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Late fire ceremonies and abandonment behaviors at the Classic Maya city of Naachtun, Guatemala.

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Abstract

This paper focuses on the process of abandonment in pre-Hispanic Maya societies. Toward the end of the Classic period (250–950 CE), the general desertion of the Central Lowland cities gave place to multiple acts – including fires and on-floor ash spreading – intended to ritually terminate the occupation of houses and buildings. While the urban area of Naachtun, Northern Peten, was apparently depopulated by the end of the Terminal Classic (830–950 CE), fire ceremonies were performed in two political buildings during the Early Postclassic (950–1250 CE). The detailed study of the remaining charcoal deposits and their comparison with habitual Late and Terminal Classic abandonment deposits in households allows us to examine the material, social and environmental dimension of these fire ceremonies. We argue that these late rituals were held by people who were still tied to the city and that they are thus distinct from those performed as part of pilgrimages to sacred landscapes during the Late Postclassic and Colonial times. Instead, we state that they reflect the continuity of rites and of collective memory drawn from Naachtun’s history, providing indirect evidence that human settlements persisted around the abandoned cities for some time after the collapse of Classic political systems.

Keywords

Maya; fire; anthracology; ritual deposit; abandonment; mobility; memory; Terminal Classic; Early Postclassic

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90 Archaeological Project.

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1. Introduction

95 The general desertion of the Central Maya Lowlands toward the end of the first millennium has been
the subject of strong debate among the scientific community and the public. Since the ruins of ancient
Maya cities were rediscovered early in the 19th century, archaeologists have sought to understand the
causes of what was called the collapse of Classic Maya civilization (e.g. Aimers, 2007; Demarest et
al., 2004; Turner and Sabloff, 2012). The crises that characterized the end of the Late Classic and the
100 Terminal Classic periods (750–950 CE) seem to have been multi-faceted (resource over-exploitation,
overpopulation, migrations, warfare and climate change, etc.) and their impact on cities more or less
slow and reversible depending on the resilience of each community. Increasing evidence indicates that
people persisted around the depopulated cities or reinvested formerly abandoned zones, long after the
departure of the majority of the inhabitants, which accompanied the disintegration of the Lowland
105 social-political systems. Yet while focusing on the causes of these phenomena, little insight is
provided on the way people themselves lived this period of disorder (Arnauld et al., 2017a).
Transitional stages of collapse and post-collapse are key, however, to understand the cognitive
processes implied in the social and cultural changes within civilizations (Diamond, 2005; Faulseit,
2016). During the Terminal Classic period (830–950 CE), the greater frequency of abandonment
110 deposits, the only vestiges of the rites intended to symbolically close a place's occupation (Boteler-
Mock, 1998), indicates the increasing concern of people faced with the abandonment of their living
spaces.

When and where excavation programs have focused on abandonment dynamics, the detailed study of
these material deposits on the buildings' floors have shown that, except in certain cases of escape due
115 to violent circumstances (e.g. Inomata et al., 2002), the abandonment of Maya cities was progressive.
Some families continued to live several decades beside houses already in ruins (Lamoureux-St-Hilaire
et al., 2015). At the site of Naachtun, Northern Guatemala (Figure 1), a Central Lowland city occupied
during the whole Classic period (150–950 CE), intensive excavations carried out for several years by
the Naachtun Archaeological Project (2010–2018, CNRS, University of Paris 1 and University San
120 Carlos of Guatemala) highlighted a complex set of depositions related to abandonment both in
residential areas and in public buildings of the urban core (Sion, 2016). While the surrounding
dwellings were abandoned between the end of the Late Classic and the Terminal Classic periods
(800–950 CE), two monumental buildings, Structures 5O-5 and 6O-5, were the site of fire ceremonies
during the Early Postclassic period (950–1250 CE) according to radiocarbon dating. Censer deposits
125 associated with incense remains and large quantities of ashes and charcoal were discovered on the
floors of these two buildings which successively hosted the political power during the Late and
Terminal Classic periods (600–950 CE) (Michelet and Nondédéo, 2012; Nondédéo, 2012, 2014).

