LIFE, DEATH, AND RENEWAL:

A REGIONAL ANALYSIS OF MAYA SWEAT BATHS IN WESTERN BELIZE

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A Thesis

Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Arts

in Anthropology

Northern Arizona University May 2024

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ABSTRACT

LIFE, DEATH, AND RENEWAL: A REGIONAL ANALYSIS OF MAYA SWEAT BATHS IN WESTERN BELIZE

This thesis project investigates and analyzes four sweat baths that were recently found at the Maya sites of Baking Pot, Cahal Pech, Pooks Hill, and Xunantunich in the upper Belize River Valley area. While sweat baths have been located in various parts of Mesoamerica and North America and are often associated with religious or ritualistic practices, the sweat baths in this study are the first to be reported in the Belize River Valley. Indigenous scholar Linda T. Smith's *Decolonial Methodologies* is used as a personal reference throughout the writing process as a form of intentionality considering Maya sweat baths are an Indigenous creation. To understand the significance of sweat baths in the Maya sites of the upper Belize River Valley, the following questions are addressed: What is the spatial context of sweat baths in western Belize? What were the socio-cultural and ideological significances of sweat baths in ancient Maya society? How were the sweat baths used? How do the uses of these four sweat baths compare to other Maya sweat baths in the archaeological record? Spatial analysis combined with ethnohistoric accounts and modern uses by descendent communities are utilized to answer and inform the research questions, and for determining their significance.

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Chapter 1: Introduction

The purpose of this thesis was to investigate four sweat baths at the Belize Valley sites of Cahal Pech, Baking Pot, Pook's Hill, and Xunantunich, to determine their form, features, and function, and to compare them with sweat bath forms and uses in the Maya area and Mesoamerica. Results of these investigations indicate that the sweat baths at the four sites had a diverse mix of shared and unique characteristics that included their orientation, their time of construction, their location within sites, their interior forms, proximity to water sources, and possible use.

Sweat Baths in Mesoamerica

Sweat bath research dates to as early as the 19th century from accounts mainly in Mesoamerica and North America (Satterthwaite 2005). Cresson (1938) was one of the earliest archaeologists to study sweat baths through collaborative work with the University of Pennsylvania in the 1930's at the site of Piedras Negras in Guatemala which was followed by a plethora of further investigations at that site. Early ethnographic work conducted by Oliver LaFarge (1947) subsequently noted that women of Santa Eulalia, Guatemala were often urged to bathe in a sweat bath following childbirth, an observation that was later reiterated by Satterthwaite (2005) in his investigation at Piedras Negras. Satterthwaite also mentioned that even earlier than LaFarge, Mason's (1935) investigations in Maya Mexican sweathouses showcased the definition of Zumpul-ché as a "bath for women after childbirth and other sick persons to cast out the cold that they have in their bodies.". As more sweat baths were encountered by archaeologists, their investigation began to examine more diverse topics that ranged from their construction methods (Canuto 2023) to their acoustic qualities (Sheets and Mahoney 2022).

Regional Analysis of Mesoamerican Sweat Baths

Religion and Ritual

Previous research on the religious and ritualistic use of Maya sweat baths ranges from examinations of death rituals to analysis of Maya creation stories (Scherer 2015, Carrasco 2010). Ritualistic healing is still practiced today by descendants of Mesoamerican civilizations and is (more recently) being discussed and recorded by a variety of professionals including archaeologists, historians, and ethnographers (Bade 1994, Domenici et al. 2019, Schnell 2017, Watson et al. 2022, just to name a few). There are both ritual and mundane uses of sweat baths and their uses can range from just normal cleansing to releasing "evil" from the body (Child 2006, Nash 1967). Sweat baths are considered a highly gendered space considering their association with gestation (Miller 2013, Perego 2007) and various goddesses of birth and femininity (Mazareigos 2018) such as Ixchel.

Some sweat bath rituals are sometimes performed in caves that contain waterfalls as a metaphorical representation of the sweat bath (Moyes 2005) although it is unclear where the origins of the metaphor came from. One other metaphorical use of sweat baths is the burial of the afterbirth in the sweat bath one was born in (Houston 1996) which is then followed by a yearly offering to the sweat bath throughout childhood and should still be done occasionally as an adult. However, it is unclear if this is a regional practice or simply a local one in Piedras Negras (Houston 1996). Birthing chants and prayers are also common ritualistic practices still taking place (Knowlton et al. 2019). However, more research is needed to confirm if these chants and prayers are common sweat bath practice.

It is important to note that water is seen as sacred to the Maya which may explain the number of water-related rituals (Lucero & Kinkella 2015). However, without fire usage, the water in sweat baths would have no use (Graña-Behrens et al. 2017). Fire ritual combined with the sacredness of water is an important analysis that has not yet been explored by archaeologists.

Healing

The healing uses of sweat baths were not simply related to relaxation in the way we use saunas in the United States. Childbirth commonly takes place in sweat baths for those still practicing some form of Maya religion (Cominski 2001). Afterbirth healing is also very important to promote a successful recovery (Cominski 2001) as well as other gynecological complications (Groark 2005). Although it is recognized that not all ailments can be healed by a sweat bath ritual (Nash 1967), their healing power is taken very seriously; There have even been ritualistic healing centers containing sweat baths found in Chiapas, Mexico (Lucero & Kinkella 2015). Although the available literature on Maya healing properties is certainly insightful, it is not completely representative of ancient Maya sweat baths, and their uses have changed over time and adapted to include different forms of healing such as modern medications (Bade 1994).

For many Maya communities, illnesses are understood on a hot-cold scale and local herbalists specialize in properly using Maya sweat baths as a primary treatment in descendent communities (Schnell 2017). For example, hot is associated with health and fertility while cold is associated with illness and evil which is why the sweat baths are so essential for healing (Groark 2005). Studies of sauna therapy have been found to improve

cardiac functions such as cardiac failure, hypertension, and more (Groark 2005) which implies that the Maya rightly associated thermal function with health (Schnell 2017).

The healing that occurs in sweat baths can depend on a variety of factors such as size, shape, acoustics, and location. Due to the specialized nature of sweat baths, sweat baths found at Maya sites must be properly documented and analyzed to understand the local ritualistic healing. There are many similarities between sweat baths found across Mesoamerica however, it does not do the Maya justice to minimize them to those few similarities rather than exploring each of them individually. Typical modern healing practices are fairly similar across the Maya region however to understand the ancient Maya uses of them, more research is required which includes my own research in the Western Belize River Valley.

Although there have been many Maya sweat baths encountered in the Maya Highland region by previous archaeologists, there has not been a concerted effort to explore their presence, usage, and symbolic meanings in the Maya lowlands (Child 2006; Hammond and Bauer 2001; Helmke 2006; Houston 1996; Watson et al. 2022). Previous research on Maya sweat baths has dated their use to the Classic period and especially throughout the Late Classic (Houston 1996: 143).

Sweat baths are much more than a place to cleanse and perform rituals. They represent many religious, hierarchical, and metaphorical meanings that are embodied in the architecture as well as the person or people using it (Child 2006; Houston 1996; Lucero and Kinkella 2018, etc.). Maya architecture is known to have many meanings and represents a variety of values and meanings such as the three planes of existence seen on many structures such as Castillo at Xunantunich (Awe 2022; Hansen 1998). Sweat baths

are important features of Maya architecture that have been neglected in many previous excavations, especially when it comes to recordation.

Previous research on the religious and ritualistic use of Maya sweat baths ranges from examinations of death rituals to analysis of Maya creation stories (Carrasco 2010; Scherer 2015). Ritualistic healing is still practiced today by descendants of Mesoamerican civilizations and is (more recently) being discussed and recorded by a variety of professionals including archaeologists, historians, and ethnographers (Bade 1994, Domenici et al. 2019, Schnell 2017, Watson et al. 2022, just to name a few). Sweat baths are considered a highly gendered space considering their association with gestation (Miller 2013, Perego 2007) and various goddesses of birth and femininity (Mazariegos 2018) such as Ixchel.

Ritualistic metaphors regarding sweat baths are existent in many areas throughout Mesoamerica including Palenque in Mexico (Houston 1996) and Chechem Ha Cave in Belize (Moyes 2005). One ritualistic metaphorical use of sweat baths is the burial of the afterbirth in the sweat bath one was born in (Houston 1996) which is then followed by a yearly offering to the sweat bath throughout childhood and should still be done occasionally as an adult. Another metaphorical use of sweat baths is often seen in cave rituals due to their association with water; ethnographic evidence suggests Chechem Ha Cave in Belize was a place where sweat bath rituals took place (Moyes 2005). According to Moyes (2005), mist in caves serves as a metaphorical representation of the sweat bath steam, and the rocky terrain was associated with hearths (Moyes 2005). Keeping this information in mind, my analysis will include metaphorical uses of the sweat baths in Belize such as those seen in Chechem Ha Cave.

Chapter 2: Literature Review

Archaeological Theories and Methods

Previous research on Mesoamerican sweat baths has often applied the direct-historical approach (Cresson 1938; Houston 1996; Ichon 1977). The direct-historical approach developed from the theory of cognitive archaeology which applies cognitive sciences to archaeological remains (Iliopoulos and Malafouris 2014). The direct-historical approach bridges the gap between archaeological interpretations and ethnohistoric reports, creating a more holistic view of what the archaeological record can be and how it can be determined (Marcus and Flannery 1994:55). An example of the application of this approach can be seen in Houston's (1996) research on sweat baths at the site of Palenque. Houston uses the direct-historical approach to understand the metaphorical uses of sweat baths by elites through ethnohistoric research (1996). However, he and many others fail to acknowledge possible cultural influences across regions that may affect /influence the way sweat baths are/were used. I will incorporate the direct-historical approach similar to Houston, with the exception that my research will be a regional rather than a single site study like that of Houston.

Cresson, Houston, and many other archaeologists provided foundational information regarding the most common uses of Maya sweat baths. However, recent research on sweat baths implement different analytical approaches that include myth and ritualist theory (Miller 2013), ethnohistorical approaches (Mazariegos 2018), and indigenous theories (Clarke et al. 2020). Although the direct-historical approach is still relevant and applicable to my research, it is important to note that other approaches also

provide significant new perspectives. Considering the multitude of uses and meanings associated with Maya sweat baths, it is absolutely necessary to combine the listed approaches with the direct-historical approach.

The application of myth and ritualist theory has reframed the way archaeological data is interpreted, especially when interpreting ancient civilizations (Fogelin 2007, Mills 2008, Soloman 1997). Rather than viewing an assemblage as merely practical and logical, they are seen through a ritualistic lens (Moses 2018). Lucero and Kinkella, (2018) and Clarke et al. (2021) both implement this theoretical framework in their analysis of sweat baths by focusing on the cosmological symbolism and liminality (the psychological process of transitioning across boundaries and borders) of Maya sweat baths. There are many Maya buildings that have specialized purposes, however, sweat baths are specialized in liminal ways (Hammond 2007). Thus, it is an essential approach to consider when analyzing Maya sweat bath use. Although archaeologists such as Lucero have implemented myth and ritual theory, again, they often do not consider this on a regional scale. This zoomed-in lens does not paint a complete picture of Maya sweat bath usage considering the vast cultural influence and exchange that was occurring between Mesoamerican communities (Tourtellot and Sabloff 1972).

Through ethnographic-based archaeological approaches, a plethora of information has been shared with archaeologists and, in turn, impact our understanding of what Maya sweat baths can symbolize and represent for people who use them. Maya sweat baths have been connected to womanhood and goddesses that represent femininity, due to their womb-like shapes (Perego 2007). The entrances of sweat baths often connect to a larger dome shape which can be circular or rectilinear (Perego 2007, Ichon 1977). The

construction and style choice also may impact the acoustics inside the sweat bath as well as their usage (Helmke 2006; Sheets and Mahoney 2022). For example, a circular sweat bath often has more seating inside which means communal usage is possible (Sheets and Mahoney 2022). Using these past interpretations and ethnographic accounts, I will be able to apply this knowledge to my own research rather than ignoring indigenous knowledge as done in the past by Binford (1962) and others.

Positionality Statement

It is with great privilege that I was able to complete this project and able to work with such intelligent peers. Therefore, I would like to quickly acknowledge my positionality and clarify that although I am not of Maya descendent myself, I do have Central American roots and Indigenous heritage. That being said, there is a possibility that I am of Maya descent according to my family history.

My paternal great grandfather was an Indigenous man who lived in the mountains in Guatemala, according to my late grandmother's stories. She described him as a small man who spoke multiple languages; My grandmother remembered these languages being his native tongue, however, she was raised speaking solely Spanish. Although she was not raised around her Indigenous family as a child, and never learned her native language, she still knew some Indigenous ways of cooking and crafting such as making jicara copitas, and cooking nacatamales with banana leaf. Even with this direct connection to Maya culture, I prefer not to identify myself as Indigenous because of my lack of knowledge of my great grandfather's background. Although this might change in the future, as of now I choose to identify as a first generation born in the United States from Central American descent.

My mother comes from El Salvador and my father from Honduras. I was always encouraged by them to learn their cultural foods, music, slang, and dances. They made it a point to my sister and I that our culture was extremely important, including their nation's history, which is why Maya archaeology always interested me. Although I was not able to work in Honduras or El Salvador, I was still able to work in Maya archaeology for this thesis which was a momentous experience for myself.

For these reasons, I also want to highlight the usage of Indigenous approaches in my methods and when first building the research design. Two of the main goals were accessibility as well as minimal disturbance to the sites. Therefore, I chose a very low-tech approach and carefully considered my interpretations and analysis with Indigenous theory in mind, specifically using Linda T. Smith's *Decolonizing Methodologies* as a reference.
I do acknowledge that I am in a position of power with the ability to disseminate this information to the proper audiences which is why I plan to work with BVAR to create an infographic accessible to any site visitors as well as on the BVAR website.

Chapter 3: Methods and Theoretical Approaches

Overview

The following section will focus on the archaeological methods, theories, and procedures followed throughout the thesis project. The order goes as follows: Materials, theory, procedure, analytical methods, and limitations. Rather than including a separate theory section, it has been included in the methods chapter to serve as guidance for the research design.

As discussed in the background, sweat baths are features that are often unexplored in the archaeological record. Other types of architecture, such as temples, palaces, and ball

courts, often get much more attention perhaps because monumentality. As a result, the excavation of sweat baths is often neglected, and when they are excavated, their investigation is usually limited to the single site level. This is unfortunate for the Maya carefully planned and built their architecture for specific purposes (Fash and Fash 1996; Houston et al. 1998; Houston 1998; Webster 1997) and much can be understood of buildings when studied at the regional level. Multi-site analyses, for example, can reveal important information on regional styles, ethnic relations, and diagnostic features that are local or foreign. It is important, therefore, that we as archaeologists give the sweat baths the same level of analytical attention as we do other architectural types and features.

The methods chosen for this specific thesis project consisted of 3D modeling using pseudo Lidar programs, mapping, and in-situ observations. Decolonial methodologies are leaning towards using non-extractive forms of data collection as an attempt to not disturb the landscape (Haber & Gnecco 2007). The chosen methods felt most appropriate and the most aligned with the goals of indigenous scholars such as Tuhiwai Smith (2021).

For clarification, the use of the term non-invasive in this context refers to archaeological methods that do not involve physical extraction of data/artifacts. Digital archaeology is **not** always considered non-invasive, this definition applies to Belize and these sites specifically. The chosen materials and methods were the most appropriate with the goals previously stated in mind. It is important to note that any replication of these methods or frameworks must be done with caution and approval of descendant communities. Not every cultural group or sacred space is automatically welcomed to be digitally recorded, especially sensitive location data. This methodology was specifically designed for Belizean archaeology and local sites that are open to the public.

Technological accessibility is another primary goal of this thesis project which heavily influenced the chosen materials. The goal was to enter the field with as little as possible while being as efficient as possible. For those of us who may not have access to expensive materials such as navigation tools, this thesis project can still be completed and replicated by anyone with access to a phone or tablet with Scaniverse capability.

Analytical Methods

Ethnographic Analysis:

The ethnohistoric and ethnographic analysis began with categorization of the sweat baths into temporal and regional tables. This categorization aimed to help contextualize sweat bath usage throughout time for the reader. The reason time is highlighted in this process is because periods of environmental stress are associated with an increase in religious activity. Next, ethnographic and ethnohistoric resources are searched to identify primary gods and goddesses that are associated with sweat baths. Once the deities associated with the sweat baths are all clearly identified, it provides a better image of the forms of healing and ritual occurring within the sweat baths. Finally, modern ethnographic accounts are compared to those found in earlier accounts to spot any significant patterns or differences.

Spatial Analysis:

The spatial analysis focuses on cardinal direction, volumetrics, and other measurements of the sweat baths, where they are located within the sites themselves, and their proximity to water. These factors were chosen with the intention of answering key questions such as who was using the sweat baths, how many people could have fit in them,

if there is any significant pattern between cardinal direction and the location of water, and finally, if location within sites determined use-type.

In many Indigenous cultures, cardinal directions are important factors in how one carries themselves in specific situations such as prayer and how one may perform ritual (Krogmeier 2017). The same is true for the Maya with each cardinal direction having a color association. West is black, east is red, north is white, south is yellow, and the center is blue-green or has a ceiba tree which was believed to hold up the heavens (Awe 2022). Therefore, it is important to observe any patterns that may indicate a spatial relationship between cardinal direction and water sources and/or other monumental architecture.

Calculating volumetrics for the sites of Baking Pot, Cahal Pech, and Pooks Hill is an appropriate method to compare the architecture without merely looking at shape of the structure and design. Unfortunately, at the site of Xunantunich, the roof of the sweat bath is collapsed and therefore volumetrics may not be the most appropriate measure of comparison. However, there is still the opportunity to compare floor plans and bench measurements for the Xunantunich building.

The location of the sweat bath within the sites can tell us significant information regarding the use and accessibility of it. For example, all of the sweat baths in this data pool are in within site cores and show elite-inspired architecture. Therefore, this tells us either only higher-status people were using these specific sweat baths, or that only elite healers were allowed to perform ceremonies in these sweat baths, almost like a clinic.

Proximity to water is an essential component for understanding how sweat baths were used in the past. For example, if a sweat bath is nowhere near a water reservoir or other water source, why place it there? Also, it is important to note any patterns of distance

between each sweat bath and their nearest water source whether it be natural or man-made. The amount of human labor required to bring water to the sweat bath may relate to the spiritual or elite importance of it.

Comparative Analysis:

As briefly mentioned, comparative analysis of the sweat baths is important for determining the use patterns and significance of sweat baths in the Belize Valley and across the Maya area. Using the diagnostic features mentioned before, a comparative analysis between the four sites was completed to first determine if there are any architectural similarities between the sites, as well as similarities in usage and location of sweat baths in the Belize Valley. Subsequent analysis compares the four Maya sites in the Belize River Valley with a couple of other well-known Maya sweat baths, particularly those found at Piedras Negras in Peten, Guatemala, and Joya de Cerén in San Juan Opico, El Salvador. These non-western Belize sites were particularly chosen for comparison because their previous detailed study provides considerable data for comparative purposes.

