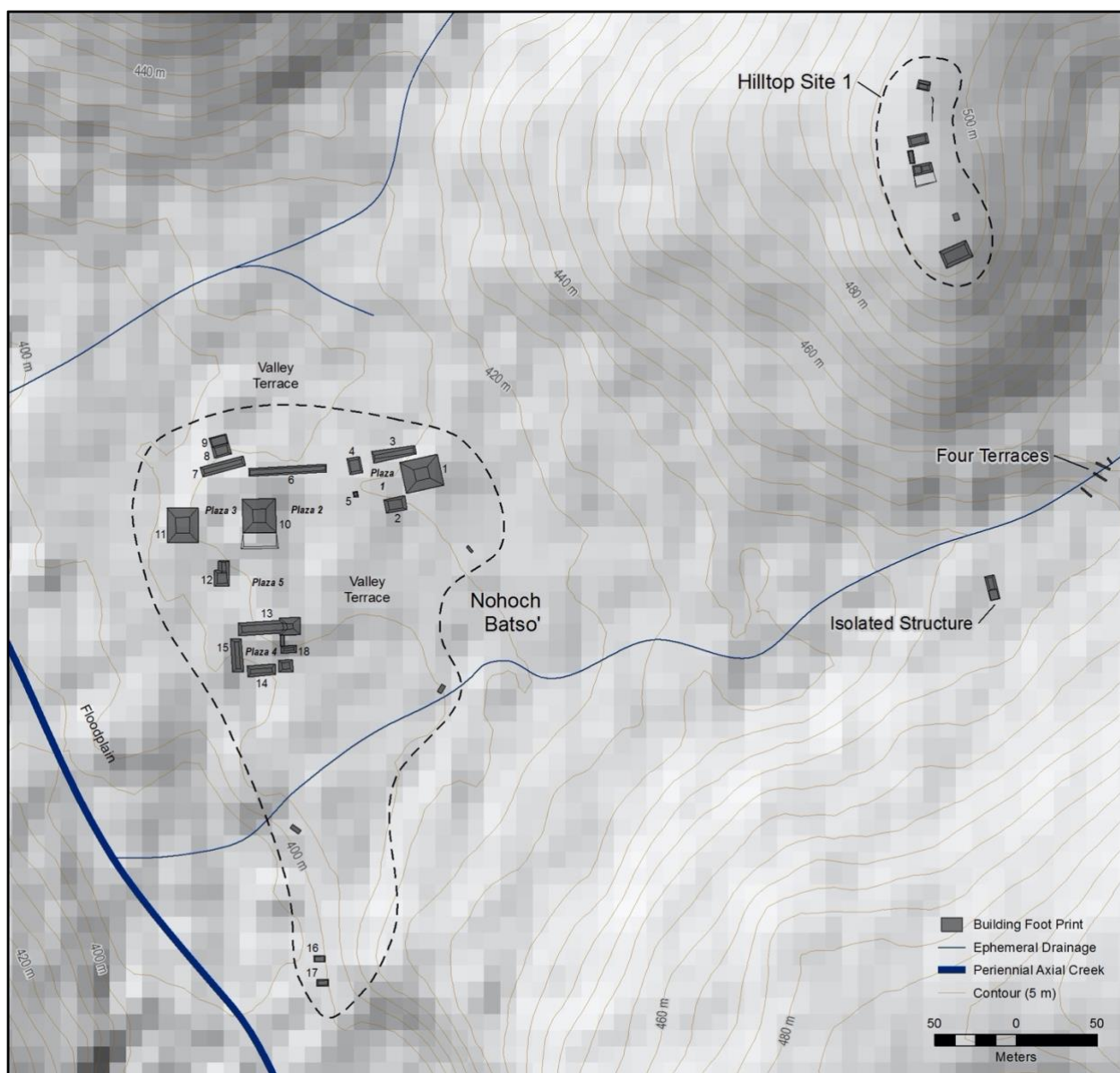
approximately 100 meters in height. The site elevation is approximately 400 to 410 meters above sea level and the explored extent is 17,500 m<sup>2</sup>. The known site core is approximately 850 m downstream from Rio Frio Cave C (RFC). Overall, the layout of the site suggests it was inhabited at least during the Late Classic period, although a comparison of other similar sized sites in the Belize Valley and Vaca Plateau, and the visibility of several phases of architecture in the few looter's trenches in main buildings suggest it was founded during an earlier time.