130 The performance of these fire rituals in such meaningful places after the last inhabitants had left the
site core raises critical questions about the process of abandonment by the various social groups and
about the dynamics of mobility after the collapse of Maya cities. Were these rituals performed by
people who came back afterward to the city center as part of a pilgrimage journey? Or were they
carried out by remaining inhabitants who still lived in the area long after the demise of the society?
How do they relate to the abandonment rituals performed by the occupants leaving their households?
135 What collective memory and social identity do they reflect?

In this paper, we address the human behaviors related to abandonment in Maya cities, through an in-
depth analysis of abandonment and post-abandonment deposits at Naachtun. After emphasizing briefly
the contribution of charcoal and fire studies to the understanding of ancient rituals, we outline the
gradual process of abandonment of Naachtun's urban area from the end of the Late Classic to the
140 Terminal Classic period (800–950 CE). We highlight the existence of two main patterns of
abandonment deposits based on their charcoal composition and formation process. We then describe
uncommon Early Postclassic deposits in two public buildings. This allows us to trace the origin of the
fire ceremonies and understand their environmental context. Finally, we discuss the possible roles and
implications of these late rituals in a post-collapse context.

145 **2. Fire, ashes, and the study of ritual behaviors**

Archaeologically, abandonment deposits at Maya Lowland sites are very often associated with ashes,
charcoal and burn marks, attesting to the central role played by fire in termination rituals (e.g. Clayton
et al., 2005; Pagliaro et al., 2003; Stanton et al., 2008). These deposits generally consist of common
objects broken and dispersed on floors, but they can also comprise a few artifacts laid in precise places
150 such as a building's entrance and accesses. Archaeological context is key to define a particular deposit
as probably related to an abandonment ritual, compared to simple domestic refuse for example
(Lamoureux-St-Hilaire, 2011). Axial placement, association with voluntary architectural destruction
(fire, floor removal, burial reopening) or deposition of artifacts in unsealed holes, are indicators of an
abandonment ritual (e.g. Barrientos et al., 2015; Stanton et al., 2008). In most cases, the conspicuous
155 burn marks on the walls and floors where a termination ritual took place, or the presence of actual
hearths provide direct evidence of *in situ* fires. In other cases, the role of fire is indirect. It is suggested
by the deposition of ashes, censers or burnt artifacts which do not visibly result from an *in situ* fire.
This archaeological evidence indicates nevertheless that the burning of incense or other objects was a
critical step in ancient Maya ritual sequences.

160 Beyond the conventional study of artifacts and of the context, the analysis of carbonized plant remains
allows us to reconstitute the botanical composition of the deposit, and thus to better understand ritual
actions and behaviors in both their material and ideological dimensions. Archaeobotanical and
anthracological studies conducted at Maya sites and elsewhere have shown that beside their fuel

function, wood and plants burned as part of ancient rituals could have been selected specifically to fill other technical or symbolic purposes (e.g. Beauclair et al., 2009; Cençon-Salvayre, 2014; Morehart et al., 2005). Admittedly, it can be risky to put forward any symbolic explanation for the use of a particular plant in ancient rituals in the absence of written sources and based solely on the archaeological record. Nevertheless, the archaeobotanical study of ritual deposits can yield much information on their formation process. Composed hearths, successive deposition of plant material such as wooden objects, or the construction of perishable structures such as altars or funeral pyres, can result in stratified or spatially-organized deposits whose layout would go unnoticed without a thorough archaeobotanical sampling (Cençon-Salvayre, 2017). By bringing to light the actions responsible for the formation of ritual deposits and putting them into a spatial and temporal context, one clarifies the diversity and variability of ritual behaviors that convey a social and identity discourse as much as the symbols attached to the ritual paraphernalia.

3. Last occupancy and abandonment at Naachtun during the Terminal Classic

Covered today by a medium sub-perennial tropical forest (Schulze and Whitacre, 1999), the site of Naachtun was significantly occupied since at least the end of the Preclassic period (150/200–300 CE). The epicenter comprises three monumental groups named A, B and C, and is surrounded by a residential area of approximately 175 ha (Figure 1). Population dynamics and abandonment processes in the city throughout the Classic period have been reconstructed through 1) intensive excavations in several households of the epicenter, and 2) systematic pit survey and excavations in the settlement area (Goudiaby, 2018; Hiquet et al., 2018; Sion, 2016). Outside of this urban area, human occupation in the hinterland of Naachtun has only been confirmed by LiDAR images (Canuto et al., 2018; Nondédéo et al., 2018a). In the current state of research, no chronological information from excavations is available regarding population dynamics in the hinterland.