The recording of diagnostic components of the sweat baths, such as their dimensions, was important because they allowed us to make accurate comparisons, they serve to indicate use type (communal vs private), architectural style (rounded or rectilinear), and to determine their location in reference to other architecture at the sites in this study. Another diagnostic factor that contributes to the analysis is the hearth component in the sweat bath which indicates whether the sweat bath was a metaphorical representation of a sweat bath or if it was one that was fully in use. For example, a sweat bath with no evidence of an active heart or any human activity may be considered a metaphorical representation of a sweat bath used as a form of homage to those of higher status. By comparing these four

diagnostic factors, the uses and significance of these architectural features can be more accurately determined and can be compared with other sweat baths to determine possible patterns of usage and significance across the Maya region.

Site Selection

The sites were chosen because they were all previously excavated by the BVAR Project starting in the 1990s. Most of the sweat baths, with the exception of Xunantunich, have been restored from states of deterioration and even looting (Awe 2023). In addition to the site maps, the sites of Xunantunich, Baking Pot, and Cahal Pech all also have Lidar data available to check for any patterns that may not be visible from the site maps. Although there is no Lidar data available for Pooks Hill, possible patterns are still distinguishable for this site.

The BVAR Project's research permit from the Belize Institute of Archaeology allowed full access to Xunantunich, Baking Pot, and Cahal Pech while the Pook's Hill resort was accessed with permission from the current owner. Jaime J. Awe and Christophe Helmke worked at Pook's Hill in the early 2000s which assisted in acquiring access to the site. It is important to note that Pook's Hill resort is currently undergoing a name change to Jade Jungle resort starting in 2024. In spite of this change, I will continue to refer to the site as Pook's Hill because this remains the established name of the archaeological site.

Equipment Used for the Project

With goals of accessibility and using non-invasive techniques in mind, the field supplies consisted of easily available items. The items were a five-meter tape measure, field notebooks, a one-terabyte hard drive, and an iPhone 14 which contained the following apps

and tools: the compass app using magnetic North, the app Scaniverse, the measurement tool, and the camera.

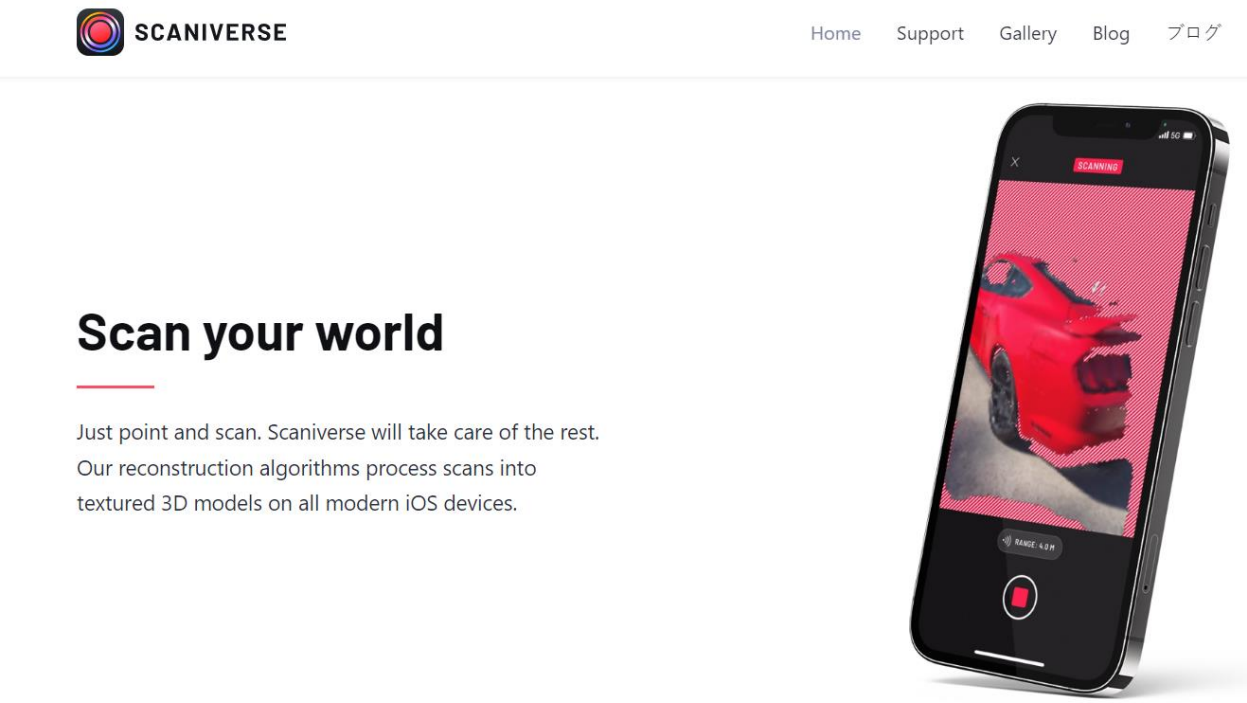

Figure 1. Scaniverse Homepage, 2024.

Other supplies and equipment consisted of moisture-wicking clothes, hiking boots, hydration packs, backpacks, and sunscreen. All of these items are available to the general public both in the United States and Belize. If hiking boots are too expensive, any water-resistant shoe that covers the entire foot would suffice. These items were chosen with minimalism and the ability to be replicated in mind.

Theory

The theoretical frameworks that informed the approach to data collection include Indigenous methodologies, liminal space theory, and social memory. Indigenous methodologies used in this approach include intentionality, the implementation of in-situ observations, positionality, and being intentional with the data collection with protection of

the site in mind. Tuhiwai Smith states that the process of answering a question is far more important than the actual outcome (2021: 149). Therefore, the in-situ data collection serves not only as information for the analysis but also as a reflective process throughout the progression of the thesis project. Coming in as an outsider to this community is something not to be taken lightly and is important to observe as the interpretation develops. Reflexivity is a key component for navigating insider-outsider research relationships and will be implemented throughout this thesis.

Previous investigations of Mesoamerican sweat baths have often applied the direct-historical approach (Cresson 1938; Houston 1996; Ichon 1977). The direct-historical approach developed from the theory of cognitive archaeology which applies cognitive sciences to archaeological remains (Iliopoulos and Malafouris 2014). The direct-historical approach bridges the gap between archaeological interpretations and ethnohistoric ones, creating a more holistic view of what the archaeological record can be and how it can be determined (Marcus and Flannery 1994:55). An example of the application of this approach can be seen in Houston's (1996) investigation of sweat baths at the site of Palenque. Houston uses the direct-historical approach to understand the metaphorical uses of sweat baths by elites through ethnohistoric investigations (1996). However, Houston and many others fail to acknowledge possible cultural influences across regions that may affect and influence the way sweat baths are used. The analytical approach of interpretation has incorporated the direct-historical approach similar to Houston, with the exception that the analysis is a regional one rather the single site study conducted by Houston and many others.

This thesis project uses methods similar to those developed from the direct-historical approach. However, the implementation of other methods of analysis enhances the interpretation of the sweat bath features. There are much more than the physical spaces themselves to interpret. For example, the religious and healing contexts of the spaces are also essential and must be interpreted with just as much care as the more diagnostic contexts.

Cresson (1938), Houston (1996), and many other archaeologists provided foundational information regarding the most common uses of Maya sweat baths. However, recent investigations of Maya sweat baths implement different analytical approaches that include liminal space and social memory theory (Miller 2013), ethnohistorical approaches (Mazariegos 2018), and Indigenous theories (Clarke et al. 2021). Although the direct-historical approach is still relevant and applicable to this investigation, it is important to note the application of other approaches also provide significant new perspectives. Considering the multitude of uses and meanings associated with Maya sweat baths, it is absolutely necessary to combine the listed approaches with the direct-historical approach.

The application of liminal space and social memory theory has reframed the way archaeological data is interpreted, especially when interpreting ancient civilizations (Fogelin 2007, Mills 2008, Soloman 1997). Rather than viewing an assemblage as merely practical and logical, they are seen through a ritualistic lens (Moses 2018). Lucero and Kinkella, (2018) and Clarke et al. (2021) both implement this theoretical framework in their analysis of sweat baths by focusing on the cosmological symbolism and liminality (the psychological process of transitioning across boundaries and borders) of Maya sweat baths. There are many Maya buildings with a specialized purpose, however, sweat baths

are specialized in liminal ways (Hammond 2007). Thus, it is an essential approach to consider when analyzing Maya sweat bath use. Although archaeologists such as Lucero have implemented myth and ritual theory, again, they often do not consider this on a regional scale. This zoomed-in lens does not paint a complete picture of Maya sweat bath usage considering the vast cultural influence and exchange occurring between Mesoamerican communities (Tourtellot and Sabloff 1972).

Data Collection

In collaboration with BVAR, the data collected during the 2023 field season (session two) consisted of 3D models of all four sweat baths made via the application Scaniverse, hand-drawn floor plans of the sweat baths, and interior measurements of the sweat baths. One focus of this thesis project is to collect data in an accessible and non-invasive manner. Therefore, the minimal materials and the decision to not excavate felt most appropriate while still collecting ample data. The goal was to collect models and measurements from all four sites which was achieved despite transportation and weather limitations.

Trips to the sites of Baking Pot and Xunantunich were provided via BVAR with the field day being approximately seven hours long including transportation time. Transportation to Cahal Pech was provided via Dr. Jaime J. Awe and transportation to Pooks Hill was provided by BVAR field staff Adrain Gutierez. After arriving to site, data collection at the sweat bath was the first step in this thesis project. Scaniverse is particularly sensitive to sunlight and shadows as are most pseudo Lidar programs. Therefore, morning light is best in Belize for model-making and for protection against UV exposure. Many attempts to make models were made at each site and would take place over the course of two to three weekdays. After the models were made in the morning, the

next steps consisted of making sketches, taking measurements of both the interior and sides of the structures, establishing what cardinal directions the sweat bath doors faced, and mapping floor plans. This was all done by one person with the exception of Xunantunich and Pook's Hill where BVAR personnel Kelly Baer, and Adrian Gutierrez, respectively assisted me with taking measurements.

When no transportation was available, archival investigation of the sites as well as model-editing were the tasks of focus. Although this only occurred on three or so days, it allowed for time to make sure the models were collected properly and accurately. The program Blender, version 3.6, was used to process the 3D models and edit them by filling in any gaps or texture issues. It was a learning process having no previous experience using this software or Scaniverse, however, the models were processed successfully.

Limitations

As mentioned above, data collection was sometimes affected by the availability of transportation and sometimes due to poor weather conditions. Although BVAR has previously worked at Cahal Pech, this site was not excavated or investigated during the 2023 season. Pooks Hill is located nearly 38 kilometers away from our base location which meant all data collection had to be squeezed into one day with the help of BVAR staff members, Adrian Gutierrez and Kelly Baer. Some days, the rain interfered with field work considering that none of the sweat bath structures have an intact roof and the technology used for recording them was not waterproof. This did not interfere with the completion of the thesis project; however, it did impact the length of time it took for data collection.

Chapter 4: Culture History of the Maya Lowlands

Chronology Overview

Maya chronology is divided into three overarching time periods with small subsets within each major period (see figure 1). The three main periods are the Preclassic (1200 BCE – 300 CE), the Classic (300 – 1000 CE), and the Postclassic (1000 CE – 1519 CE). In the Preclassic, the typical behaviors observed were the establishment of farming settlements and growing inequality. The latter part of this period also witnesses the establishment of hereditary rulership, long distance exchange, and craft specialization. The Classic period consists primarily of competition between major polities, the introduction of divine rulership. the widespread use of hieroglyphic inscriptions, the rise of a few superstates, and eventually the decline and disintegration of Maya cities. Then lastly, the Postclassic period witnesses the development of council rule, maritime trade, and greater interaction with western Mesoamerica. This is shortly followed by the Spanish invasion leading to colonial rule, drastic depopulation as a result of the introduction of non-native diseases such as smallpox. The sweat baths analyzed for this project were not constructed in one singular time period, therefore there will be no focus on a singular time period.

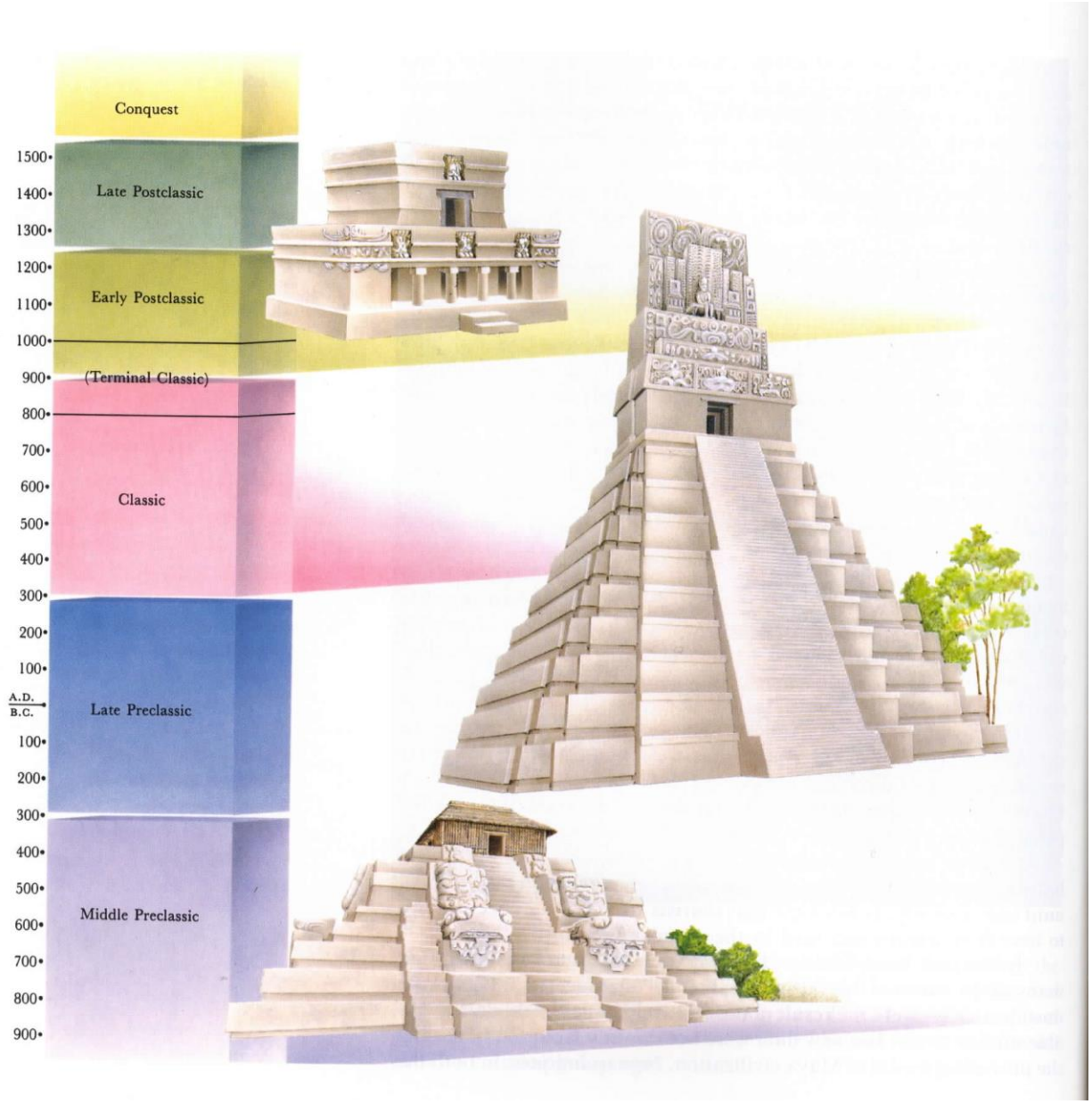

Figure 2. Maya Chronology Chart, courtesy of Jaime Awe.

Environmental setting of the Belize River Valley. The Belize River Valley, which is located in the central Maya lowlands, is comprised of two topographical subregions: The Upper and lower Belize Valley (Chase and Garber 2004). The data collection for this thesis occurred solely in the Upper Belize River Valley at the sites of Baking Pot, Cahal Pech, Pooks Hill, and Xunantunich. The Upper Belize River Valley can be described as hilly with

major changes in elevation above the confluence of the Macal and Mopan rivers in Western Belize (Chase and Garber 2004). Rainfall in this region is approximately 40-60 inches annually with occasional increases during tropical storms that cause seasonal flooding of the area (Belize.com).

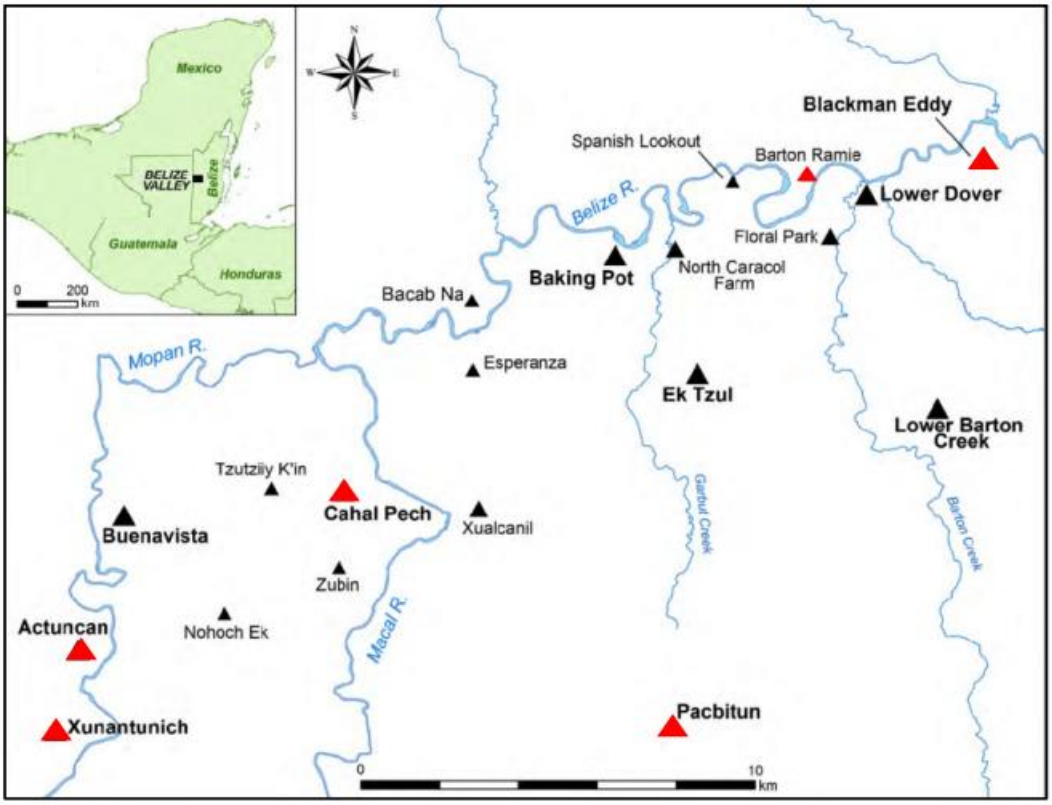

Figure 3. Map of Maya Sites in the Upper Belize River Valley, after Hoggarth 2015.