While the site is located near the Rio Frio, which is prone to flooding, no flood damage was observed to any structures recorded during either reconnaissance trip. The active channel of the Rio Frio is approximately 120 to 140 meters west of the site center and the floodplain occupies the lower extent of this area. The floodplain is incised by overflow or cut-off channels, remnant terrace features, and in general uneven terrain. The vegetation is thick in the area making access difficult and visibility low. We left it unsurveyed for future seasons. The two tributaries are located 60 meters north and 50 meters south of the central site area and occupy shallow channels incised into the valley terrace surface. While these creeks may be subject to periodic ephemeral flow, they do not seem to be negatively impacting the site.

The explored portion of the central site area consists of 15 structures and four or possibly five plazas (**Figure 2**). **Table 1** below lists all structures found in the central part of the site and notes which plaza each is associated with. The numbers given to the structures and plazas in the table are temporary. They will be relabeled after the site is fully mapped. Plaza 1 sits at the easternmost known portion of the core measuring approximately 25 m x 23 m. Flanking the east side of this partially enclosed plaza is a 4-meter-tall range structure with a stela (Stela 1) centrally located along the base of its western face at the foot of a staircase. Plaza 2 is immediately to the west of Plaza 1, and it has an undefined southern boundary. The space is wide open and may be an interstitial space between two parts of the site core rather than a formally planned plaza space. Plaza 3 is flanked by the two tallest known pyramidal structures at the site. One is on the eastern side of the plaza ("Structure 10"; the tallest pyramid yet recorded at the site), and the other due west of it ("Structure 11"). A possible platform extends from the southern side of Structure 10, and evidence of a staircase was found on its west side. The platform was reconnoitered for stela though none were immediately visible on the surface. Structure 11 has ancillary structures to the north and south (not mapped), suggesting that it may be part of an E-group arrangement. Plaza 5 is due south of Structure 10. It is bounded on the south by the northern range structure of Plaza 4. Plaza 4 is a restricted plaza with range structures flanking it to the north and south, and a low mound to the west. The eastern side of the plaza is complex and appears to be a series of smaller structures that had been later connected, indicating at least two construction phases. A ballcourt has yet to be located at the site.

Stela 1 is aligned with the central axis of Structure 1 at the base of its western face (**Figure 3**). The stela is in two pieces with the base remaining in situ protruding vertically from the ground by 38 to 43 cm and the body lying flat on the ground with its longitudinal axis aligned with the structure axis. The stela is approximately 15 to 25 cm thick and 76 cm wide. The body tapers toward the top narrowing to 36 cm wide from its 76 cm wide base. The thickness of the upper part of the body was not measured as the stela was not fully excavated. The full height of Stela 1, when erect prior to breaking, measures 138 cm tall. For a 360° video of the stela, follow this [weblink: https://www.youtube.com/watch?v=fuLvokTaxpc&t=5s](https://www.youtube.com/watch?v=fuLvokTaxpc&t=5s).