Forming the east part of the epicenter, Group B (Figure 2) became the hub of political and economic activities after a political break occurred during the 6th century. The relocation of the seat of power from Group A to Group B was materialized by the construction of the Eastern Plaza with its main structure 5O-5. This was accompanied by the building of the Western Complex, an elite residential compound that probably hosted the royal family during most of the Late Classic period (600–830 CE).

From the second half of the 8th century, new political changes led to the construction of the Río Bec Plaza and two new elite residential compounds, the Central and Southern Complexes. New political buildings such as the pyramid 6O-3 and Structure 6O-5 shaped this new sector. This architectural renewal is interpreted as the expression of a desire to break away from the former period when Naachtun was subjugated to the Kanu'1 dynasty of Calakmul (Nondédéo et al., 2013b). During this phase (750–830 CE), the population of Naachtun reached its apogee, as observed in many other Northern Peten cities (Culbert and Rice, 1990). Besides the densely populated households of Group B,

200 around 60% of dwellings in the urban area were occupied at the end of the Late Classic period (Hiquet et al., 2018, n.d.).

205 Around 800 CE, Naachtun's royal dynasty collapsed, and the political authority apparently passed into the hands of new elite families living in the Southern Complex (Nondédéo et al., n.d.). These families maintained their prosperity until the end of the Terminal Classic (830–950 CE) by developing new exchange roads, as reflected in the diversity and richness of artifacts contained in the domestic middens of this post-dynastic period (Sion, 2016; Sion et al., n.d.). In the meantime however, and for unclear reasons, the people of Naachtun gradually left the city, while part of the remaining population apparently contracted around the residences of these new leading groups until at least the 10th century. Forty-eight percent of dwellings in the urban area remained occupied during the Terminal Classic, whereas the Early Postclassic occupation is limited to a single structure (Hiquet et al., 2018).

210 The progressive abandonment of Naachtun's Group B from the end of the Late Classic resulted in a variety of deposits (including broken and burnt ceramic vessels, lithic tools, faunal remains, human bones, ashes and charcoal) that we interpret as the vestiges of ritual practices carried out by the inhabitants themselves at the time of departure (Figure 2). In the Southern Complex, evidence of these ritual events was particularly widespread and puzzling, especially in Patio 28 which was certainly
215 home to the most powerful family of Naachtun during the Terminal Classic (Sion, 2016).

The variations observed in these rituals seem to reflect spontaneous acts which apparently did not follow strict liturgical standards. Indeed, the prayers enunciated during these rites may have been as important as paraphernalia and actions, of breaking, spreading and burning objects (Sion and Arnauld, 2015). Often, the similarities between the contents of the deposits and those of domestic middens
220 suggest that the action of retrieving domestic trash and depositing it inside the buildings was a critical step in the abandonment process (Halperin and Foias, 2016; Newman, 2015). Daily life garbage seems to materialize residential permanency of sedentary life in stone houses. Masonry houses represent a larger investment than thatched roof dwellings that are more easily reconstructed, and a stronger territorial anchoring, showing a greater willingness of sedentariness of their inhabitants. This
225 residential stability over time is manifested by the accumulation of domestic waste, which is then included in the rituals related to the abandonment of dwellings. Abandonment rituals also involved the remains of the deceased that had been buried under the houses' floors or integrated into caches related to dedicatory rituals or architectural modifications (Barrientos et al., 2015; Goudiaby, 2018; Pereira, 2013). Ritual acts were somehow carried out by the living with the dead. Closing the house meant
230 ending sedentary times in these stone houses where successive generations of people had lived and died (Arnauld et al., 2013; Sion and Arnauld, 2015).