Early Maya settlement in the upper Belize River Valley were heavily influenced by the abundance of natural resources, mainly water, good agricultural land, and mineral resources such as limestone (2004). Today, over 35 percent of land in Belize is under some sector of official protection (Terrestrial Protected Areas 2022) because of these precious resources. The Belize River, and its Macal and Mopan branches are navigable waterways

and from quite early served as major trade routes that linked the Caribbean coast with inland sites (Awe 2022).

The general climate of the Upper Belize River Valley can be described as a drier subtype of the humid tropics (Ford and Fedick 1992). This climate is suitable for farming and creates more food availability throughout the year. The biodiversity of this region richens the soils and ecosystems. The local flora in Belize consists of 4000 flowering species, many of which have medicinal uses, approximately 700 tree species, various fruit and nut bearing plants, and a large variety of grasses. The fauna consists of hundreds of bird species, several mammals including monkeys, plus lizards, snakes, big cats, turtles, and an abundance of marine animals along the coasts. There are also wild turkeys, *Meleagris ocellata*, that can often be seen at the site of Xunantunich. The Maya carefully selected their site locations considering all of these available resources and environmental factors.

In general, the Upper Belize River Valley was and is one of the most biodiverse and resource rich areas in all of the Maya lowlands making it a perfect location for the establishment of early agricultural communities and Maya epicenters. Not only is there a plethora of natural resources but also consistent rainfall to rely on.

Sweat Baths in Belize

Although there have been many Maya sweat baths encountered in the Maya Highland region by previous archaeologists, there has not been a large effort to explore their presence, usage, and symbolic meanings in the Maya lowlands (Child 2006; Hammond and Bauer 2001; Helmke 2006; Houston 1996; Watson et al. 2022). Previous research on Maya sweat baths has dated their use to the Classic period and throughout the Late Classic (Houston 1996: 143).

Previous research on the religious and ritualistic use of Maya sweat baths ranges from examinations of death rituals to analysis of Maya creation stories (Carrasco 2010; Scherer 2015). Ritualistic healing is still practiced today by descendants of Mesoamerican civilizations and is (more recently) being discussed and recorded by a variety of professionals including archaeologists, historians, and ethnographers (Bade 1994, Domenici et al. 2019, Schnell 2017, Watson et al. 2022, just to name a few). There are both sacred and mundane uses of sweat baths and their uses can range from standard cleansing to rituals releasing "evil" from the body (Child 2006, Nash 1967). Sweat baths are considered a highly gendered space considering their association with gestation (Miller 2013, Perego 2007) and various goddesses of birth, fertility, and femininity (Mazariegos 2018) such as Ixchel.

Ritualistic metaphors regarding sweat baths are existent in many areas throughout Mesoamerica including Palenque in Mexico (Houston 1996) and Chechem Ha Cave in Belize (Moyes 2005). One ritualistic metaphorical use of sweat baths is the burial of the afterbirth in the sweat bath one was born in (Houston 1996) which is then followed by a yearly offering to the sweat bath throughout childhood and should still be done occasionally as an adult. Another metaphorical use of sweat baths is often seen in cave ritual due to their association with water; ethnographic evidence suggests Chechem Ha Cave in Belize was a place where sweat bath rituals took place (Moyes 2005). According to Moyes (2005), mist in caves serves as a metaphorical representation of the sweat bath steam and the rocky terrain was associated with hearths (Moyes 2005). Keeping this information in mind, my analysis will include metaphorical uses of the sweat baths in Belize such as those seen in Chechem Ha Cave.

Architectural Details of the Project Sites

Cahal Pech, Baking Pot, and Pook's Hill all had similar structures and styles. All three of the sweat baths have low-entry doors, a small set of stairs leading up to the hearth and benches, or in the case of Cahal Pech, where the hearth should be located. The roofs of the sweat baths at Baking Pot, Pook's Hill, and Xunantunich were also the same style, rectilinear towards the bottom and a gradual dome shape toward the top. Each sweat bath had wide benches inside that extended from the entrance wall toward the hearth wall. Baking Pot, Pook's Hill, and Xunantunich's original entrance all had outdoor benches which were typically used as areas to cool off and douse one selves in cold water. The Cahal Pech sweat bath was the only one that did not have benches for cooling off however there is a long bench on the backside of the Cahal Pech's sweat bath that likely served as the cooling area.

Baking Pot: Site description and brief history of investigation.

Baking Pot is located on the alluvial valley of the Belize River about 10km east of the town of San Ignacio. The site core sits on the southern bank of the river and is surrounded by pastures and farmland administered by the Belize Ministry of Agriculture (Hoggarth et al. 2010). The monumental epicenter is divided into two major groups connected by a *sacbe* or causeway which is considered to be one of the most prominent features at Baking Pot (Willey et al. 1965). The site is considered to be one of the largest in the area, at 4.1 hectares (Andres et al. 2014; Colas et al. 2002; Helmke et al. 2019), however, it has only been partially excavated.

Baking Pot was first investigated by Oliver Ricketson (1931) of the Carnegie Institution of Washington in 1924. This was followed by a brief Harvard University

investigation in the 1950s by Gordon Willey and his colleagues (1965), and later by a Royal Ontario Museum project under the direction of Bullard and Bullard (1965). After a long hiatus, research at Baking Pot was resumed in the 1990s when the BVAR Project, under the direction of Jaime Awe, began long-term investigations of the site (Audet 2006; Awe et al. 2020; Ferguson 1999; Helmke et al. 2020; Hoggarth 2012). The BVAR investigations indicate that Baking Pot was settled sometime around the start of the Middle Preclassic period (900 BC), rose to prominence during the Late Classic period (600-900 AD), abandoned at the start of the Early Postclassic (1000-1200 AD), and then briefly reoccupied during the Late Postclassic period (1200-1300 AD).

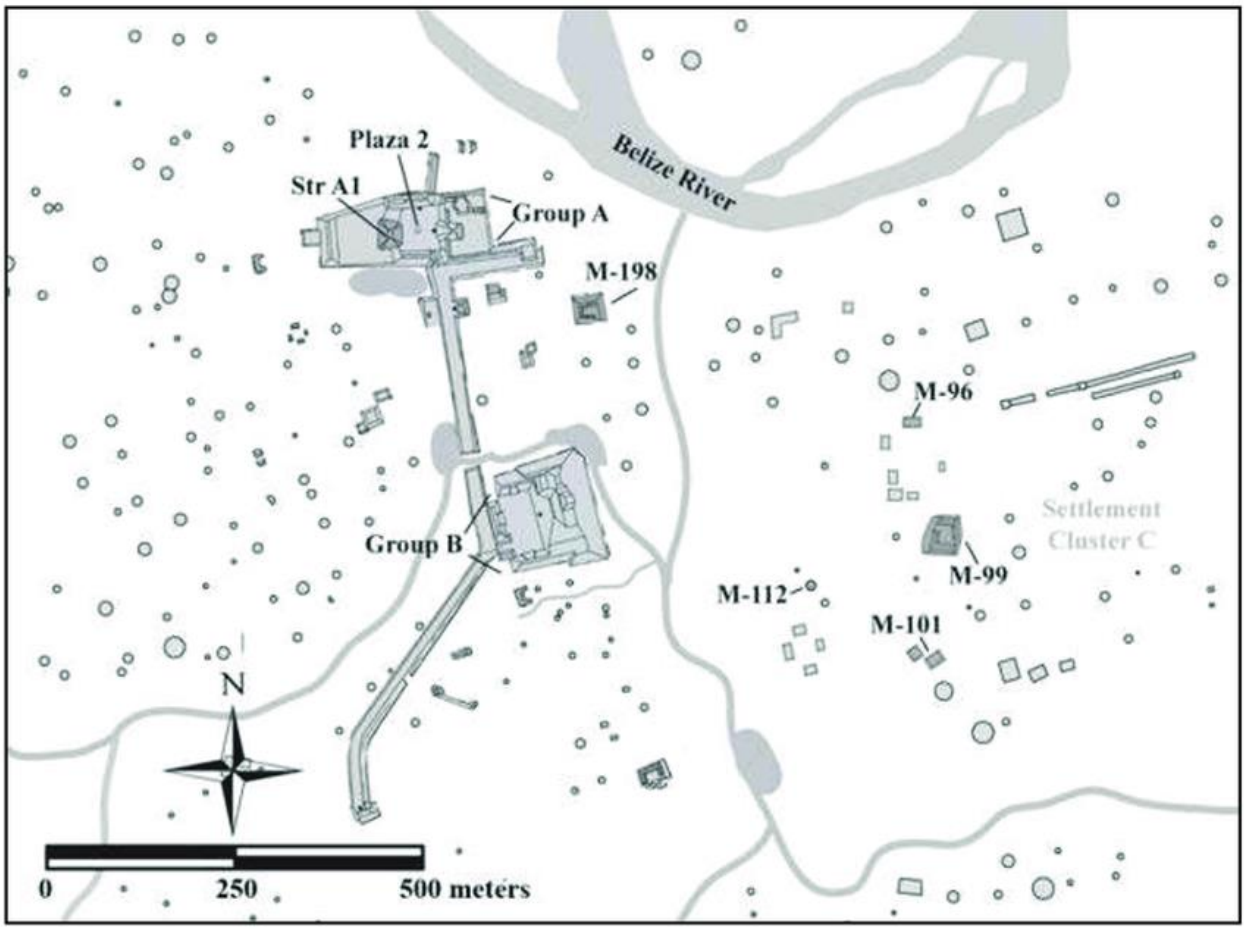

Figure 4. Baking Pot Site Map by Julie Hoggarth, 2015.

Baking Pot Sweat Bath Diagnostics

The sweat bath found at Baking Pot is located in an elite residential area designated as Group B, Courtyard 3, and the building is integrated within the nearby structures and features rather than a standalone structure. The entrance of the sweat bath faces 75 degrees east and there is no evidence of renovation occurring. The dimensions are not exactly the same as those at Xunantunich, the interior back wall of the sweat bath is 2 m wide, the sides are also 2 m long, however they angle out toward the interior front wall which measures at 3 m. The shape of the floorplan is reminiscent of a rhombus rather than a square and the walls curve in near the top to create a dome. There is a fire hearth as well as a firebox at the center of the room along the western wall of the building. There are benches outside of the structure on either side of the entrance however they do not continue onto the sides of the building. The sweat bath itself is located within the palace complex and is built into the surrounding structures similar to that of Pook's Hill. The nearest natural water source is a creek about 100 meters away from the base of the acropolis. Associated artifacts identified near the sweat bath include apple snails, Terminal Classic ceramics, chert flakes, obsidian blade fragments, and shell (Hoggarth 2015). In summary, the sweat bath at Baking Pot shares many similarities with the baths at Pook's Hill and Xunantunich.

Cahal Pech: Site History Site Description and Brief History of Investigation

The site of Cahal Pech is located within the present-day boundaries of San Ignacio Town in the Cayo District of Belize. The site core sits atop a prominent hill overlooking the confluence of the Macal and Mopan Rivers to the north and northeast, and the Maya Mountains to the south. The first report of Cahal Pech was by Linton Satterthwaite from the

University Museum of Pennsylvania in the 1950s. It was also Satterthwaite who named the site Cahal Pech, Yucatec Maya for "place of ticks," (Awe 1992). In the 1950, Gordon Willey visited the site but decided to work instead downriver at Barton Ramie. Several years later, in the 1970, Belize Commissioner of Archaeology Peter Schmidt conducted salvage excavations in one of the main pyramids at the site. Schmidt, however, never published the results of his investigations.

In the late 1970 and early 1980s, three structures in the site core were partly vandalized by looters (Awe 1993). This led Awe (1992) to launch the first intensive and long-term project at the site, which began in 1988 and continues to the present day under the auspices of the BVAR Project.

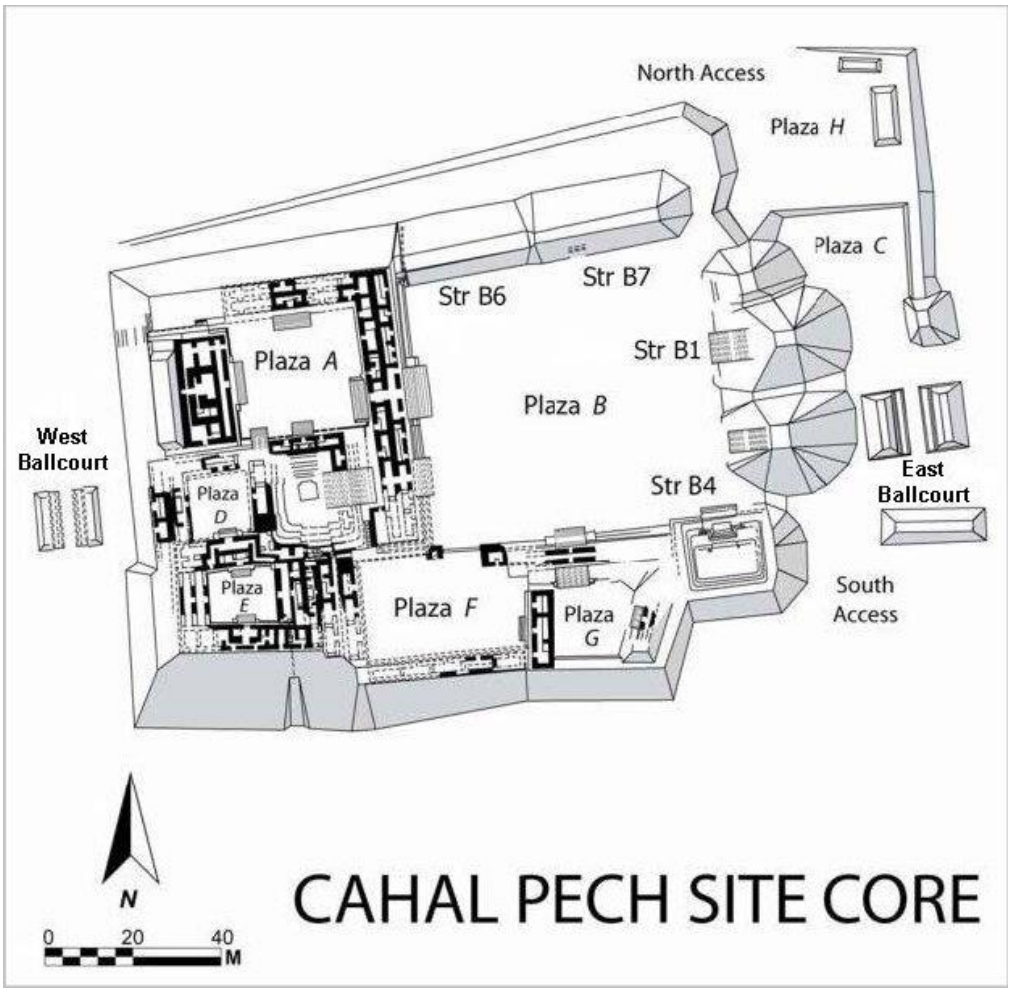

Figure 5. Cahal Pech Site Core by Claire Ebert 2017.

The BVAR Project's investigations at Cahal Pech have established that initial settlement of the site occurred around 1200/1100 BCE (Awe 1992; Garber and Awe 2008). The site core covers roughly 2.4 hectares and has 34 defined buildings with the tallest being 24 meters tall. The monumental architecture in the epicenter encloses seven plazas, and includes several large temples, palaces, and administrative buildings, two ballcourts, and one sweat bath (Awe 1992).

As I noted above, Cahal Pech was one of the first permanently occupied sites in the Maya Lowlands and was occupied continuously into the Terminal Classic period (Awe et al. 2020; Ebert *et al*. 2016). During the Late Formative, Cahal Pech was considered a major

regional center in the Belize Valley (Awe 1992). Previous excavations at Cahal Pech have demonstrated unique ritualistic systems that parallel stories from the Popul Vuh and other sacred histories (Garber and Awe 2008).

Cahal Pech Sweat Bath Diagnostics

The entrance of the sweat bath (B5) faces 180 degrees south towards Plaza G. The interior dimensions are 2.8 meters long and 3.7 meters wide with slightly curved-in walls. From a planar view, the sweat bath has a rectangular and symmetrical shape with a vaulted ceiling. The benches inside extend 1.5 meters out from the walls to create a level surface large enough to lay down. Unfortunately, there was no obvious evidence for the hearth due to a looters trench that was dug right in the middle of the structure. However, there is still a small hallway and staircase leading up to where we believe the hearth was located. There is a small hole above the entrance of the sweat bath that is likely a "curtain hole" which were used to hold hides or other textiles to function as a door, see figure 10. Like many other ancient sweat baths, the benches are found along the sides and opposite end of the entrance. The nearest natural water source is a now dry creek about 70 meters away. Artifacts associated with the sweat bath include ceramic and chert, there may have been other artifacts associated with the sweat bath however looters destroyed much of the structure in the early 1980s (Pritchard et al. 2016: 22).

Pook's Hill: Site Description and Brief History of Investigation.

Pook's Hill is considered to be a minor center consisting of a single large *plazuela* (small patio/plaza) with several outlying house mounds (Helmke 2006). Typically, plazuela groups are comprised of four or more buildings that align with the cardinal directions, and which enclose a large courtyard. The courtyard at Pook's Hill is bordered by six buildings,

including an eastern shrine, three large residential structure, a building of undetermined function, and a sweat bath (Awe and Helmke 2007; Helmke 2009). Research by the BVAR Project (see Awe and Helmke 2007; Helmke 2009) indicates that the site was predominantly occupied during the Classic period, and that it eventually declined and was abandoned by the end of the Terminal Classic (800-900 AD).

Pooks Hill is located in the foothills of the Maya Mountains and along the Roaring Creek Valley in western Belize (Helmke 2009; Stemp et al. 2010). The site also sits in the middle of a modern-day resort called Pooks Hill Lodge. The name "Pooks Hill" is in reference to the children's book, "Puck of Pook's Hill", by Rudyard Kipling (Helmke 2009), and was given to the site by Ray and Vicki Snaddon, owners of the resort and property. Coincidentally, the word *puuc* in Yucatec Maya means "low range hills" which adequately describes the landscape on which Pooks Hill is located.