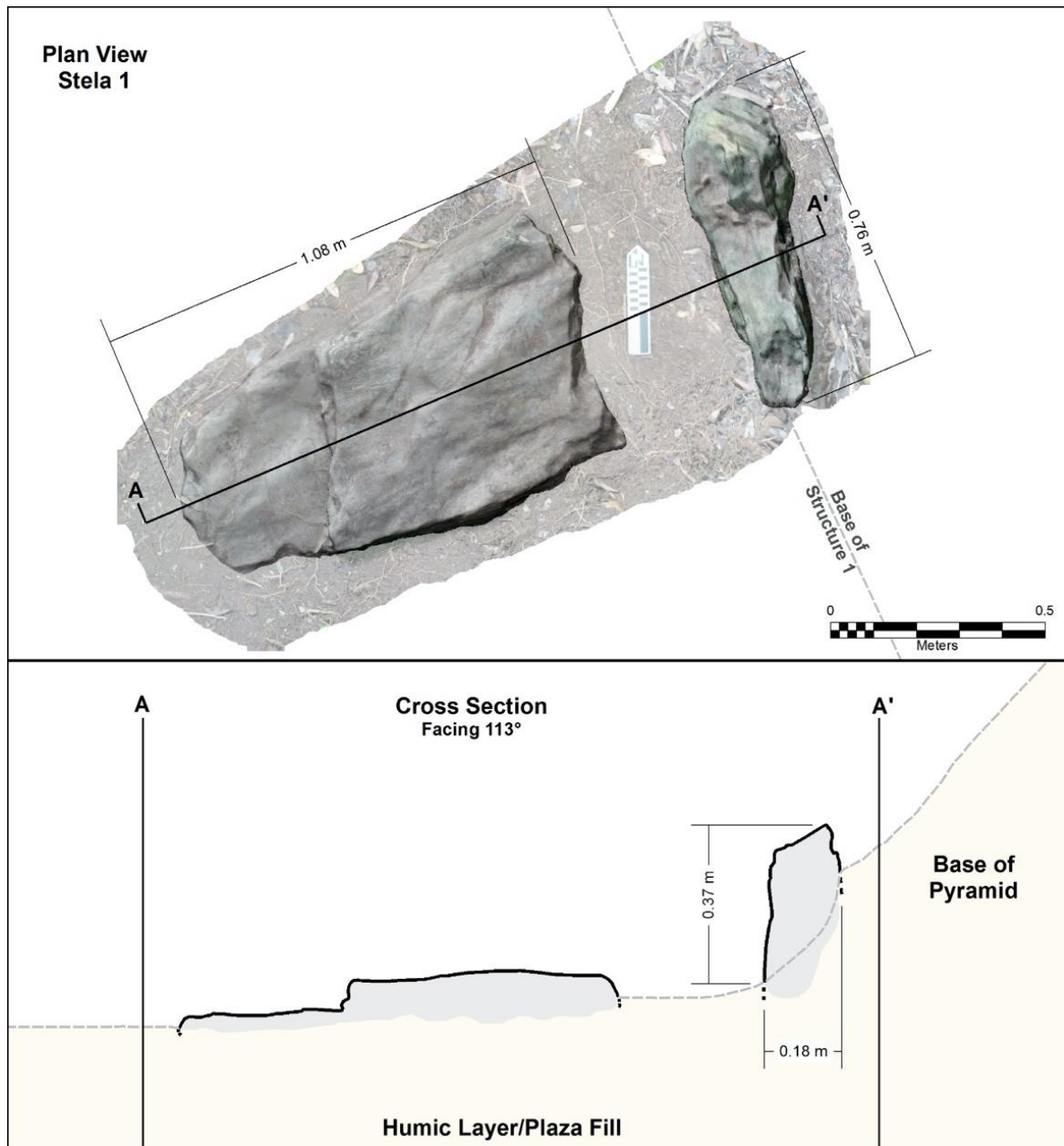
**Figure 2.** Preliminary plan view map of Nohoch Batso' site core and surrounding periphery settlements. Plaza and structure numbers given here are temporary. They will be relabeled when the site is formally mapped.