4. Anthracological analysis and formation processes of the deposits

Several abandonment deposits were identified in the households of the Southern, Central and Western Complexes of Group B and in the political buildings 5O-5 and 6O-5 (Sion, 2016; Nondédéo, 2012, 2014; Michelet and Nondédéo, 2012). Twenty of them were embedded in ashy matrices that were sampled for charcoal analysis in order to trace their origin (Table 1). The anthracological study of the deposits was carried out in parallel with a general study on firewood economy at Naachtun (Dussol, 2017). During excavations, soil samples of 5 to 20 liters depending on the deposit's extension were systematically taken. Carbonized macro-botanical remains were extracted through manual flotation of sediment through a 2 mm screen. Some ash and charcoal deposits in Structures 5O-5 and 6O-5 had been sampled manually during field seasons that preceded implementation of the flotation sampling protocol in 2013. These were dry-screened in laboratory. In the present case, the different strategy used to sample the deposits does not prevent their comparison, insofar as the interpretation of charcoal assemblages proceeding from direct fire events or specialized activities does not require the same standards, in terms of sampling and quantification methods, as those intended for paleoecological restitutions (Chabal et al., 1999; Théry-Parisot et al., 2010). The samples were analyzed in the Archaeobotany laboratory of the University of Paris 1 (Nanterre) following standard anthracology methods (Chabal et al., 1999). Identification of charcoal pieces of over 4 mm in size was based on Dussol's reference collection of Central-American wood (Dussol, 2017) as well as on wood anatomy literature and databases (e.g. Barajas-Morales et al., 1997; Metcalfe and Chalk, 1957; Wheeler, 2011; Wheeler et al., 1989). In total, 2,144 charcoal fragments were analyzed including 106 unidentifiable fragments that were not included in data analysis. Sixty-one taxa were identified (Table 2). Description of their anatomical features and diagnosis for their identification are available in Dussol (2017, Appendix E).

When taking into account the process of deposition, the density of macro-botanical remains and the taxa richness and diversity (number and relative abundance of taxa), the household deposits display two main patterns of formation (Figure 3).

The first pattern corresponds to the remains of *in situ* fires as shown by the associated burn marks. It comprises Deposits #7, #17 and #20, along with Deposit #4 in the non-residential Structure 5O-4. These generally display a higher remain density and a lower taxa diversity, which characterize a single fire event made of only one or two different kinds of wood. The less represented taxa in these deposits could correspond to small branches or twigs that were used to start the fire, or to post-depositional contamination.

The second pattern was found in Deposits #10, #12–14, #16 and #18. The absence of *in situ* burn marks indicates that they probably correspond to secondary ash deposits. They are characterized by a generally lower remain density and a higher taxa diversity compared to the total number of charcoal

fragments (Deposit #10 yielded no less than 26 taxa for only 153 charcoal fragments). These deposits are similar to domestic refuse that contains the eroded remains of multiple fires made over a long time, explaining that they may yield only few charcoal fragments (e.g. only 30 and 22 identifiable charcoal fragments in Deposits #16 and #18) that nevertheless display a relatively higher diversity of taxa. This pattern suggests that ashes were gathered from domestic middens and relocated inside houses for ritual purposes. This hypothesis is supported by the frequency of ordinary ceramic shards and faunal remains in these secondary ash deposits, as usually found in middens (Sion, 2016).

That being stated, some deposits cannot be clearly classified in one or the other category. Deposits #8, #9 and #11 are associated with burn marks but display quite diversified taxa spectra. Conversely, Deposit #19 is clearly a secondary deposit, but since it contains only large charcoal fragments (resulting in high remains density) of only one wood species, it probably results from a single fire event. Several scenarios could explain these intermediate cases. In any event, they indicate that a strict categorization of deposits based on their material composition and context might sometimes be insufficient to account for the diversity and variability of ritual behaviors, especially as many steps in the ritual sequence may leave no material traces.

A series of radiocarbon dating tests carried out on some deposits and domestic middens of Group B provided quite homogeneous dates ranging between 725 and 980 CE (Table 3). This corroborates a final occupation and abandonment of Group B between the end of the Late Classic and the end of the Terminal Classic periods. Based on ceramic analysis and stratigraphy, Sion (2016) determined that the process of abandonment was gradual and that it certainly spanned more than a century. Indeed, the first abandonment rituals were performed as early as the final Late Classic in the Western Complex (e.g. Deposit #7). Furthermore, some of the Terminal Classic deposits were made in already collapsed structures (Deposits #17 and #20), while nearby houses were still inhabited. The following sections deal with the latest of these deposits, which distinguish themselves from the others not only by their late dating but also by their atypical pattern of formation.