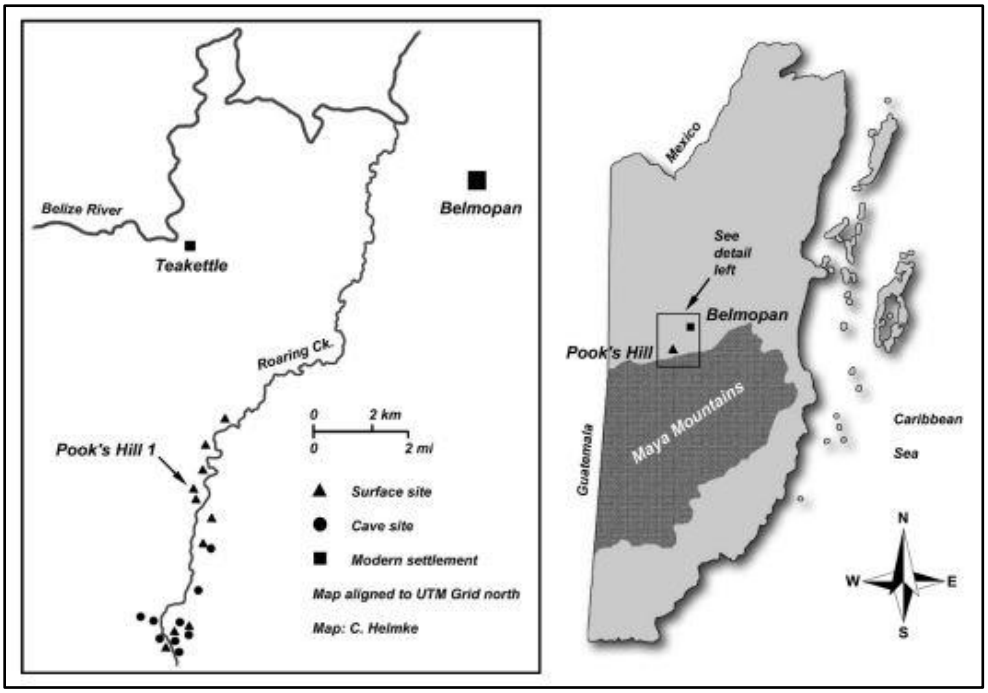

Figure 6. Map of Pook's Hill by Christophe Helmke, 2003.

Pook's Hill Sweat Bath Diagnostics

Like at Baking Pot, the Pook's Hill sweat bath (1B) is relatively well-preserved. It is located within a plazuela group attached to a possible residential structure, 1A. The entrance of the sweat bath faces due south (180 degrees). The interior dimensions are 2.25m wide and 2.85m long with a much more circular form than the other three sweat baths investigated by this study. Like the other sweat baths in the Belize Valley, the bench is U-shaped, about 1.5 meters wide, and there is a small staircase in the middle of the sweat bath that leads up to the benches. Unlike Cahal Pech, this sweat bath does not have a curtain holder and there are exterior benches flanking the doorway. The nearest natural water source is Roaring Creek approximately 357m away. For a complete list of artifact types previously excavated in the sweat bath see Awe et al. 2020, Figure 1, and Helmke 2006. These remains, however, were likely deposited on the surface of the benches during the time of abandonment (Awe et al 2020).

Table 1. Diagnostic features of sweat baths in western Belize, (by Lilian Tejeda-Barillas, 2024).

Site Name	Interior Shape	Interior Dimensions	Entrance Direction	Nearest Water Feature	Associated Features	Site Time Period
Baking Pot	Round	2 L x 3 W	East	Creek	Temple B1	Classic (300-900 CE)
Cahal Pech	Round	2.8 L x 3.7 W	South	Dry Creek	Plaza G and the Eastern Triadic	Early Mid Preclassic-Classic (1200 BCE - 900 CE)
Pook's Hill	Round	2.85 L x 2.5 W	South	Roaring Creek	Eastern Shrine 4A	Late Classic (830 - 950 CE)
Xunantunich	Rectangular	2.65 L x 2.65 W	North then West	Dry Creek	Residential Plots, Possibly the Ballcourt	Terminal Classic (900 - 1150 CE)

Xunantunich Site Description and Brief History of Investigation.

Xunantunich is located along Belize's western border with Guatemala and along the banks of the Mopan River. The site core consists of four distinctive architectural complexes: Group A, Group B, Group C, and Group D, with Group A and its three courtyards representing the center of the ancient city (Awe 2008). Groups C and D are located to the east and southeast of this epicentral area, while Group B, a residential compound, lies to the west.

The site core covers approximately 2.5 square hectares and lies at the summit of a large hill at an elevation of 183 meters above sea level (Awe *et al*. 2020). The site sits right

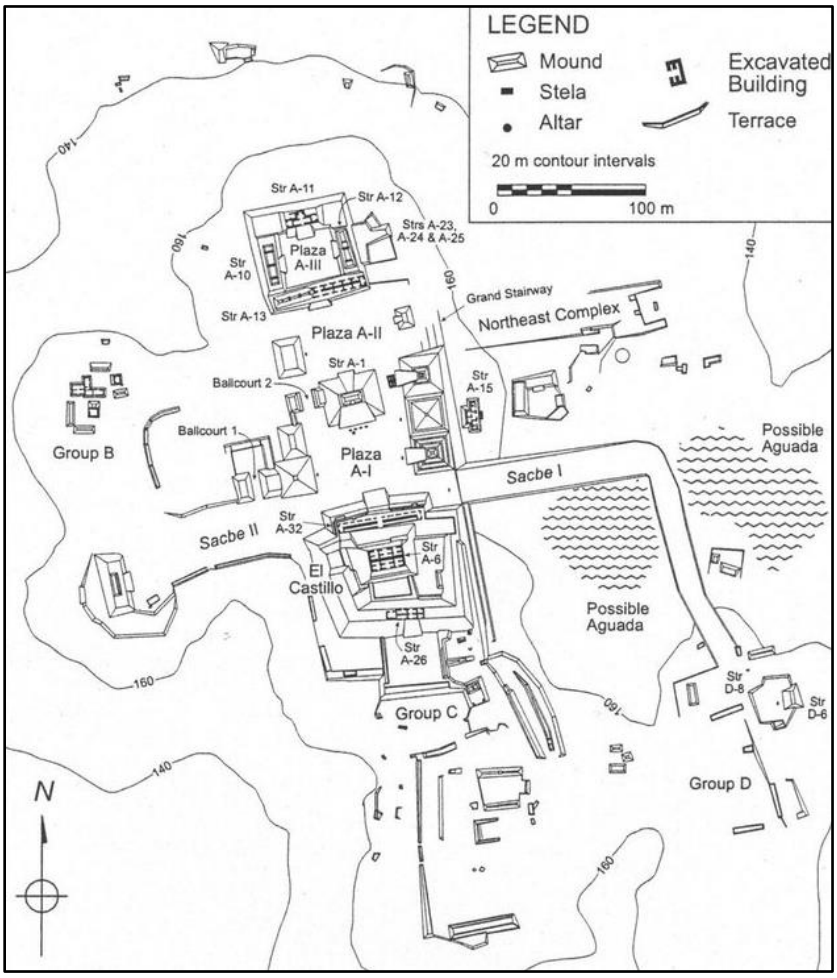

Figure 7. Map of Xunantunich by Kelsey J. Sullivan et al. 2017.

along the Mopan River in San Jose Succotz, less than 1,000 meters from the Guatemalan border. The site was occupied during the Late Classic to Terminal Classic time periods and is considered to be short-lived compared to surrounding Belizean Maya sites (LeCount *et al*. 2002). To be specific, the rise of Xunantunich is believed to have occurred during the Samal phase (600-670 CE) and Hats' Chaak phase of the Late Classic (600-800 CE) period and became politically autonomous in the Tsak' phase (780-890 CE) of the Terminal Classic (800-900 CE) (LeCount *et al*. 2002).

The name Xunantunich comes from the Yucatec Maya dialect combining the words "xunan" translating to "woman," and "tunich" which translates to "stone" (McCurdy 2016). According to local folklore, in the early 1800's, a man from the village of San Jose Succotz saw the ghost of a woman while hunting who appeared to be made of stone (Awe 2020). The woman beckoned him toward a cavern however, she quickly disappeared and has been spotted by many other locals since. However, Christopher Helmke and Jaime J. Awe have suggested the ancient Maya name for the site may possibly be *Katyaatz Witz*, which translates to "Claybearing Mountain" (Helmke and Awe 2012). This discovery was based on hieroglyphic inscriptions found on Panel 2 at Xunantunich which was excavated just years before their 2012 publication (Helmke and Awe 2012).

Xunantunich is one of the most well-known and visited sites in the Cayo district alongside Cahal Pech. The site was opened to the public in 1954, one of the first Maya sites ever opened for tourism in Belize (Belize Tour Base). Alfred Maloney, governor of what was then British Honduras, was the first person to record the site in 1891 (Awe et al. 2020). Shortly thereafter, British Medical doctor and archaeological enthusiast Thomas Gann conducted some of the first explorations and excavations of the site. Gann's foray into

Xunantunich was followed by short visits from a number of British and North American archaeologist right into the 1960s.

The sweat bath at Xunantunich is located in Group B. This residential area was first excavated in 1938 by J. Eric Thompson who focused much of his attention in Plaza B1. In 1978, following reports of looting in Group B, David Pendergast and Elizabeth Graham (1981) conducted salvage excavations of a mound in Plaza B2. Almost 20 years later, in the mid-1990s, the Xunantunich Archaeological Project under the direction of Richard Leventhal conducted additional work in Plaza B1. More recently, intensive investigation of Group B has been conducted by the Xunantunich Archaeology and Conservation (XAC) Project directed by Jaime Awe, with some additional efforts in Plaza B2 by Jason Yaegar from the University of Texas at San Antonio. The sweat bath was discovered by the XAC Project during the 2022 field season.

Xunantunich Sweat bath Diagnostics

The sweat bath located at the site of Xunantunich (B5A) is within a residential area for nobles and other elite people in Group B. The door of the sweat bath was modified at some point during the Terminal Classic (BVAR Report 2022: 210) to face west instead of north. This alteration was likely to make room for more residential quarters (BVAR Report 2022: iv). There is evidence of reoccupation in the Terminal Classic period which aligns with the timeline of Courtyard B1. The interior dimensions of the sweat bath are 2.65 m by 2.65 m with short interior benches only 22 cm off of the ground and slightly less than a meter away from the interior wall for sitting space.

In summary, the sweat bath at Xunantunich has deteriorated significantly with walls standing at only a meter or less in some spots and the entrance does not have an intact

doorway. The sweat bath at this site is also located within an elite residential complex adjacent to the site core, and in proximity to Ballcourt 1 and Sacbe II. The closest natural water source to the sweat bath is a dry creek, about 300 meters to the south. Attached to the old entrance, facing North, are benches likely used for cleansing with cold water after the Sweat bath session was over. Artifacts found in association with the sweat bath include fragments of plain and effigy censers, a ladle censer, and a small flute (BVAR 2022: 240), but these were likely placed in the sweat bath sometime after Group had been abandoned. The effigy censer found at the sweat bath is also almost identical to one found in tomb H1 at Cahal Pech indicating interaction between the two sites during the Terminal Classic period.

Chapter 5: Results

This chapter serves as an overview of the results of the sweat bath research. The chapter first discusses a general statement of observations, then discusses the in-situ evidence, diagnostic evidence, spatial contexts, followed by maps and graphs. The results are ordered to represent the four sites separately then comparatively with each other and other related sites.

Statements of Observations

When preparing the research design for this thesis, the working hypotheses was that all of the sweat baths were expected to be closely associated to a natural water source, and that the direction of the entrance would face the natural water source. What I observed was that every sweat bath in the study was within walking distance of a natural water source. However, the entrances did not face the nearest water source except for Pook's Hill

which was likely not intentional. There is also evidence of architectural stylistic changes over time which will be discussed later in the discussion.

There were multiple similarities found between the four sweat baths studied in this project. No two sweat baths are the same size or are constructed exactly the same, however they do have share some characteristics. One of the most noticeable similarities was the construction material which was limestone and plaster which is typical architectural material found in elite residential areas and site cores of Maya sites. Small doorways, fire boxes, and fire hearths are essential sweat bath characteristics which were present at each sweat bath in this study with the exception of Cahal Pech. Sweat bath architecture in the Maya world is uniform in the essential elements mentioned previously, however, Dr. Awe informed me that a looters tunnel destroyed the area where the hearth would have been located in the Cahal Pech sweat bath. Later, when BVAR archaeologists decided to restore the site, they decided not to reconstruct the hearth so as to not assume its original size and what it may have looked like. Another significant difference between the sweat bath at Cahal Pech and others in the Belize Valley is their roofs. The Cahal Pech building, for example, has a vaulted roof while those at Baking Pot, Pook's Hill, and Xunantunich are domed. One reason for this might be that the Cahal Pech sweat bath dates to the Early Classic period while those at the other three sites date to the end of the Late Classic period (Awe 1992; Helmke and Awe 2005).

Unfortunately, there were some questions and characteristics that were not able to be addressed due to a variety of factors. The collapsed nature of the roofs, for example, made it impossible to determine whether soundscapes played a significant role in ancient Maya sweat bath ceremonies in Western Belize. Another element that was disregarded was

the volumetric measurements due to the collapsed roof of Xunantunich's sweat bath. Three of the four central sweat bath sites have lidar data available which may have helped to identify where water may have been sourced from if not from the nearest natural water source. However, the nearest natural water sources were located and calculated using ArcGIS Pro. The last two sentences are confusing. It is hard to determine what you are trying to say. Consider rewriting.

Other Observations

When conducting in-situ observations of the sweat bath spaces, it was clear that the acoustics change drastically when inside the sweat bath at the sites of Baking Pot, Cahal Pech, and Pook's Hill. Although the roofs of the sweat baths were not completely intact, there was still a significant change in octaves, making sounds deeper and more baritone. The change in sound was similar to that of a geodesic dome, focusing on the sound while also amplifying it. Although there was no decibel meter to measure the exact changes, there were still notable differences in sound inside of the structures. Though there is no evidence that birthing chants were common among all Mesoamerican sweat baths, it is possible that the dome-shape of the sweat baths would have amplified any ritual chants or singing (Sheets and Mahoney 2022).

Another important observation was that the benches were wide or long enough for a person to lie vertically across the bench. This would provide ample working space for any birthing processes. However, if sitting, the space was also constructed in a manner in which an average sized Maya individual could sit across from another person comfortably without being cramped. Ample space in the domed room was likely an important consideration during the construction of the sweat bath.

Lastly, when entering the sweat baths with complete doorways, it does feel as if one is being transported into a sacred, cave-like, space. At Xultun, the doorway is shaped as a figure believed to be a goddess with what appears to be either iguana or frog limbs in which you must enter as you walk into the sweat bath. Although the doorways found at the four sweat bath sites central to this thesis do not have any artistic depictions of metaphorical wombs, the dome shape and small entryway are certainly reminiscent of a birthing canal as one enters the sweat baths.

Spatial Context

To reiterate, most of the sweat baths had all of the main characteristics that define a Maya sweat bath which are a firebox, hearth, U-shaped indoor benches, a small entryway, and a dome-shaped roof. The only two outliers with four out of five of the characteristics were Xunantunich and Cahal Pech; Xunantunich did not have an intact roof, or any restoration work done, and Cahal Pech's hearth was destroyed by a looter's tunnel. Xunantunich was the most symmetrical square shape sweat bath contrasting with Pook's Hill's which was the most rounded sweat bath. Cahal Pech was unique being the only sweat bath that has a vaulted interior roof, and a doorway with a "curtain hole" that would have held some type of thick cloth to cover the entrance. Other than these few differences, the sweat baths all contained most of the essential sweat bath characteristics and did show evidence of fire activity.

Baking Pot's sweat bath, located in Courtyard 4 of Group B, is built into the rear side of structure B1 which is a temple. It resembles the sweat bath found at Pook's Hill with the two small steps that lead up to the hearth and firebox. There are also stairs along the north side of the sweat bath that lead up to elite residential buildings. The closest structures

other than B1 are B15 and B17 whose uses have not been clearly identified. The sweat bath's connection to B1 and the palace complex indicates that the usage was considered much more sacred and reserved for nobles and royals to use.

Cahal Pech's sweat bath (B5) is located in Plaza G and connected or integrated into what is believed to be a residential area. It is within the center of the site very much like those at Baking Pot and Pook's Hill. Without the current foliage, the sweat bath would be visible from A1 and B1, the largest temples in the site. It is clear that B5 was built to be available to the greater public (beyond royals and nobles) due to its location in the site core. Due to these differences, it is assumed that this sweat bath served a purpose more similar to a clinic for anyone able to bring an offering rather than a private healing place for nobles and royals. However, this is inconclusive because of the looter's tunnel that destroyed much of the artifactual evidence and will require more research to confirm.

Pook's Hills sweat bath, Structure 1B, is located within a plazuela group in a corner opposite from structure 4A containing a shrine. The plazuela group is the only plaza that has been identified at the site of Pook's Hill thus far. Therefore, more data, perhaps lidar, would be required to determine any significant patterns between 1B and the site core. However, it was determined that there is evidence of intentional destruction of the bannerstone which indicates a change in 1B's use over time.

Xunantunich's sweat bath, B5A, is located in a residential complex northwest of the Castillo and away from the site's epicentral courtyard. Structure B5A is the only sweat bath that is not fully connected to another building such as the other three sites. Only narrow alleyways, however, separate it from adjacent architecture. The other three sites' sweat baths are built against other structures.

When analyzing the mapped locations of the sweat baths in comparison to the nearest natural water source, almost every site was less than 450 meters of a natural water source. Although when analyzing the location of ancient Maya sweat baths that have been recorded, there is a "hot-spot" of sweat baths in Western Belize that may include the site of Xultun in present day Guatemala (considering how near it is to the "hot-spot" (see Figure 14).