The monument was made from a moderately light gray slate (shale) and the laminar structure of the rock can be seen in the cross section of the broken face with the layering aligning with the rock's longitudinal orientation. The break appears to be a step fracture suggesting that the stela was intentionally broken rather than breaking along natural weakness in the rock; however, no impact scars have been identified on the stone surface. Concooidal fractures are evident along the margin of the body suggesting the stela was intentionally shaped while the dorsal and exposed portion of the ventral side (the base) are relative smooth. The monument was flipped during the December trip revealing it was uncarved. Slate monuments are rare in the Maya lowlands, but have been reported at several sites in Belize, including Actun Tunichil Muknal, Cahal Uitz Na, Caracol,

**Table 1.** Nohoch Batso' building numbers, measurements, and descriptions.

Structure	Plaza	Height (m)	Estimated Dimensions (m)	Description
1	1	4	23 x 20	A rectangular shaped building at the eastern most know extent of the site core. Alignments of stone were observed on all faces. Stela 1 is centrally located at the base of the western face. A looters trench was excavated in the center of the eastern face of the structure, revealing a minimum of two construction phases. The trench did not reach bedrock, was askew from the centerline, and did not appear to encounter any interior chambers.
2	1	1	13 x 9	A low range structure of cut stones.
3	1	0.2 to 3	27 x 7	A long-range structure along the northern side of Plaza 1. It varies in height from 3 meters on the western side to almost ground level on the east, where it flanks Structure 1. Linear alignments of cut stones (limestone and granite) are visible on the north and south sides.
4	1	< 1	10 x 3	A low rectangular structure on the northwest corner of Plaza 1.
5	1	1	3 x 3	A low, small, and nearly square structure on the west side of Plaza 1.
6	2	0.5 to 2	48 x 4	Possibly a sacbe or low range structure, this edifice forms the northern boundary of Plaza 2. Alignments of stones one to two courses high were observed along the southern base of the structure. Small pits, possibly looter excavations, we observed in several places within the structure.
7	3	5	27 x 6	A fairly tall and steep range structure forming the northern boundary of Plaza 3. It appears to be a wall of unknown function.
8		2	11 x 7	A rectangular mound, 2 m tall, located north of Structure 7. The two structures have a narrow alley running between. A substantial looter trench is located in the central east face that reaches the current forest floor and almost passes completely through the structure.
9		1	11 x 6	This low structure is north of Structure 8. It is separated by a narrow alley and does not appear to form a patio off the northern face of the other building.
10	2; 3; 5	10	20 x 21	A roughly square pyramidal shaped building 10-12 m tall. It divides Plazas 3 and 2. Alignments of stone representing intact architecture were observed on all sides of the structure. This building may also represent the northern structure of Plaza 5. A collapsed apron of stairs is visible on the west side of the structure suggesting it was oriented to face west toward Structure 11. If that is the case, Plaza 3 is the main plaza of the site, and this its primary pyramid.
11	3	7	21 x 19	This nearly square pyramidal shaped building forms the western side of Plaza 3. Ancillary structures were noted to the north and south in December 2019, but do not appear on the map. Paired with Structure 10 this may be an E-group, or an Eastern Triadic Architectural Assemblage.
12	3; 5	3 and 1	15 x 10	This "L" shaped building defines the southern boundary of Plaza 3 and western boundary of Plaza 5. The structure has a 1 m tall patio extending off the northern side of the 3 m tall structure.
13	4; 5	5	26 x 10	The size of this range structure was estimated from afar. It is part of at least seven structures that form a patio group (Plaza 4) representing the north structure. A low pyramidal structure (unnumbered) is connected to the eastern side of this range structure. That unnumbered structure connects with another smaller ancillary structure, possibly a staircase on the east side of Plaza 4, creating what appears to be a u-shaped formal entrance.
14	4	4	20 x 9	This range structure's size was estimated from afar and was not mapped by GPS. The building forms the south side of Plaza 4. Like Structure 13, there is an ancillary structure on the east side (unnumbered), though they are not connected. We are unable to determine if the disconnect between the two structures represents an intentional alleyway or a looting event.
15	4	2	21 x 10	This is a low platform whose size was estimated from afar. We were unable to determine if this is an actual structure or a natural elevation during subsequent visits.
16		1	7 x 4	Part of a series of terraces that lead uphill to a massive range structure with abutting ancillary building (neither mapped). At least three additional terraces uphill from this and Structure 17 were noted during subsequent visits.
17		1	7 x 4	Part of a series of terraces that lead uphill to a massive range structure with abutting ancillary building (neither mapped). At least three additional terraces uphill from this and Structure 16 were noted during subsequent visits.
18	4	4	26 x 10	Appears to have been three isolated structures (a, b, and c north to south) later combined into one through architectural expansion. A u-shaped plaza to the east, possibly indicating an inset staircase, likely provided the main entrance to the otherwise enclosed patio. Structure 18a the northern most of the three is roughly pyramidal in shape. Structure 18 C, the southern most of the three, is the least connected and may have had open corners throughout the life of the plaza.