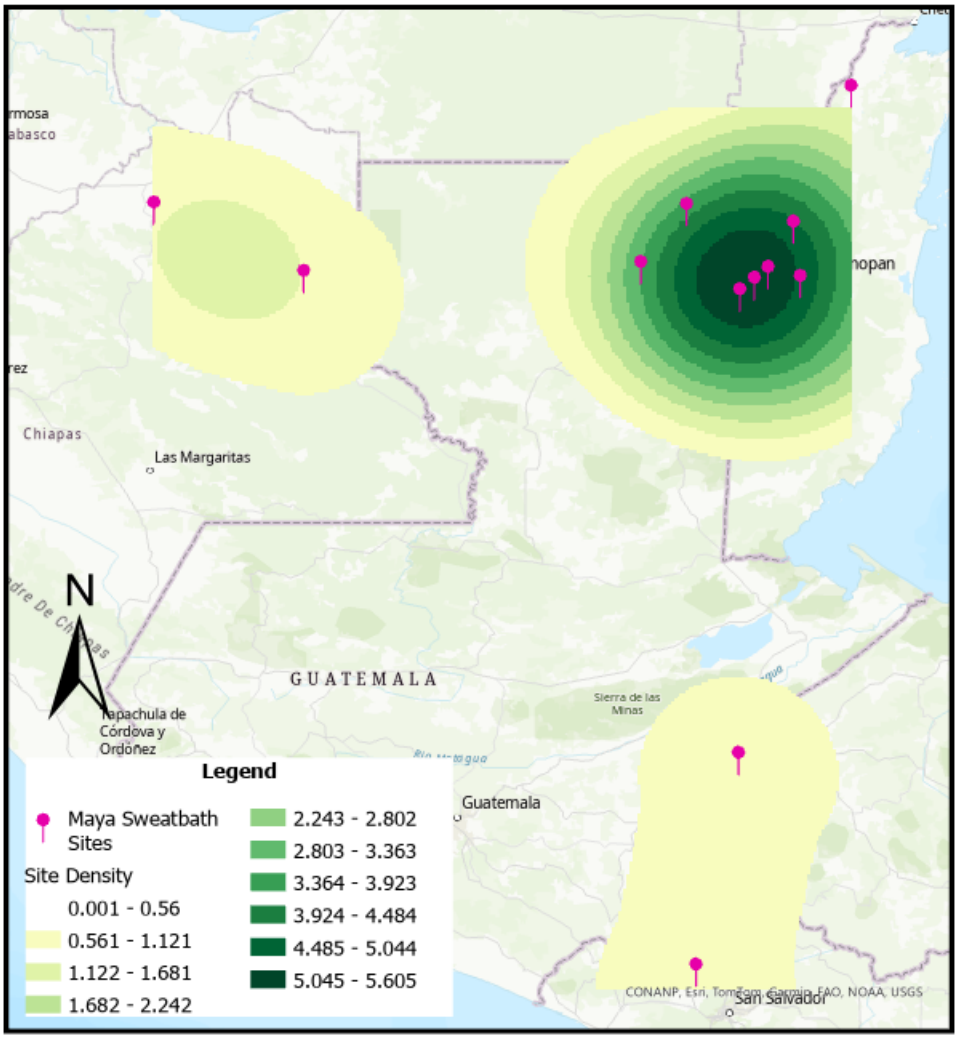

Figure 8. Map of Kernel Density of Sweat bath Sites made by Lilian Tejeda-Barillas, 2024.

Another notable pattern when viewing the sweat baths on a map includes the regional density of them. The Maya highlands are where the majority of recorded Maya sweat baths

are located. This pocket of high frequency of sweat baths was determined to be a result of architectural influences over time in tandem with the availability of natural water sources.

Models

The 3D models created for this thesis were successfully created and uploaded to Sketchfab for any future researchers interested in understanding these structures. It was determined that without creating these models and observing the structures firsthand, this thesis would not have been successful. With the previous excavation research available along with the models providing a more accurate representations of the sweat baths, there was enough evidence to make meaningful comparisons of all the reported sweat baths in western Belize.

The models (see Figure 9 through 12) serve as a reference as well as a data source for those unable to visit the sites themselves and who are interested in making any additional observations. For sites like Baking Pot and Pook's Hill, access is not always available to the general public or even to archaeologists who do not work in Belize. Therefore, the models can provide significant information such as dimensions and overall style via Sketchfab or QR code.

Another essential function of the models is conservation. Over time, the structures will continue to deteriorate despite efforts to preserve them. With the models, structural changes can be monitored and analyzed using point cloud software such as CloudCompare. Point cloud software can use lidar data points to compare models or point clouds which are collected using photogrammetry, lidar data, or GIS data. Although the sweat baths will not survive forever, these models can serve as a data source and reference for future researchers or curious locals.

Figure 9. Baking Pot Model from Sketchfab

Figure 10. Cahal Pech Model from Sketchfab

Figure 11. Pook's Hill Model from Sketchfab

Figure 12. Xunantunich Model from Sketchfab

Chapter 6: Discussion

Part 1: Ethnohistoric Analysis

The following section focuses on ethnohistoric reports of sweat baths in the Maya area. The section begins with an overview of the major themes and patterns between the sweat bath sites followed by a more detailed examination of their characteristics. The subsections include ritualistic cleansing, healing uses and properties, associated gods and goddesses, and finally, it identifies any additional data.

As a caveat, it is important to note that all of the early post-conquest accounts of sweat baths were written by foreign colonizers observing what they saw. Many of their accounts may be skewed or unreliable, therefore the accuracy of all of this information must be carefully considered in any study that explores the significance of this architectural type. In spite of potential and subtle inaccuracies, however, these first-hand accounts are the most reliable written sources available for critical examination of sweat bath uses and are thus essential to this analysis.

Healing Properties and Uses

The healing uses of sweat baths are not simply related to relaxation in the way we use saunas throughout the world today. Childbirth commonly takes place in sweat baths for those still practicing some form of Maya religion (Cominski 2001: 179) quickly followed by afterbirth healing. Afterbirth healing is also very important to promote a successful recovery (Cominski 2001: 179) as well as other gynecological complications (Groark 2005: 789). Although it is recognized that not all ailments can be healed by a sweat bath ritual (Nash 1967: 132), their healing power is taken very seriously; as is evident in ritualistic

healing centers containing sweat baths in Chiapas, Mexico (Lucero and Kinkella 2015: 165). Although the available literature on Maya healing methods is certainly insightful, it is not completely representative of ancient Maya sweat bath functions, and their uses have changed over time and adapted to include different forms of healing that also use modern medications (Bade 1994: 36).

For many Maya communities, illnesses are understood on a hot-cold scale and local herbalists specialize in properly using Maya sweat baths as a primary treatment in descendent communities (Schnell 2017). For example, hot is associated with health and fertility while cold is associated with illness and evil which is why sweat baths are so essential for healing in Maya culture (Cresson 1938; Groark 2005; Lucero and Kinkella 2015; Schnell 2017; etc.). Studies of sauna therapy have been found to improve cardiac functions such as cardiac failure, hypertension, and more (Groark 2005: 792) which implies that the Maya rightly associated thermal function with health (Schnell 2017: 7-8).

How Sweat bath Healing Has Changed

In Bernardino de Sahagún's reports of Aztec society, the goddess Yoalticitl was to be called on by the person giving birth as a form of respect or homage. However, this is not reflected in modern sweat bath practices according to June Nash (1967). Before any healing can begin, a family must visit a healer and gift them chocolate, bread, and liquor. Next, the healer analyzes the patient to sense "good or evil" to assess the seriousness of the ailment (Nash 1967). Although this may be common practice in more modern times, this was not the case from Sahagún and Landa's recordings.

Of course, Nash (1967) was there to experience a post-colonial version of sweat bath ceremonies which may indicate that Nash's "assessment" may have been created after

disease started to spread among the Maya. The Maya likely started to realize that the sweat baths were unable to cure certain ailments such as the diseases brought over by foreigners. Also, the goddess Yoalticitl seems to be less popular according to Nash's reports that emphasize giving the healer gifts and offerings rather than the goddess herself. Additionally, there has been a shift in who receives the offering; healers are often offered goods as a form of payment rather than the sweat bath receiving the offering. This shift may indicate that the personification of gods and deities within sweat baths (Clarke et al. 2021: 68) may be becoming an obsolete belief.

Ritualistic Cleansing

Ritualistic ceremonies are an essential component of Maya religion and lifeways. Unfortunately, after Spanish conquest, a lot of the ritualistic ceremonies were slightly altered as they were forced to convert to Catholicism. Bishop Landa is one of the few contact period Spaniard who wrote surviving accounts of sweat bath use by the Maya (Satterthwaite 2005). Landa describes the sweat bath process as being focused on health and cleanliness and describes it as an infrequent occurrence (Satterthwaite 2005). An account from the Motul dictionary Sahagún claims similar uses as Landa however they also describe post-partem care as being a ritualistic use of sweat baths to help the mothers recover and improve milk production (Motul Dictionary 1577). Themes of childbirth, new beginnings, and feminine energy are common when discussing the ritual and spiritual aspects of sweat baths as can be seen from Landa's and Sahagún's accounts.

An important distinction that must be addressed is that caves and sweat baths may be ritualistically associated, both are dark enclosed spaces that can be considered to be womb-like. The ethnohistoric and ethnographic data both indicate that Maya sweat baths

and caves are associated with regeneration, fertility, and birth. Codex Nuttall contains imagery of a mountainous cave followed by imagery of a figure in a sweat bath inside of the cave. Yearly rituals to visit caves with water are still common as they represent sweat baths and are followed by the offering of three stones or potsherds for the gods before entering them.

Ritual Cleansing in Different Contexts

All Maya sweat baths have some sort of spiritual or ritualistic element tied to them whether it be literal or metaphorical. However, some sweat baths indicate more ritualistic activity and representations than others. Overall, there are similar themes of femininity, birth, and renewal throughout all Mesoamerican sweat baths, however, the way that these themes are represented differ greatly between each site.

One example of this can be seen at the site of Xultun (see Fig. 20) in Guatemala. Xultun has one of the most decorated sweat bath structures in Mesoamerica (Clarke 2020) with unique carvings surrounding the entrance. The entity represented by the carving is called the Amphibian Goddess although the proper name has not been deciphered (Smithsonian 2020). This is seen as a depiction of personifying the goddess' feminine nature and themes of birth similar to those seen in the Nahua Codex Magliabechiano (Mazariegos 2017:110). At Baking Pot, Cahal Pech, Xunantunich, and Pook's Hill we unfortunately do not see any inscriptions or ritualistic representations within the architecture itself. However, this does not indicate that there was no metaphorical personification occurring with the sweat baths at these sites. For example, at Baking Pot, obsidian, shell, and apple snails were found within the structure during excavation which

displays evidence of rituals taking place inside (Hoggarth 2015: 222). Apple snails (*Pomacea flagellata*) are a common Maya delicacy, therefore Hoggarth (2015: 222) believes it is possible that the snails were cooked and consumed within the sweat bath. However, there is also a possibility the snails were buried as a form of ritual considering they have been found in ritual deposits in other Maya sites (Healy et al. 1990: 175). This practice of ritualistic burial is common among many Mesoamerican peoples and the burial of the snails at Baking Pot may have been an offering rather than food scraps (Mills 2006, etc.) The snail's shell was often used in a powdered form which was rich in lime which means that the shell was not to be wasted and further suggests that the shells were offerings (White 1979: 569).

At Pook's Hill, effigy ocarina fragments and a bannerstone were found inside which Helmke believed was intentionally broken to signify a change in the structure's usage (Helmke 2006: 185). In Maya culture, once an object was done being used or given as an offering, there is a "termination event" or some type of intentional breaking of the item to release the spirit inside (Awe Presentation 2022). Although it is unsure what the usage was altered to, there is still an indication that the sweat bath was indeed representative of a god or goddess which explains why the bannerstone at Pook's Hill was intentionally terminated.

Xunantunich's sweat bath also had various associated artifacts such as an effigy censor, a mano, and metate (Beardall 2022: 1). These items are all tied to ritual ceremonies or seen in previous ritual deposits. Similar to Pook's, the sweat bath found in Group B (Xunantunich) was altered; the original entrance faced north while the more recent construction has the entrance facing west (Messinger et al. 2023: 205). Cardinal directions

are significant indicators of ritual and religion. North represents white and also represents the word *xaman*, while West represents black and the word *chik'in*. Xaman does not currently have a definition other than north however chik'in is likely related to *chin-k'in* which means lowering of the sun (Hopkins and Josserand 2001:3). This shift may represent the "rest" or "death" of the old entrance but does not represent the end of usage of the sweat bath due to the presence of a fire hearth with evidence of fire activity.

Although there is no hieroglyphic evidence to suggest that this alteration was ritualistic, the shift from north to west is significant considering their associated colors, white and black, are considered opposites. White is believed to represent purity and the dawn, while black often represents death and rest (Leal 2023). Therefore, this could be the representation of a metaphorical termination associated with the reconstruction.

Gods and Goddesses Associated with Mesoamerican Sweat baths

Sweat baths in Mesoamerica are often associated with gods and goddesses that must be honored through offerings (Child 2006; Cresson 1938; Houston 1996; Nash 1967; Satterthwaite 2005 etc.). This personification of the sweat baths exemplifies the liminal qualities of these structures that impacts their usage. Modern usage focuses on offering goods to the healer rather than to the sweat bath itself and the gods and goddess associated with it. However, that is not to say that the sweat bath gods and goddesses are not recognized and honored in other ways throughout the sweat bath ceremony.

Sweat baths are undoubtedly connected to childbirth and fertility which is why they are constructed in a dome like shape with small openings, to represent a womb (Clarke et al. 2021). Sweat baths are associated with many gods and goddesses such as the Lunar

Maize God, the Old Goddess, Teteoinan, Toci, Cihuacoatl, Itzpapalotl, and Tlazolteotl (Mazariegos 2018:39). The old Maya goddess, Ix Chel, in particular is mythologically connected to sweat baths; Goddess O, or the Old Goddess, is also considered the principal deity of creation, divination, medicine, childbirth, midwifery, and weaving (Christianson 2007: 53, Tozzer 1941: 129, 154). A Maya myth claims that the hero twins burned Goddess O in a sweat bath after her attempt to kill them which personified her into the sweat bath in the process (Mazariegos 2018: 30).

Personification of sweat baths can be seen throughout Mesoamerica in a variety of ways. In Chiapas, Mexico, Child (2006:161) describes the sweat bath fire as being the soul of the sweat bath that was still being depicted by the Tzotzil Maya in the early 1970's. At Xultun, the Amphibian Goddess is depicted as birthing whoever enter the sweat bath (Clarke et al. 2021: 72). The Nahua Codex Magliabechiano depicts the face of the goddess Tlazoteotl directly above the doorway in a manner that represents her as the overseer of the sweat bath (Nuttall 1903). In all of these cases, the sweat baths are personified through gods and goddesses that represent lunar themes, fertility, and reproduction with subtle themes of motherhood and nourishment.

Although Xultun is a unique site that has the most obvious representation of personification of gods/goddesses within the sweat bath construction, this feature is not obvious at all sites. Baking Pot, Cahal Pech, Pook's Hill, and Xunantunich as well as most sweat baths found in Mesoamerica do not contain any obvious connections to particular gods/goddesses. Xultun can be considered an outlier with the other four sites (Baking Pot, Cahal Pech, Pook's Hill, and Xunantunich) actually being more "traditional." However, that is not to say that all other sweat baths are not associated with gods/goddesses as indicated

by a number of ethnographic texts (Motul Dictionary 1577; Nuttall 1903; Satterwaite et al. 2005).

However, it was interesting to note that when inside of Baking Pot, Cahal Pech, and Pook's Hill's sweat baths, there was a significant change in octaves that made any sound projected a few octaves lower representing a more masculine timber. Sheets and Mahoney have a theory that the reason for the amplification of more masculine sounding voices is that perhaps there was more male activity occurring in sweat baths than has been previously estimated, which may explain why the Lunar Maize God is sometimes associated with sweat baths.

These evolving spaces can be labeled as liminal spaces, as explained by Moses (2018: 28) and the items being reused at Chaco (mainly ceramics) can be described as liminal as well; Mills describes this development as "memory construction" in the process of forgetting (2008: 98). The Maya also implemented liminal uses of space which can be seen when excavating temples and other ritualistic areas; Cahal Pech and Blackman Eddy are two examples of sites where "layered" construction has been identified and dated to line up with societal development. Oftentimes, ritualistic offerings and royal burials are found within these layers such as those described at Chaco and Hume. Although the cultural processes behind these phenomena have not been conclusively identified, it is undeniable that social memory is not at play in all three of these cultural areas.

Conclusion

To summarize, the ethnohistoric evidence available for sweat bath activity in tandem with more modern depictions can exemplify how sweat bath use has evolved or remained constant. There is evidence of changes over time regarding the usage, the

ceremony, and the conditions of use. One clear example of evolution over time can be seen in western Belize where construction styles were altered as we see a shift from rectangular forms (e.g. at Cahal Pech) to more elliptical shaped sweat baths like those at Baking Pot, Pook's Hill, and Xunantunich. However, there are also constants such as the essential sweat bath elements (hearths, U-shaped benches, low, narrow doorways), and the use of ceremonial objects such as copal and herbs. Despite the differences and constants over time, sweat bath traditions are continuing to persist in descendant communities such as in central Mexico (Cosminsky 1972; Groark 1997; Miller 2013).

Part 2: Spatial Analysis

Site-Specific Spatial Patterns

Baking Pot

Baking Pot's layout is comprised of two large complexes (Fig.4), Group A and Group B, approximately 500 meters away from each other with a sacbe connecting them. Smaller settlement clusters surround Groups A and B as well as some water reservoirs. The sweat bath is located in Group B, courtyard four, located right behind B1. The integration of the sweat bath into B1 is not common.

Sweat baths being integrated into surrounding architecture is common as seen at Pook's Hill and Cahal Pech, however, in Belize, Baking Pot is the only site where a sweat bath was built against a temple. Surviving Maya sweat baths are known for being associated with royalty and prestige, however this seclusion and construction location indicate that this was even more reserved than those seen in other locations. Also, the sweat bath is the only structure in the entire plaza that has an east-facing entrance. East represents the sunrise with the color red,

Offerings found while excavating a sweat bath can sometimes help researchers determine activities associated with these buildings, as well as the possible time period of their use. The variety of artifacts found when excavating the sweat bath at Baking Pot indicates there was frequent activity as each offering may represent a ceremonial event. Although there was not a large number of artifacts found, that does not determine that there was little use. Offerings are meant to be buried under the sweat bath and considering the age of the site, more artifacts may have been present further beneath the surface. The variety of artifacts speaks more to the use in this case rather than the artifact density.

Cahal Pech

The site of Cahal Pech is comprised of a large site core, peripheral settlements, surrounding quarries and reservoirs, and a sacbe located approximately 500 meters south of the site core. There are seven plazas within the site core and an eastern triadic shrine on the outer eastern edge of the site's largest courtyard. Triadics are believed to represent the three realms which are heaven, the middleworld, and the underworld (Awe 2022; Szymański 2014; Voelkel & Voelkel, etc.).

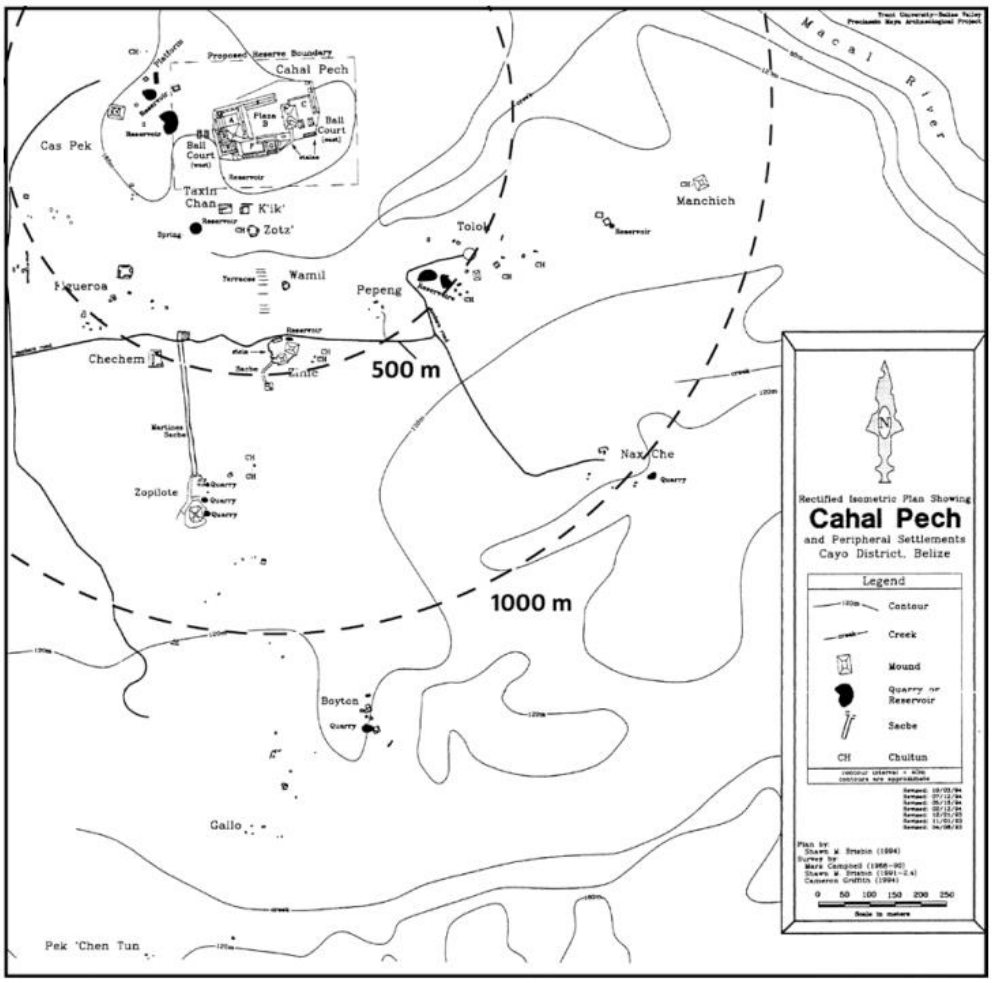

Figure 13. Map of the site core of Cahal Pech and surrounding settlement (after Awe 1992).

The presence of the triadic may indicate that the sweat bath was viewed as a portal to the underworld similar to how caves are viewed (Clarke 2022: 48; Houk et al. 2023; Houston 1996: 138). In addition to B5, there are two ballcourts that also have connections to the underworld (Christianson 2007: 207). Therefore, the position of the sweat bath near the triadic and also near the center of the site core indicates that B5 likely represented a cave or portal while also serving as a healing center.

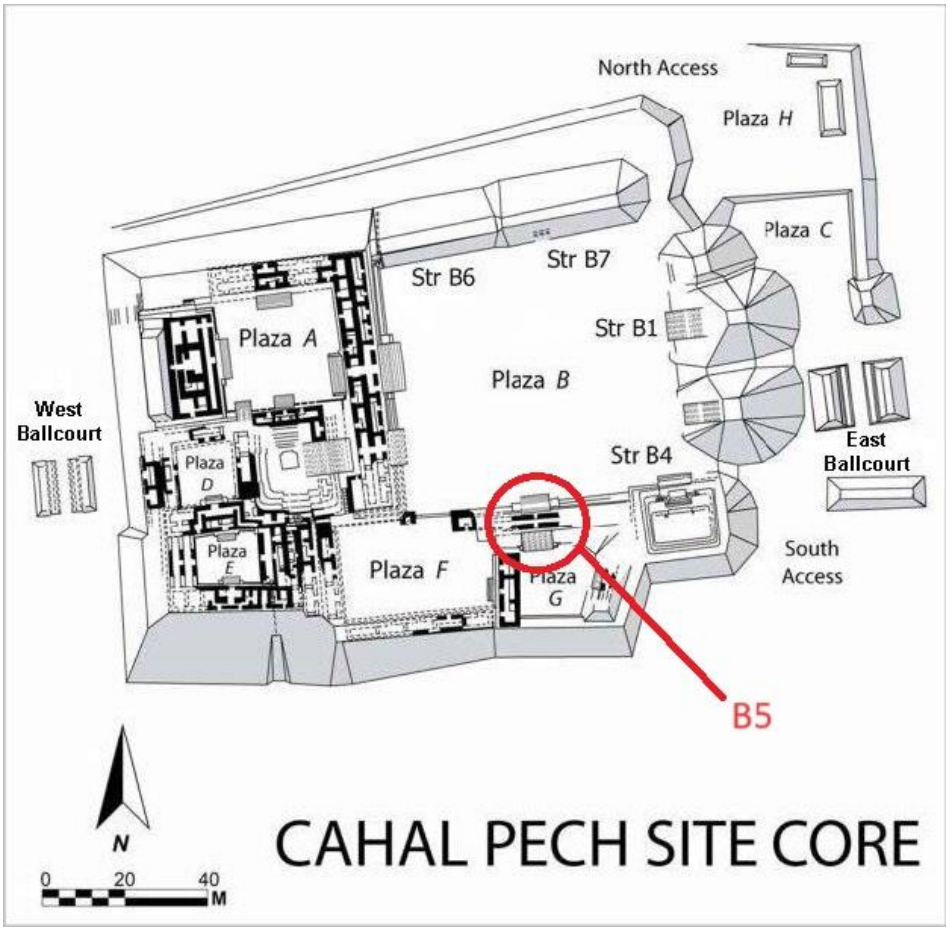

Figure 14. Cahal Pech site core modified to show structure B5, Courtesy of BVAR.

When isolating the area where B5 is located (see figure 10), there are no patterns suggesting intentional placement of B5 or significant architecture related to the sweat bath in Plaza F. Helmke suggests that circular sweat baths seem to be reserved for communal use while rectilinear ones are more monumental (Helmke 2006: 83). This further suggests that B5 was a more communal bath rather than a private bath like those at other sites such as Xunantunich, Piedras Negras, Tikal, and Copan (Helmke 2006:83). The more circular shape is also more reminiscent of a cave, further suggesting that this served as the sites metaphorical cave.

Despite the looter's tunnel destroying the artifact assemblage and structural integrity of the sweat bath at Cahal Pech, chert and ceramics artifacts were still recovered from B5. The Maya often broke items to release the spirit of the object, further supporting the theory of frequent ritual (communal) use of B5.

Pook's Hill

Unfortunately, a large part of Pook's Hill has not been mapped outside of the plazuela group containing the sweat bath. The sweat bath, 1B, opposes a shrine in the eastern corner of the plazuela. These two "special use" structures located in the same plazuela suggests that they are connected beyond their location. A looters tunnel disturbed the shrine however there were human remains from at least two people found inside the shrine. This discovery along with the bannerstone that is believed to be intentionally broken may suggest that the sweat bath was first another structure turned sweat bath. Opposing the eastern shrine, 1B represents renewal and birth contrasting the death associated with the shrine.

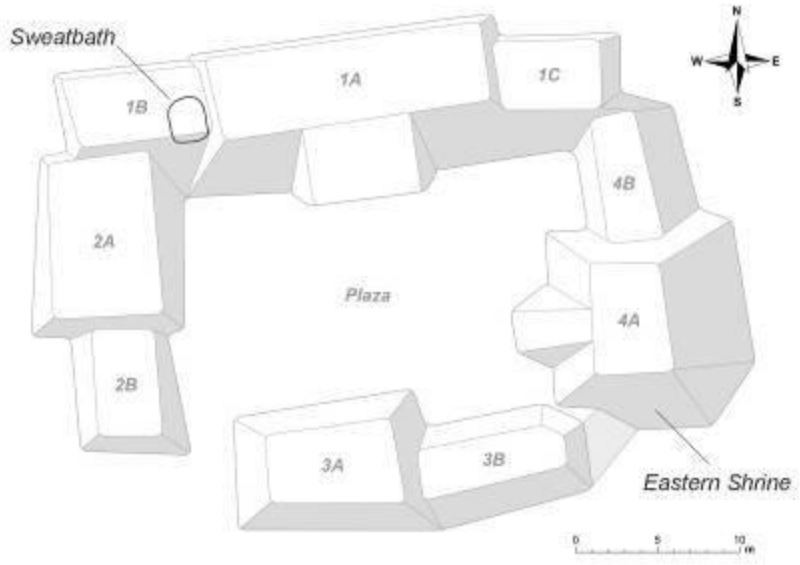

Figure 15. Map of Pook's Hill Plazuela Group, produced by Helmke 2006.

The opposing themes of life and birth suggest that the placement of these two "special use" structures was intentional. For the Maya, life and death are often associated with ritual and ceremony meaning the plazuela group at Pook's Hill was likely reserved for public ritual and ceremonies. This is further indicated by the discovery of considerable peri-abandonment remains inside of the sweat bath at Pook's Hill. The concentration of these remains inside the sweat bath, along with evidence of burning, led Awe et al. (2020) to suggest that the Maya likely conducted rituals in the site core during the time of abandonment.

Xunantunich

The site of Xunantunich is made up of three central plazas (Plazas AI, AII, AIII with three other courtyard complexes (Groups B, C, and D) being slightly disconnected from the site core. There is a sacbe running across Plaza A1 going east to west and partially standing walls running across the south edge of the site core. There is an Eastern triadic shrine located along the east edge of the site almost directly across from Group B approximately

250 meters away. The triadic and sweat bath line up almost perfectly which may indicate, similar to Cahal Pech, that this was seen as a metaphorical cave. Unlike Cahal Pech, however, B5 is more secluded and suggesting that its usage was reserved for for residents of Group B and that its use was more secular than therapeutic.

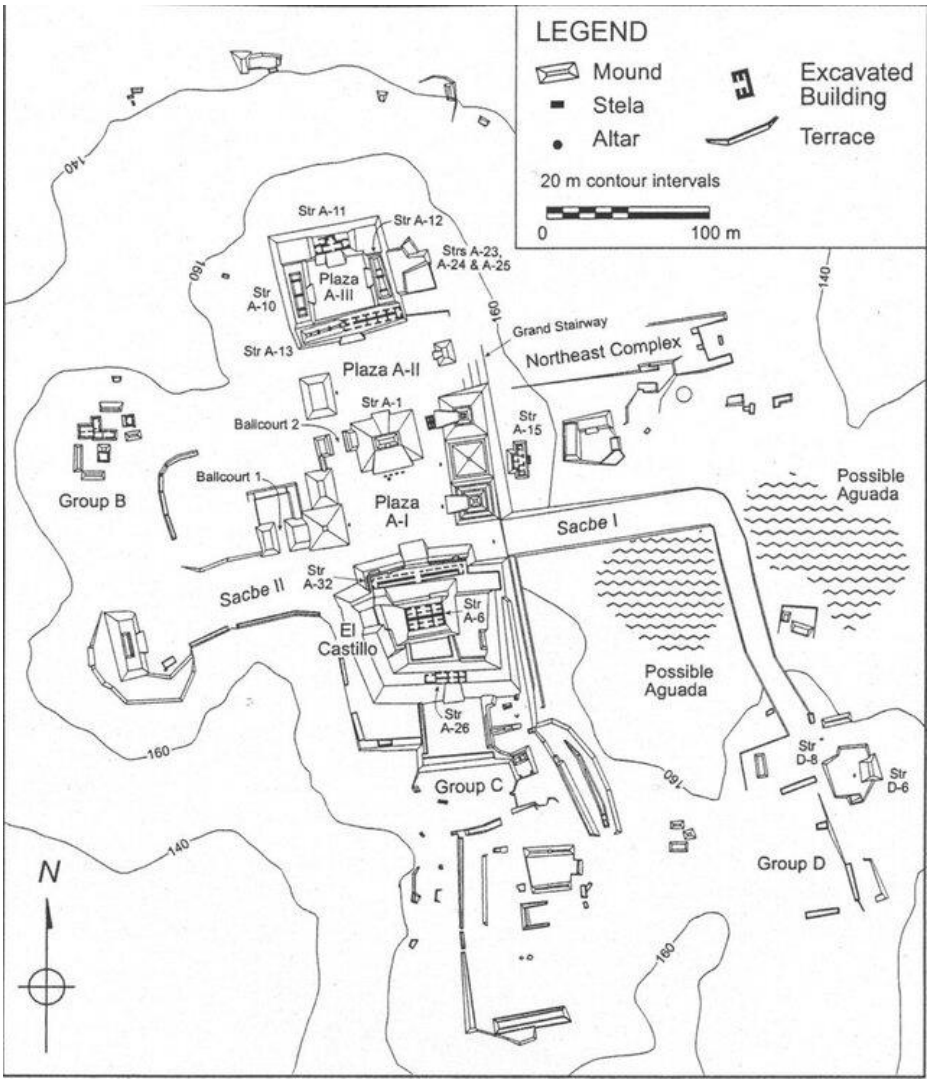

Figure 16. Xunantunich Site Map, from LeCount and Yager 2010.

Unlike the other three sweat baths, B5 is an independently standing structure with no direct association with any monumental or sacred structures. Integrating sweat baths

into surrounding architecture is more representative of a cave than a standalone sweat bath.

Also, the nearest features outside of Group B are two ballcourts, akin to Cahal Pech. As mentioned, ballcourts are also connected to the underworld throughout Maya folklore and the sacred text, the Popol Vuh (Christianson 2007: 100-105). The triadic representation of the three realms, the ballcourts, and the sweat bath all have connections to themes of passage and portals. These structures are meant to be considered highly secular and sacred spaces which was likely tied to increased ritual activity due to drought.

Patterns Across Sites

Despite some differences among each sweat bath site, there are a few patterns between the sites that help clarify the intention behind the construction and location of each sweat bath. Out of the four sweat baths, Cahal Pech is the only rectilinear structure suggesting that it was used for ritual use more often that it was used for therapeutic purposes which may explain the more intricate artifacts found such as the effigy censer (BVAR 2022: 240). The effigy censer from B5A is nearly identical to one found in tomb H1 located at Cahal Pech. Cahal Pech has been determined to have been occupied from the terminal Early Preclassic (1200 B.C.) to the Late Classic (A.D. 850) which briefly overlays the time period Xunantunich was occupied. The near identical effigies suggest a relationship between the two sites but more importantly, it suggests that the tomb and sweat bath date to around the same time.

Many precolonial cultures including the Maya paid close attention to the cardinal directions and often constructed monumental structures to align with celestial events. The colors associated with each direction are white for north, red for east, yellow for south, and

black for west. These colors were chosen to reflect the environment and more specifically, sunlight. Therefore, it should be noted that directionality is much more intentional than is discussed in the academic setting. Considering how sacred sweat baths are to the Maya, both ancient and current, it is crucial to explore the meaning behind the directionality of the sweat baths.

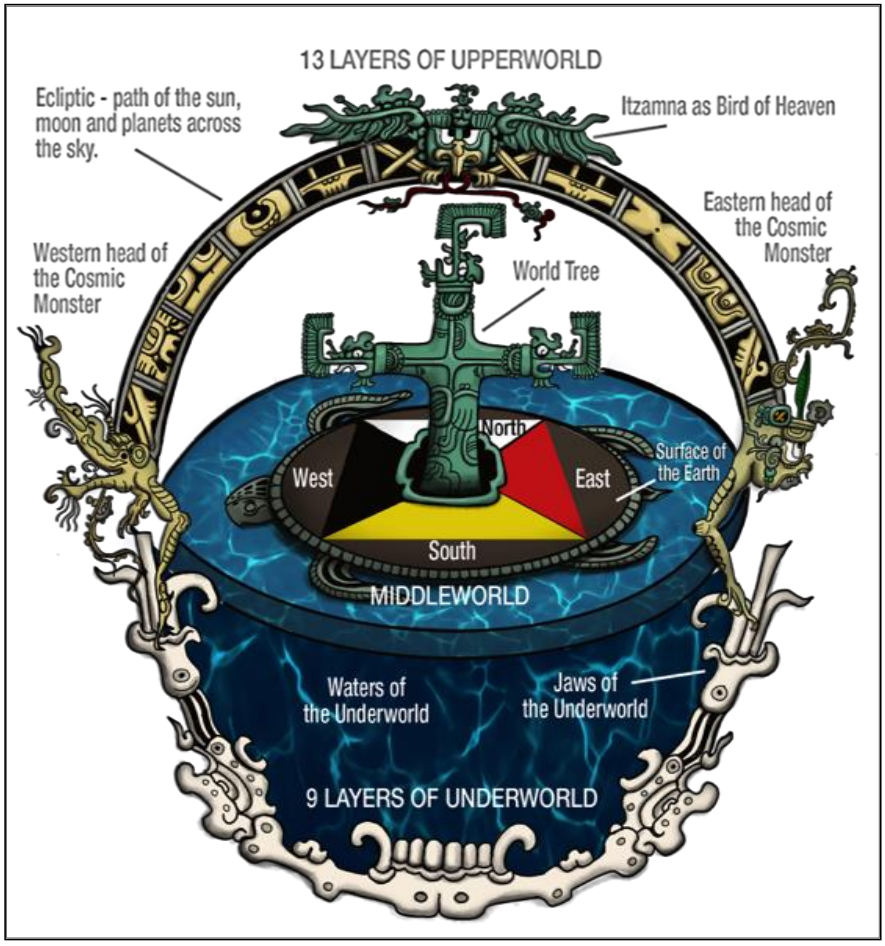

Figure 17. The Maya Worldview

The sweat bath entrance at Baking Pot is the only entrance that faces east that of Cahal Pech and Pook's Hill face south, and the doorways of the Xunantunich bath face north then west. Baking Pot's sweat bath is also the only sweat bath referenced in this thesis with an east facing entrance. East or *kan* represents the color red according to the Maya to

represent the suns morning rays. Solar connotations are commonly associated with sweat baths (Mazariegos 2018: 33) and often represent the birth of the sun. Birth must have been the central use of this particular sweat bath which may explain the snail shell offerings as snails represent the earth, water, death, the underworld and darkness (Schele et al. 1992: 234).

Despite the gap between construction times, Cahal Pech and Pook's Hill resemble each other the most out of the four sweat bath sites. Cahal Pech's B5 and Pook's Hill 1B have a south facing entrances which is a theme seen through the Maya lowlands (see table __). All south facing, sweat baths identified in this thesis (Cahal Pech, Pook's Hill, and Cuello) are associated with communal and frequent use while all of the others are more symbolic and secular such as Piedras Negras and Palenque. Six of the nine sweat baths with identifiable entrances face south which may be significant although there is no definitive answer as to why at this moment.