**Figure 3.** Plan and Cross Section View of Stela 1 Located at the Base of Structure 1.

Pacbitun, and Tarantula Cave (Awe et al. 2005; Awe and Helmke 1998; Beetz and Satterthwaite 1981; Healy et al. 2004). One complete and several fragments have also been recorded at Tikal (Coe 1990).

### Peripheral Sites

Several isolated structures and features were located on the fringes of the valley in which Nohoch Batso' sits. It is important to reiterate that these settlements were encountered during

random survey, and settlement density is difficult to determine at present. We encountered four isolated mounds, presumably commoner households, all near the banks of the southern tributary creek. Three are on the valley terrace floor, while the fourth is at the base of a hill. Those on the valley bottom are single constructions measuring approximately 2 m x 2 m and 0.5 m tall. The one adjacent to the hill is roughly the same size as the others except it appears to have been constructed on an elevated platform. One hundred meters to the northeast of the hillside mound is a series of four, closely-spaced terrace-like structures that span the tributary creek. They are well constructed, made from cut stone and in pristine condition. Though their purpose is not yet clear, their placement across the creek indicates they may have served a hydrological function, although they may be agricultural terraces.

Approximately 180 m south of the site core we recorded a large range structure and one ancillary structure on a natural bench in the hillside, and a series of five to six terraces leading up to the complex. Very thick vegetation prevented a good understanding and GPS mapping of the complex, but the range structure stands 3-5 m tall, is approximately 40 m long (northwest-southeast), and 20 m wide. The ancillary structure stood the same height but is only about half of the width of the adjacent building. Unfortunately, our GPS received a very poor signal under the thick forest there and the measurements were made by pace mapping, which was also hindered by the thick vegetation.

The most expansive known peripheral settlement is on a hilltop 350 m northeast from Plaza 1. The complex follows the natural topography of the hill. It runs roughly north to south and has three possible plazas. The largest structure is on the southern extent of the hill and stands 3 m tall. To the north is a partially enclosed plaza with identified range structures on the north, south and west sides. The southern structure may have a platform on its southern side. The northern most plaza is flanked to the north by a small structure and on the east by a possible wall. One unique characteristic of this periphery group is a roughly 2 m by 2 m walled semi subterranean feature of unknown function.

## **Discussion**

The discovery of Nohoch Batso' has several important implications for Classic period Maya archaeology in Belize. The Mountain Pine Ridge has been long recognized as a likely major source of many important economic resources for the Maya of Belize and adjacent regions of Guatemala and Mexico. These resources include granite and slate, and pine (Graham 1987, Healy et al. 1995; Healy et al. 2011; Lentz et al. 2005). Granite is a type of rock at the foundation of the ancient domestic economy as it was used primarily to make grinding stones found in all households. Pine had a range of both sacred and profane uses ranging from construction material to fuel for fires, and incense for rituals, though it seems to have been partially controlled by elites (Lentz et al. 2005; Morehart 2011). Similarly, slate had a wide range of uses including as construction material, public monuments (rarely), and for portable objects (Bill 1987; Healy et al. 1995; Healy et al. 2011; Healy et al. 2004:213; Helmke et al. 1999). But questions related to the control, distribution, and labor organization surrounding resource extraction of these resources remain unanswered. Recent geologic research has identified a particular outcrop in the MPR as the primary source of granite for most sites in Belize (Skaggs and Powis 2014; Tibbits 2016, 2020),

and the discovery of an extensive groundstone production area at Pacbitun suggests the possibility of centralized control and distribution over granite (Skaggs et al. 2020; Ward 2013). Nohoch Batso' is at present the closest known center to that outcrop, suggesting it may have been partially controlling access to the granite and thus exerted great power over the domestic economy of the Maya world.

This newly rediscovered center also fits into a regional settlement pattern in western Belize where public architecture was situated every 10-12 km (Chase et al. 2014; Chase et al. 2014; Driver and Garber 2004; Helmke and Awe 2012; Spenard 2014) suggesting the site's inhabitants were well integrated into and contributors to that larger social system (**Figure 4**). The rediscovery of Nohoch Batso' thus renders previous models of Classic period Maya geopolitics of the eastern Maya Lowlands outdated as they have been constructed without accounting for its presence and the influence of this center.

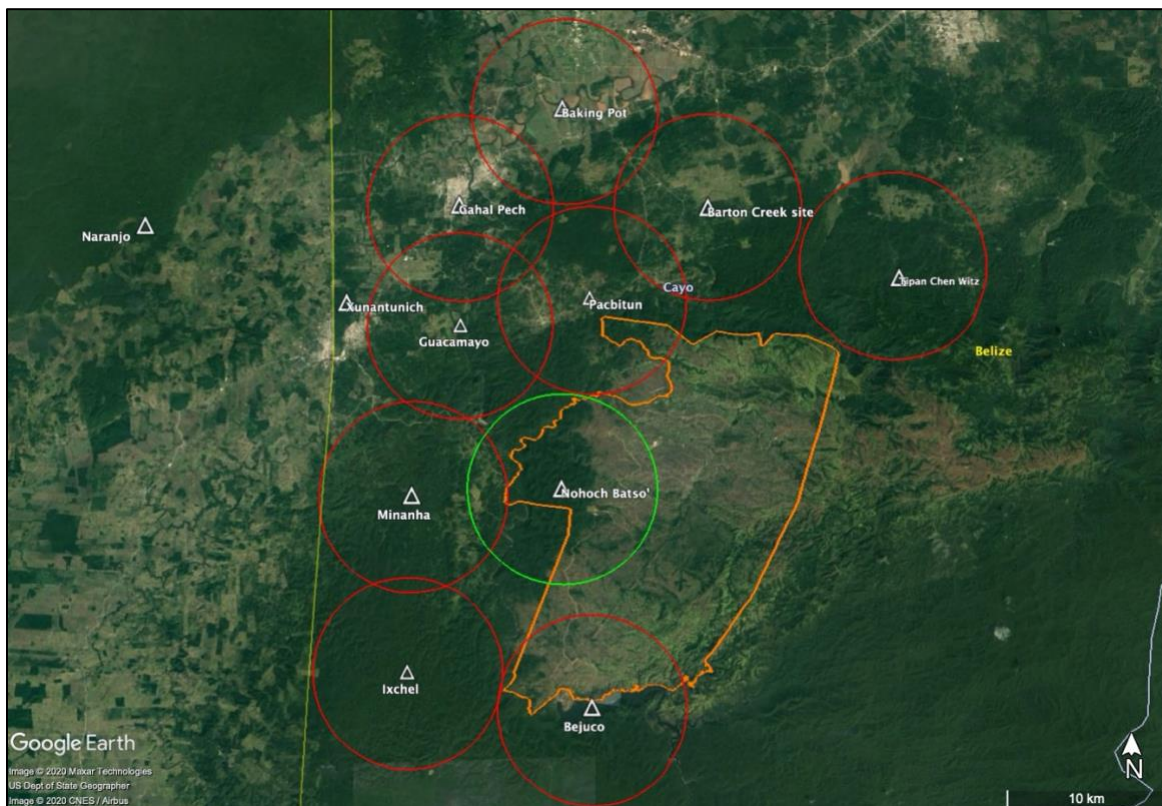
Stela 1 is also significant from a geopolitical perspective because public monuments were commissioned by nobility to celebrate significant events of their lives and reigns, even if uncarved (Proskouriakoff 1960; Martin and Grube 2008; Moholy-Nagy 2016; Stuart 2010). Thus, the discovery of the monument as a marker of a dynast forgotten to time and a possible dynastic line introduces another political player on the geopolitical stage of western Belize. Moreover, hieroglyphic texts on many carved monuments record that Classic period (AD 250-900) geopolitics in the eastern Maya Lowlands revolved around the hostile interactions between the rulers of the powerful kingdoms of Caracol in southern Belize and Naranjo 35 km northwest just over the border in Guatemala (Ashmore 2010; Helmke 2019; Helmke et al. 2010). The hieroglyphic records of medium-sized kingdoms in the greater Belize Valley tell of the influence or the direct control regents of those two centers had over them throughout the Classic period (Helmke 2019). The recovery of Stela 1 at the Rio Frio site suggests more monuments may be revealed during survey and that, if carved, they will expand our knowledge of this complex history. Moreover, that ceramics from caves in the RFV region demonstrate close ties to the Belize Valley, but not sites to the south, suggests the inhabitants of the Rio Frio valley were politically affiliated with Naranjo, but it is geographically closer to Caracol, near the terminus of its extensive road system, and sites further north fell under its influence. As such, its affiliations are ambiguous, and future research at the site should aim to clarify them.