At Xunantunich, the entrance of B5A was altered when new construction occurred in Group B moving it from a north facing entrance to a west facing one. While there is nothing north of B5 that would suggesting a spatial relationship, there is also nothing particularly significant facing west of the entrance either. Rather than facing the site core or any monumental structures, it is constantly facing away from the more public spaces, suggesting that seclusion is a key element which impacted its construction.

Water and Sweat bath Locations

Ritualistic use of water is a common theme in Maya culture such as cenotes and sweat baths. Although maize was a major source of sustenance for the ancient Maya, water can be considered even more sacred. Water ceremonies, water gods and goddesses, the

Maya worldview of earth represented by a crocodile floating on water, the use of cenotes, and sweat baths are all examples of how essential water is to Maya religion and symbology. Therefore, the relationship between sweat baths and natural water sources is one that must not be ignored and may tell us where other sweat baths are located.

Water Availability and Sweat Bath Frequency

According to Satterthwaite (2005: 224), water was used not only for steam but also for cleansing oneself both inside and outside of the sweat bath. Therefore, the need for a local water source other than reservoirs are necessary. This trend can be seen when comparing the density of natural water sources compared to the kernel density or frequency of sites in that region.

The proximity of water sources and the amount of sweat baths found in a region are undeniably correlated. As seen in Figure 14, the highest density of sweat baths are found in the Upper Belize River Valley which is where the most natural water sources are located in western Belize. All of the sweat baths referred to in this thesis are within 500 meters of a natural water source. The only outlier to this trend is Tikal with the nearest river being over 2,000 meters away however there were many reservoirs which would replace the need for a close water source.

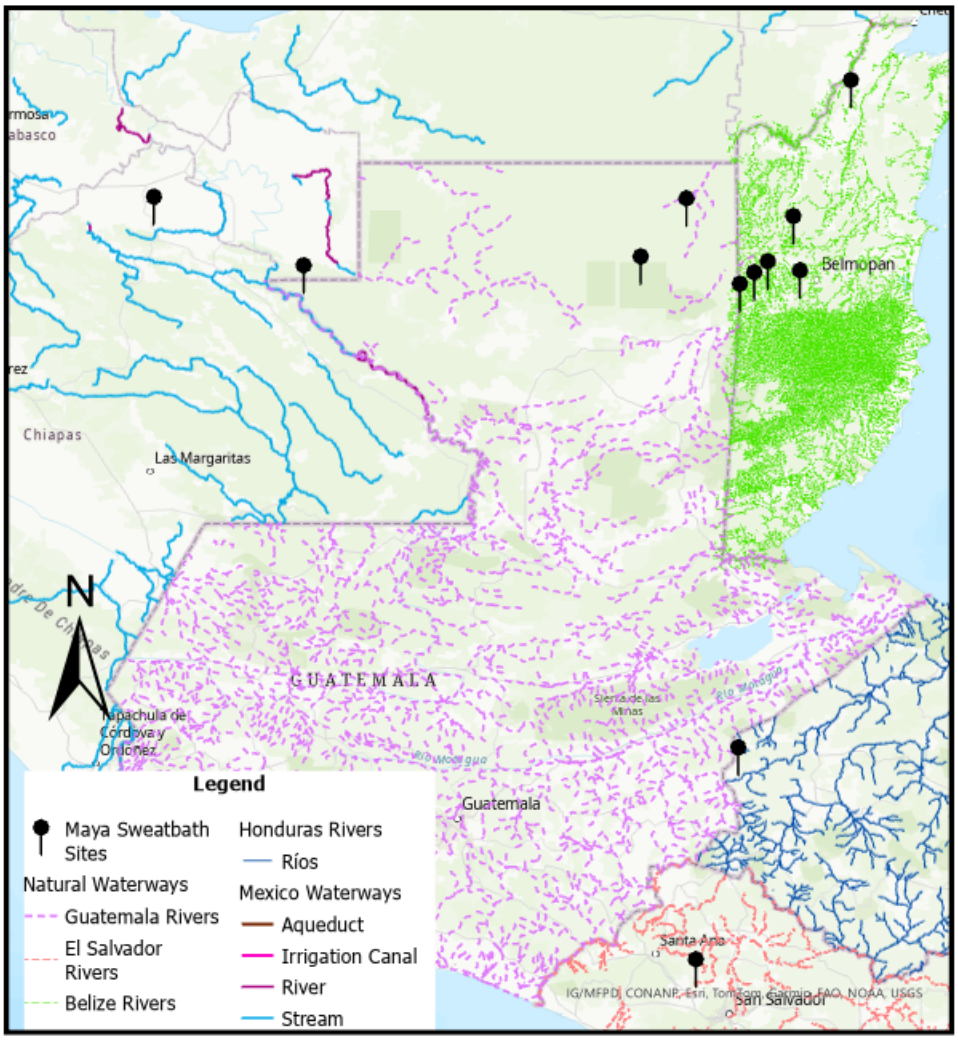

Figure 18. Map of Maya Sweat bath Sites and Natural Waterways by Lilian Tejeda-Barillas, 2024.

Other Mesoamerican Sweat baths

Piedras Negras – Guatemala

Linton Satterwaite was one of the first to work at Piedras Negras in the 1930s and found that their presence at Piedras Negras was almost expected considering its ceremonial use (Satterthwaite 2005). Not all ceremonial ancient Maya sites contain sweat baths however, when viewing figure 14, there is a hotspot of sweat baths in the region making it more likely that any ceremonial sites found here will also contain sweat baths. P-

7 was one of the only standing structures found at the site, a sweat bath, assumed by Satterthwaite to date back to the earliest occupation of the site.

Piedras Negras (Fig. 15) is a site known for its sweat baths due to their size and frequency (Houk et al. 2023). Piedras Negras contains eight sweat baths, one of the largest collections of Mesoamerican sweat baths presently known. Interestingly, the P-7 sweat bath was reconstructed during a Brigham Young University and Universidad del Valle Project in the 1970s and was able to be used by researchers working at the site to determine its use (Houk et al. et al. 2023).

The reconstruction helped researchers come to the realization that other than the religious and medicinal uses of the sweat baths, there is also the practical use of it to cool down the body by heating the body and subsequently exposing oneself to fresh air and cold water after. Of course, not every sweat bath site is able to be fully reconstructed such as P-7 was however there are communities throughout Mesoamerica that still use sweat baths regularly where one can experience this ancient method of temperature manipulation. Also, the site is less than 2,000 m away from the Rio Usumacinta with some closer seasonal creeks creating easy access.

Figure 19. Piedras Negras P-7 Reconstruction, Houk et al. 2023.

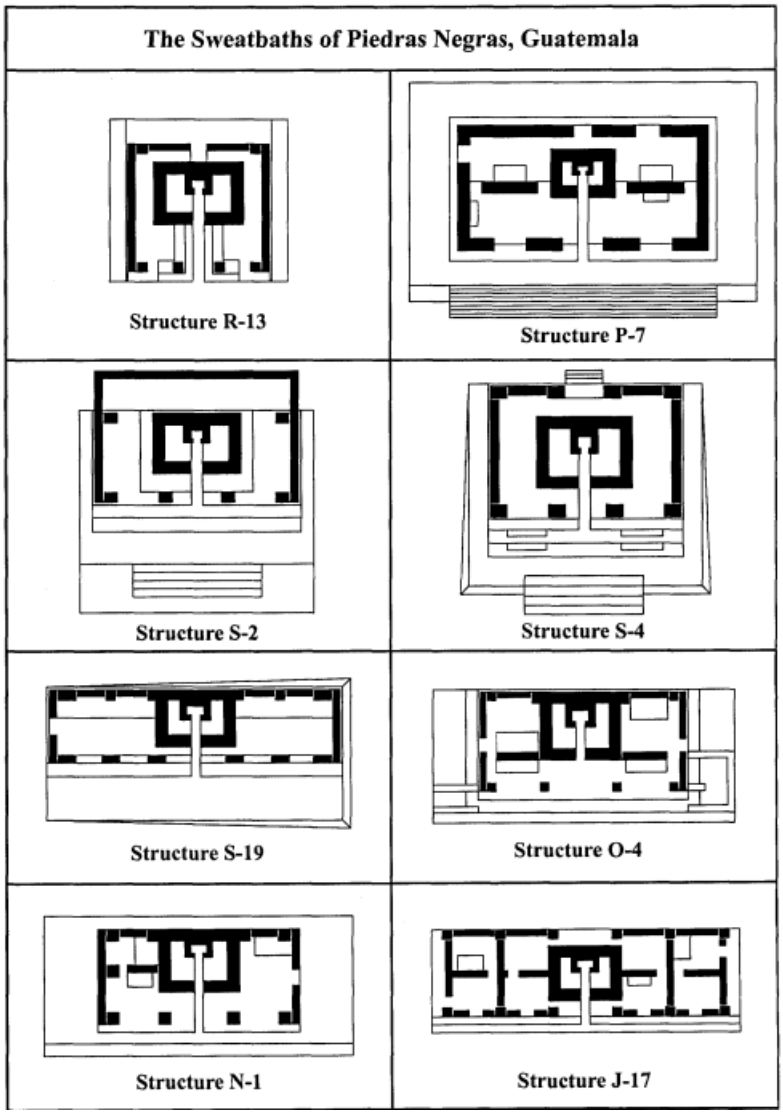

Figure 20. The Sweat baths of Piedras Negras, Guatemala from Child, 2006.

Table 2. Regional Sweat bath Site Diagnostic Data by Lilian Tejeda-Barillas, 2024.

Site	Interior Shape	Exterior Dimensions (Meters)	Entrance Direction	Site Context	Construction Period
Baking Pot	Rectangular with dome shaped roof	4.5 L x 3 W	East	Courtyard 4	Terminal Classic (750 – 900 CE)
Cahal Pech	Rectangular with vaulted roof	5.1 L x 5.3 W	South	Plaza F	Early Classic (300 – 600 CE)
Copan	Rectangular	No Public Data	No Public Data	Plaza A	Preclassic – Classic (1500 BCE – 900 CE)
Cuello	Round with dome shaped roof	2.4 Diameter	South	Temple on Platform 34	Preclassic (900 BCE – 300 CE)
Joya de Cerén	Rectangular with dome shaped roof	3.4 L x 3.4 W	North	Household Complex	Classic (200 – 600 CE)
Palenque (P7)	Rectangular with vaulted roof	No Public Data	South	Cross Group	Late Classic (600 – 900 CE)
Piedras Negras	Rectangular with vaulted roof	3.3 L x 2.2 W	South	East Group Plaza and Temples	Late Classic (600 – 900 CE)
Pook's Hill	Rectangular with dome shaped roof	3.5 L x 2.5 W	South	Plaza A	Terminal Classic (800-900 CE
Xultun	Rectangular with vaulted roof	No Public Data	North	Elite Residential Complex	Classic (500 - 970 CE)
Xunantunich	Rectangular	3.85 L x 3.85 W	North then West	Group B Courtyard	Terminal Classic (750-900 CE)

Palenque Cross Group – Chiapas, México

Palenque is a site found in Chiapas, Mexico that was occupied from around 600 BCE-250 BCE (Mellard 2023). The site, however, climaxed during the Classic period and contains what Houston believes to be several symbolic shrine structures, including a sweat bath (Houston 1996: 132). These unique structures contain inscriptions referring to gods, goddesses, and rulers associated with the sweat baths. Some of these inscriptions include that of a caiman which is closely identified with an aged god of creation and sustenance, a snouted creature, the births of deities, and Lady Beastie (Houston 1996: 132, 135).

Houston explains that there are structures at Palenque with inscriptions for words such as "oven" on them with no indication of actual sweat bath activity. This alone

represents how a sweat bath can be a liminal space representing secular themes while also serving another functional purpose. There was no evidence of steam or heat activity occurring in the structures not identified as literal sweat baths however that is not to say that there was no ritual activity occurring inside.

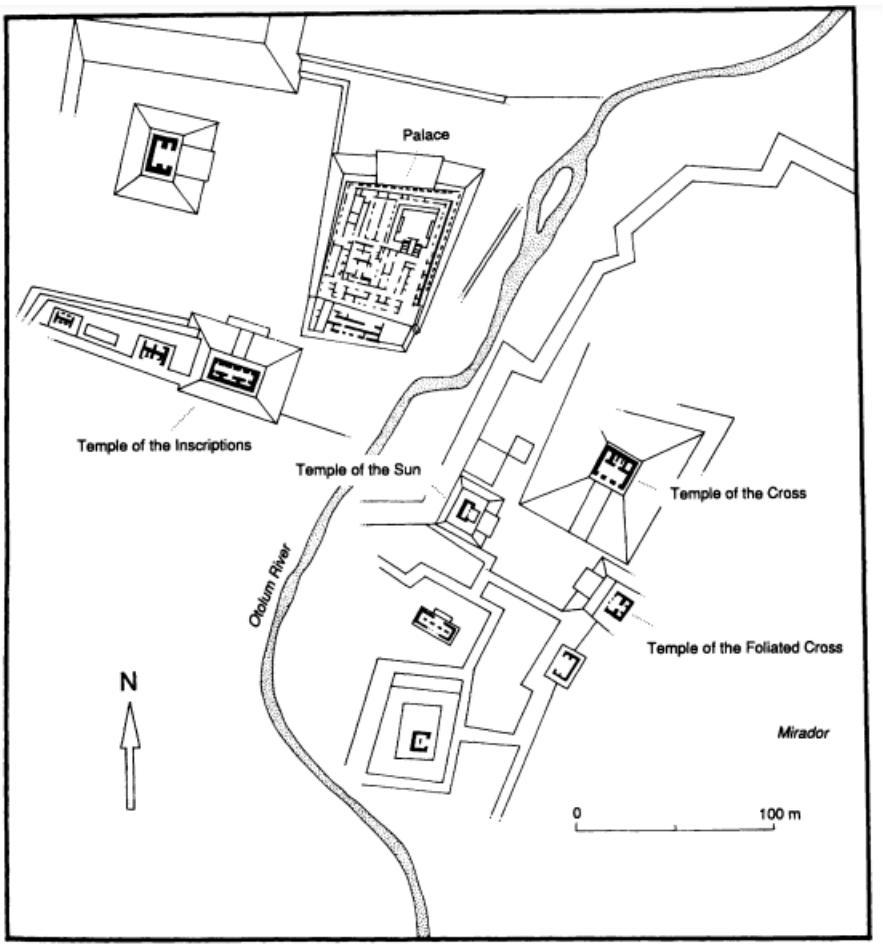

Figure 21. Palenque Cross Group, from Houston 1996.

Joya de Cerén – El Salvador

Joya de Cerén was a Classic period Maya village in El Salvador which was buried in volcanic activity around 600CE which depopulated the area, preserving many structures including a sweat bath (Fig. 18). The almost perfectly preserved sweat bath was able to be

completely excavated and studied by Sheets and Mahoney (2021). The Joya de Cerén sweat bath is famously known for amplifying masculine sounding voices which Sheets and Mahoney (2021:1) determined impacts its overall usage.

Joya de Cerén has a river flowing right along the site making it an ideal location for sweat bath activity. It is located diagonally from the eastern shrine which, like Pook's Hill and Cuello, may indicate especially secular themes. The proximity to the ball court combined with the unique acoustics of the sweat bath led Sheets and Mahoney to believe that male-led ceremonies may have been more common at this site specifically.

Figure 22. Joya de Cerén sweat bath replica, Sheets and Mahoney 2021.

Cuello – Belize

The sweat bath found at the site of Cuello in Belize dates to about 800 BCE (Sharer 1994: 129; Hammond and Bauer 2001) and is believed to be the oldest Mesoamerican Sweat bath yet reported. The 2000 excavation led by Hammond revealed that the sweat

bath had a dome-like interior about eight meters in diameter. The direction of the door was not determined nor were there benches found inside or outside of the sweat bath. There were no carbon samples taken from the sweat bath resulting in an unknown use date however it was determined to be one of the older structures found at Cuello (Hammond 2005: 52).

The sweat bath is located on the east side of the courtyard which Hammond and Bauer believe represents a secular theme as many Maya secular structures face east such as shrines (Hammond and Bauer 2001: 683). Similar to the sweat bath found at Pook's Hill, this sweat bath is associated with the cardinal direction east. Hammond and Bauer also compare the Cuello sweat bath to the one found at Joya de Ceren due to its similar shape and construction. Cuello's debated occupation dates make it difficult to confirm however it is possible that the two sweat baths were constructed around the same time.

The site of Cuello is assumed to have been subject to heavy warfare as mass graves and evidence of burnt structures confirmed (Hammon 2005). It is not uncommon in ancient Maya culture to see an increase of secular or religious activity or representations during times of stress. There are no connections between the level of violence and the level of usage of the Cuello sweat bath however that may be something for future researchers to explore.

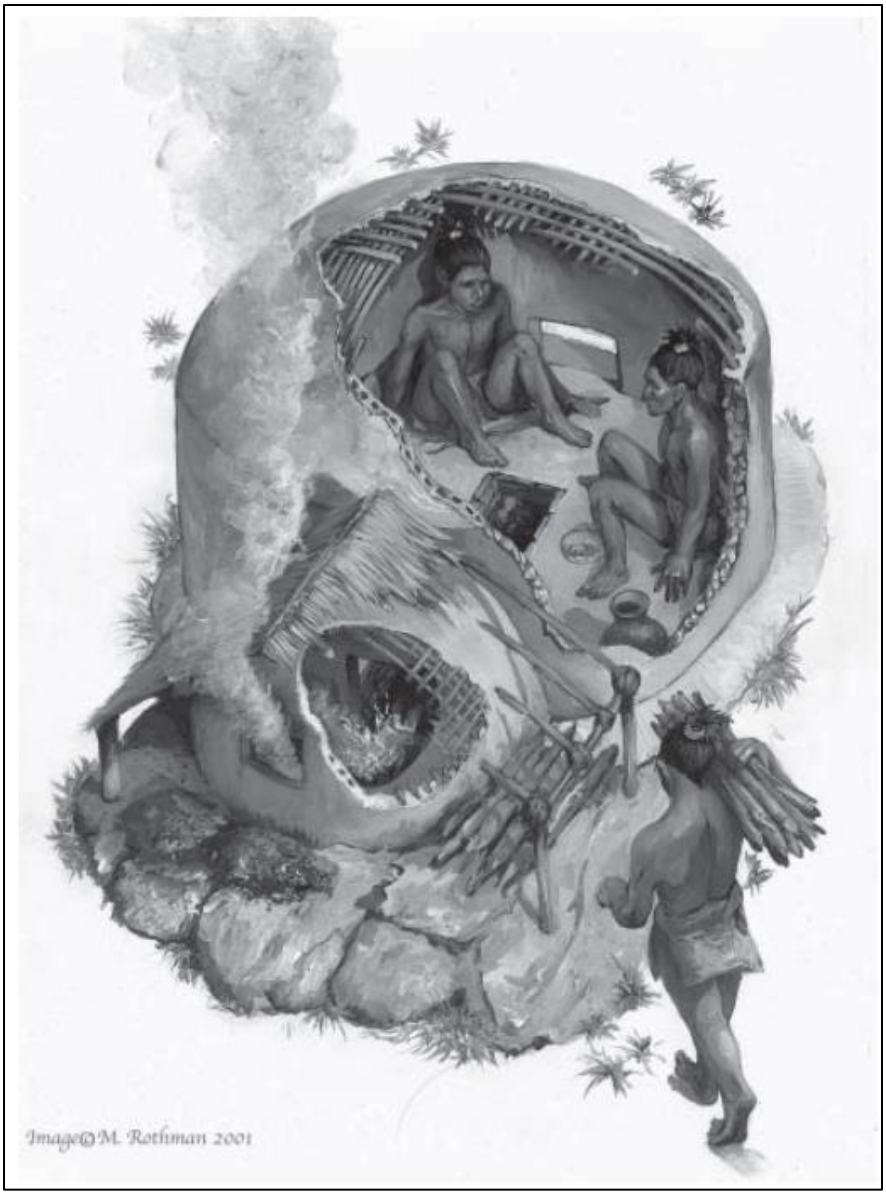

Figure 23. Reconstruction of Cuello Sweat bath, Hammond, 2007.