## **Goals for Future Research**

Future research at Nohoch Batso' will focus on several domains given the site's proximity to a limited natural resource confined to central Belize, the site's proximity to the Macal River (a navigable waterway connecting the site to the Belize Valley to the north and providing a natural barrier from sites in the Vaca Plateau), the presence of several large and unique caves, and the complex settlement patterns of the region. Research domains will include investigating the role that Nohoch Batso' played in harvesting and quarrying the natural resources of the Mountain Pine Ridge; how resources were processed and in what state they were traded to other sites; identification of trade routes; and how trade affected the wealth of the site. Detailed mapping the site core, classifying building types, and identifying architectural styles will help determine the site's placement, or deviation, from regional settlement models.

To date, investigations at Nohoch Batso' have been minimal, but future field studies will be multidisciplinary. Surveys will include both random and focused documentation of the Rio Frio Valley and adjacent ridge tops to better map the full extent of the site and understand local settlement patterns. Horizontal excavations in the site core will help understand site chronology and evolution, while vertical excavations on households will help understand the lives of the site's commoner population. Geologic sampling of the granite, slate, and other stone resources at the site and throughout the RiFRAP permit area will be conducted to determine quarrying patterns, reduction and manufacture of resources into goods, and the distributary networks of those items. Continued study into caves and sacred landscape will continue to build an understanding of how the site is linked to these features and how pilgrimages and regional use of the sacred karstscape affect the politics and economics of the site.

Next season, field research will focus on mapping the full extent of the site core, classifying building types, identifying production, storage, and quarrying loci of natural resources, roads and physical evidence of transportation or networking with other sites, and physical links to karst and other natural landscape features. Future seasons will include systematic survey of hilltops to identify small settlement clusters and natural features within the broader area surrounding the site to better understand intrasite dynamics and networks. Detailed geologic sampling of the Mountain Pine Ridge will be conducted to hopefully build a fine-grained differentiation of granitic sources and identify quarry sources.



**Figure 4.** Satellite map of primary centers in the southern Belize Valley and Vaca Plateau with 6km buffers placed around each center. The Nohoch Batso' buffer is in green. The orange polygon is the RiFRAP permit concession area.



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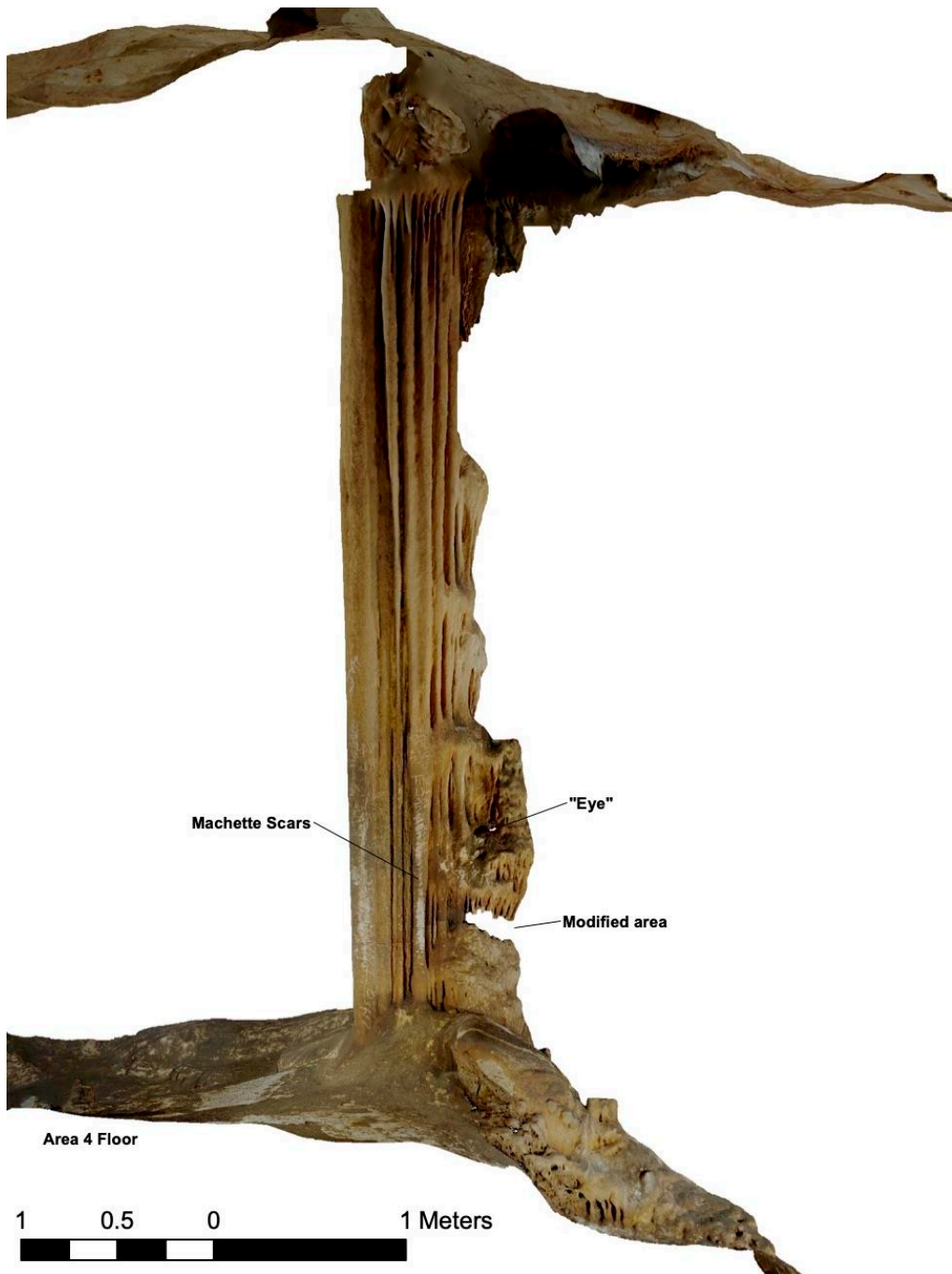
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