Xultun – Guatemala

Xultun is considered a Classic site containing a unique sweat bath which was only recently excavated in 2015 (Clarke 2022: 50). What separates the Xultun sweat bath from others is its artistic embellishments surrounding the entrance of the sweat bath (see figure 20). It is considered to be a heavily personified representation of an amphibian goddess who has not yet been identified.

The sweat bath at Xultun being a personified goddess separates it from any other Mesoamerican sweat bath excavated to date. However, Palenque is a similar case where we see the integration of artistic representations of deities and rulers that personify the sweat bath and create liminal spaces.

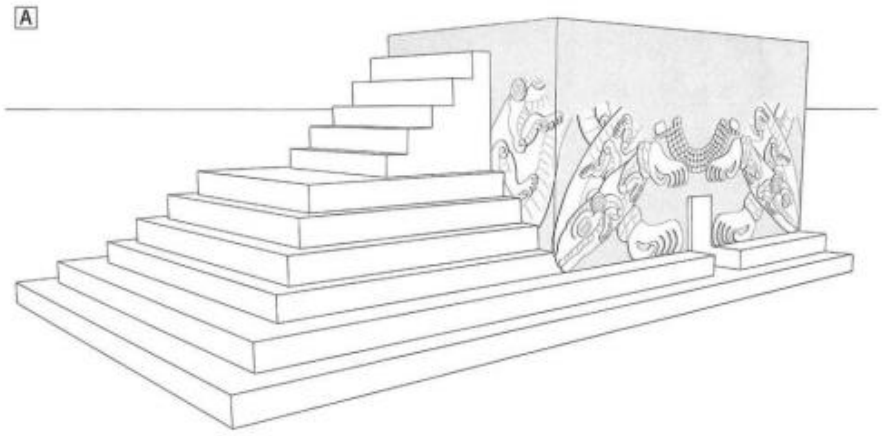

Figure 24. Xultun Sweat bath found in Los Sapos, Clarke 2022.

It is important to note that each Maya structure is built with great thought and effort behind every detail and stylistic choice. Sweat baths are no exception to this rule and from this analysis, it can be determined that their presence can be indicators of high ritual activity or high therapeutic activity. Large, monumental sweat baths such as P-7 in Piedras Negras are often rectilinear while more commonly used sweat baths are rounded meaning every sweat bath found in Belize except for B5A was used communally.

Representations of Sweat baths in Mesoamerica

In the Aztec villages of Vera Cruz there are rectangular sweat baths constructed of poles plastered over with mud (Cresson 1938:100). In the state of Oaxaca sweat baths are used by both the Mixtecs and the Zapotecs. Sweat baths found in the Mixtec town of Cuquila are rectangular, with stone walls and flat roofs of logs plastered with mud similar to those

in Vera Cruz. Sweat houses are also noted in the town of Teposcolula. The Zapotecs at Mitla have rectangular sweat houses built of rough stones laid in mud and are used only by women after giving birth (Cresson 1938: 100).

Native American Sweat Lodges

Religion and Ritual

Despite many cultures around the world participating in some form of healing sweat practice, only a handful of cultures have turned this practice into a ceremonial practice (Schiff & Moore 2006). Many Native American tribes practice ritual sweat as stated above, and although each tribe has similar meanings and uses of the sweat lodges or "hot houses," they're not all the same. Reports of sweat lodge rituals can be found in many publications by both Indigenous and non-Indigenous authors such as *Story of the Navajo Sweat Lodge* by Harold Carey Jr and *The Lakota Ritual of the Sweat Lodge* by Raymond A. Bucko.

As briefly mentioned, sweat lodge ceremonies have been centered around many forms of healing including rehabilitation for jail inmates, for youth in the community, for mental health, and much more (Colmant and Merta 1999; Gossage et al. 2003; Smith 2005). Garret et al. (2011) describes the sweat lodge ceremony as a therapeutic healing ceremony that is also a process of transformation. The "traditionalists" believe that to have pure harmony and peace, ceremonial sweat must be done throughout one's life to achieve purification of the mind, body, and spirit (2011). Although the traditionalists might have used sweat lodges for more metaphorical healing and phases of transformation such as the transformation into adulthood, modern medicinal uses of sweat lodges range from substance abuse to corrective behavior.

Traditional uses of sweat lodges conjoined the elements of Mother Earth and the Universal Circle for giving thanks and asking for blessings through the purification process. According to Krogmeier (2017), the sweat lodge itself represents the universe and origins of life with the actual dome itself representing the womb (2017). Cardinal directions are essential elements to consider when practicing ceremonial sweat. East represents belonging and connection, the south is one's sense of achievement, the west represents physical awareness and independence, and the north represents wisdom and generosity (Krogmeier 2017).

Native American Connection Center in Phoenix holds traditional sweat ceremonies that do not explicitly say they are only for Indigenous people and their goal is to improve the lives of individuals through Native health practices and traditions (Native American Connections).

Healing

Many native origin stories state that "a sickness came to the first people" which then resulted in a council being held "from every direction." The origin story goes, many animals came together and built a fire, but the fire grew far too large. Raven accidentally bumped Bear's basket of water onto the fire making steam causing Raven to sweat. Raven experienced a vision through the head, and it was then decided that this act would become honored and known as the sweat lodge ceremony (Krogmeier 2017). Sweat lodge ceremony cleanses the mind, body, and soul giving it a diverse set of uses. Native perspectives on healing and transformation state that one should heal in the presence of one's support system (family, friends, etc.) which is why the ceremony is seen as so sacred (Garett et al. 2017).

Garret et al. (2011) list the different uses and importance of the sweat lodge as basic bathing; warmth; and socialization as a form of schooling for the young to be taught their history, heritage, language, culture, myths, and religion; celebration; ceremonial cleansing; physical doctoring; spiritual training; and preparation for war, hunting, trips, marriage, vision quest, and various other rites of passage, cleansing, and healing (Colmant & Merta, 1999; Oswalt, 2005; Smith, 2005). There is no limitation when considering the healing properties of a sweat lodge because of the emphasis on mind, body, and soul as one unit rather than separate entities that require different healing ceremonies.

Comparing Native American Sweat lodges and Maya Sweat baths.

Unsurprisingly, there are many stark similarities between Native American sweat lodges and Maya sweat baths. One similarity that seems to be the most noticeable when comparing the two is the structures themselves; The architecture is not exactly alike however the dome-like shape and hearth used to hold the hot stones are essential elements that are shared between the two. Another similarity is the concept of the structure representing a womb. They both also have directional meanings that are important to their usage.

Ceremonial similarities are the use of herbs/tobacco when performing sweat rituals. It is said that in the Maya sweat baths, the person controlling the heat would also use herb mixtures to add to the fire or to slap against the skin to open up the pores. In Native American sweat lodges, tobacco is used as an offering and can be given to the fire or smoked. Also, both can be used to heal mental anguish in the body although the Native American ones push for more mental and spiritual healing than Maya sweat baths which focus on more physical ailments. For example, childbirth and dental work are the most

depicted sweat bath representations we have in Mesoamerican codices while Native American ethnographies and origin stories depict more spiritual experiences.

Structurally, most Native American sweat lodges are either covered with adobe, hide, or tarp depending on the tribe as well as available resources. Maya sweat baths are often made out of stone and have built-in benches and hearth structures, unlike the Native ones. Maya sweat baths often have a hole to let the steam and smoke escape a bit while this is uncommon among those in the United States. However, their shape is very similar as many Maya sweat baths have dome roofs as well, some of them contributing to different soundscapes.

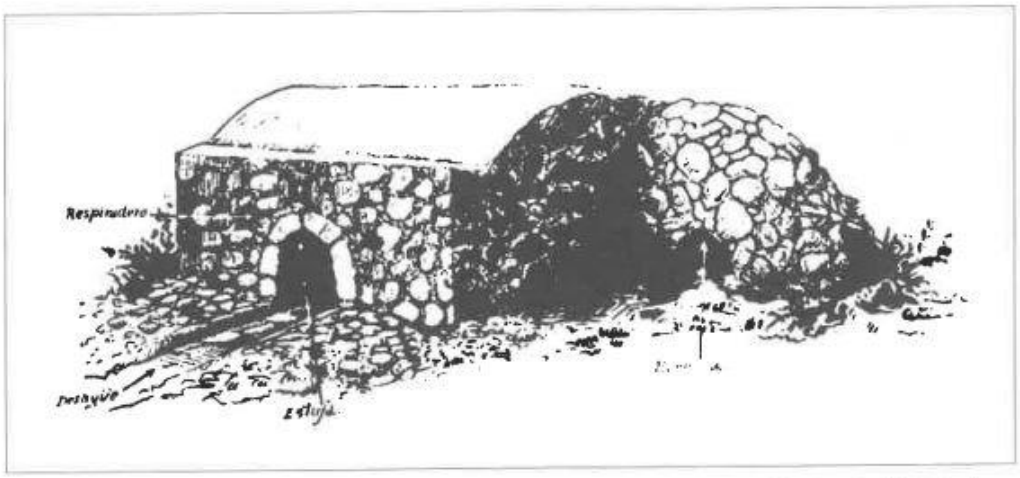

Figure 25. An Indigenous Sweat bath found in Mexico in the early 1930s by Linton Satterwaite, 1938.

In conclusion, there are many similarities between Maya and Native American sweat houses. Although they are not identical, their similarities are notable and undeniably related in some way. Healing practices for Indigenous people in the Americas often display some sort of similarities however, these similarities are much more closely connected than one might expect.

The most similar elements were the shape of the sweat houses, the presence of heated rocks for steam, the use of herbal plants, the depiction of the sweat house as a womb, directionality having importance in usage, and having a "leader" controlling the ceremony and the fire. The most contrasting elements were the material used to build the sweat houses, the emphasis on medical procedures in Maya sweat houses, and the lack of steam holes in Native American sweat houses.

The origin stories of Native American sweat lodges claim that people came from all over the world to council the ceremonial sweat tradition. Therefore, it is plausible that cultural diffusion took place and can explain many of the similarities seen between the two. Just as we see cultural diffusion of goods such as foods and animals, we can also see it through cultural practices such as these sweat house practices.

The purpose of this thesis was to investigate four sweat baths at the Belize Valley sites of Cahal Pech, Baking Pot, Pook's Hill, and Xunantunich, to determine their form, features, and function, and to compare them with sweat bath forms and uses in the Maya area and Mesoamerica. Results of these investigations indicate that the sweat baths at the four sites had a diverse mix of shared and unique characteristics that included their orientation, their time of construction, their location within sites, their interior forms, proximity to water sources, and possible use.

In the case of orientation, we noted that the doorways of the sweat baths faced diverse directions. The doorways of the Cahal Pech and Pook's Hill sweat baths, for example, both faced southwards. In contrast, the doorway of the Baking Pot sweat bath faced east, while at Xunantunich the original doorway of the building faced north, then later, after it was remodeled, the doorway faced west. When we compare this Belize Valley

orientation with that of sweat baths in other regions of the Maya area, or Mesoamerica in general, we see a possible connection between east facing doorways or association with eastern religious structures such as shrines and highly secular spaces. Examples of this are seen as Pook's Hill (Helmke 2006), Cuello (Hammond 2005), Cahal Pech (Beardall 2017) and Joya de Ceren (Sheets and Mahoney 2022). The diverse orientation of sweat bath doorways in the Maya area has two) implications. Either it indicates that doorway orientation had no significance in the building's overall functions, or that orientations may have been linked to some still to be determined function.

In regard to their date of construction, the Belize River Valley data presently indicate that the Cahal Pech sweat bath, which was constructed during the Early Classic period, represents the first of these building types built in this region. Later, during the Terminal Classic period, Baking Pot, Pook's Hill, and Xunantunich added sweat baths to their architectural repertoire. The Terminal Classic increase in the number of sweat baths likely indicates that rituals associated with sweat bathing may have become a more common cultural practice at this later time, and that it may have been associated with external influences from other regions of Mesoamerica. Awe et al. (2024), for example, recently reported that the Terminal Classic period witnessed increased influences in the Belize Valley that originated in the Yucatan and Gulf Coast regions of Mesoamerica. These influences included new architectural styles, artifacts, and ideological symbols and practices that may have also included sweat bath-related rituals (Awe et al. 2024).

In terms of their location within the sites, we noted that the sweat baths at all four sites were located within site cores and associated particularly with elite residential complexes. As mentioned, there may be a connection between the cardinal direction east

and the location of sweat baths within a site to represent especially secular themes. However, more research is needed to confirm a relationship between eastern religious structures and east facing sweat baths. Other than the location of the sweat baths being in elite areas, there are no other significant patterns regarding their locations within site cores.

Chapter 7: Conclusion

In summary, there are numerous functions, implications, and interesting questions that can be gathered from analyzing sweat bath activity. Sweat baths are much more complex and can tell us ample information about specific ritual activity occurring within a site core. Information regarding use dates, periods of high activity, what kind of offerings were being made, and even information about royal births can be derived from sweat bath research. There are endless questions that can be asked about these structures, this is simply a starting point.

Possible Functions

In conclusion, it is apparent that sweat baths in the Belize River Valley, like sweat baths across Mesoamerica and the American Southwest, played a significant role in the ritual traditions of their users. They served not only as healing centers but also as a liminal space representing life, death, transformations, rites of passage, evolution, and rebirth. Sweat baths and their meaning are complex, and it is important to consider their complex nature when analyzing them and their multi-faceted function.

Maya cosmology is a multifaceted concept that intricately ties in nature and religion that dictates Maya lifeways. For this reason, all of the significant characteristics listed above were considered collaboratively to understand the multiple meanings behind the sweat baths. With careful consideration, it was determined that the sweat baths at each site

represents a cave structure and were all communally used both therapeutically and ritualistically with the exception of Xunantunich that had a more exclusive ritualistic purpose.

Baking Pot's sweat bath was determined to be focused on birthing ceremonies due to the association with snails which represent fertility, earth, water, and the underworld as well as its east facing entrance that represents the birth of the sun. Cahal Pech's sweat bath was determined to be more open to the public as a healing center given its location within the site core and its rounded, large, shape. Pook's Hill and Xunantunich were both determined to have been constructed as a response to environmental stress in the Late Classic period because of their strong connections to secular spaces and evidence of reconstruction at both sites.

It is important to consider that sweat bath activity is not always as detectable considering that many of them are made of perishable materials such as mud plaster and wood. Surviving ancient Maya sweat baths are constructed of lime plaster and stone just as any other structure found in Maya site cores. The higher quality of construction is what allowed the sweat baths to survive for so long resulting in a limited view of what normal Maya sweat bath use was like. However, ancient Maya sweat baths that are surviving are not more important than those being used outside of the site core, rather their structural integrity helps tell us what we need to know regarding their specific usage.

Another notable function of sweat baths is their association with Maya cave rituals. Caves, like sweat baths, represent fertility and are often used in ritual, specifically those surrounding crop production and rain. There has been evidence of sweat bath ritual

activity taking place in caves whenever there is no access to an active sweat bath, which is something that must be considered when analyzing sweat bath activity.

Implications

Understanding more about sweat bath use in Mesoamerica can tell us more about the site than academics have discussed in the past. Environmental responses, secular themes, and relationships between Mesoamerican centers can be analyzed through sweat bath use. Although there is no pattern indicating exactly where a sweat bath will be located, it is clear from Figure 20 that there is a higher density of sweat baths in areas where there is high natural water density which may help researchers narrow down where possible sweat bath sites may be.

Also, there may be some connection between east facing doorways or being associated with religious eastern structures as seen at Pook's Hill and Cahal Pech. Again, more future research is needed to confirm or deny the possibility of the connection between the two. However, the Maya are known for placing their most secular structures toward the eastern edge of site cores, making it possible that a connection between sweat baths and the east may exist.

Liminal spaces are common for many religions and are seen all throughout Maya architecture as well. There is no denying that sweat baths are considered to be liminal spaces to the Maya which is why there are so many deities associated with them. These liminal spaces represent a plethora of themes relating to the human life cycle, transformations, and health. It is important that researchers consider their literal and metaphorical representations when studying sweat baths as to not deny their liminal characteristics.

Future Suggestions

Future researchers interested in continuing to explore the patterns between Mesoamerican Maya sweat baths must first consider the limitations of this specific research design. In the future, GPS site boundaries and lidar data for each site would be ideal as well as new recordings of sweat baths that have been recorded incorrectly such as Copan and Tikal. However, 3D models of each sweat bath would be sufficient enough to get all of the essential data to expand on this research on a budget.

Future research can further identify any patterns between cardinal direction and sweat baths as well as their intimate relationship with water. Models of each sweat bath site mentioned in this thesis would not only provide superior recordation to that collected in the past, it would also aid in the preservation of the structures. Other than excavation, the models in combination with GIS data are the best way to get information out of the sweat baths.

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Maya Gods and Goddesses Appendix

Amphibian Goddess –	Goddess who has not been identified however she represents the sweat bath found at Xultun
Goddess Itzpapalotl –	Known as the Obsidian Butterfly, Itzpapalotl is an Aztec goddess connected to death and warfare
Goddess Ix Chel –	Maya goddess of midwifery and medicine
Goddess Teteoinan –	Aztec earth goddess, symbol of the earth as both creator and destroyer, mother of the gods and mortals
Goddess Tlazolteotl –	An Aztec earth-mother goddess representing sexual impurity and sinful behavior
Goddess Toci –	An Aztec life-giving spirit known for residing over the sweat baths
Goddess Xpiacoc –	The divine grandmother of Maya mythology and day keeper of the Popol Vuh
Goddess Yoalticitl –	The Nahuatl goddess of sweat baths, also known as the midwife
K'o Tuja –	Lord Sweat bath, mentioned in the Popol Vuh however his characteristics beyond sweat baths are not defined