5. The Early Postclassic deposits in Naachtun's political buildings

5.1. Structure 5O-5, Eastern Plaza

Located at the northern edge of the Eastern Plaza, Structure 5O-5 and adjacent buildings form a palatial compound which probably hosted political and administrative activities (Figure 2). We believe that this building was the seat of Naachtun's royal dynasty during the Late Classic (Nondédéo et al., 2013b, n.d.). Intensive excavations were carried out in 2011 and 2013 (Escobar Durand et al., 2012; Nondédéo, 2012, 2014; Perla, 2014). The main structure was built at the beginning of the 7th century. It is composed of three rooms aligned on a west-east axis and opened to the south (Figure 4a). It stands on a monumental stepped platform, about 5 meters-high, giving direct access to the plaza. Consistent ash, charcoal and material deposits were found on the burnt stucco floors of the central and east

rooms, as well as on the upper platform in front of the east room entrance (Figure 5). No ash deposit was detected in the west room despite the burn marks on its floor. This evidence indicates that fire rituals related to abandonment were performed in this building. Indeed, nothing in the regular occupation of the structure seems to justify the existence of functional hearths in those places.

The central room deposit (Deposit #1) was located in the very center of the room (Nondédéo, 2012). It consists of a large concentration of burnt censer fragments, accompanied by a blend of ashes, charcoal and remains of burnt vegetal resin (evidenced by fluorescence under UV light, Colín, 2016). All of this was set directly on the floor that was intensely burnt on an area of approximately 1.40 meters in diameter. Restoration work helped identify at least three different vessels: two big pedestal censers (Figure 6) and a small *sahumador*. Nondédéo (2012) states that according to the disposal of shards and debris, the censers had been placed intact on the floor and were then destroyed by the collapse of the roof.

This deposit originates unequivocally from an *in situ* fire that was lit as part of a ceremony performed between 1030 and 1260 CE according to two radiocarbon dates (Table 3). If we refer to the pattern of abandonment deposits observed at Naachtun, one would expect that this single fire event would contain only a few different types of wood. However, charcoal analyses showed that this fire was built with at least 13 taxa (among 213 charcoal fragments identified). The spectrum includes Sapotaceae (58 %), Sapindaceae (11 %) including guayo (*Allophylus sp.*) and possibly canchunup (*Thouinia paucidentata*), pine (*Pinus sp.*, 8 %), goncalo alves (*Astronium sp.*, 8 %), Jamaica dogwood (*Piscidia piscipula*, 5 %), Euphorbiaceae (4 %), craboo (*Byrsonima sp.*, 2 %), a dalbergia species, possibly rosewood (*Dalbergia stevensonii*, 2 %), Moraceae (1.5 %) including breadnut (*Brosimum alicastrum*), possibly fustic (*Maclura tinctoria*) and annatto (*Bixa sp.*, 0.5 %), and an undetermined taxon (0.5 %). This taxonomic richness is quite surprising for a single fire. Furthermore, the use of fustic and annatto as firewood is not documented elsewhere at Naachtun according to the anthracological data (Dussol, 2017). This indicates all the more the singularity of this deposit.

In the east room, several ash concentrations (Deposits #2) were spread over the floor which was also burnt (Nondédéo, 2014). On-floor artifacts include a fragment of a spiked censer identical to those of the central room, an obsidian blade, a flint knife, and a piece of mosaic made of polished green stone. Each ash deposit was sampled separately. In total, 23 taxa were identified among 543 charcoal fragments. As in the central room, Sapotaceae dominate the spectrum (43 %, Figure 7.a–7.c). Other taxa include pine (*Pinus sp.*, 31 %), Sapindaceae (12 %) including possibly canchunup (*Thouinia paucidentata*), craboo (*Byrsonima sp.*, 3 %), Jamaica dogwood (*Piscidia piscipula*, 3 %), Moraceae including breadnut (*Brosimum alicastrum*, 2 %), and several minor taxa each representing less than 1 % of the charcoal: Myrtaceae, Euphorbiaceae, goncalo alves (*Astronium sp.*), sapote (*Pouteria* type), *dzidzilche* (*Gymnopodium floribundum*), several Fabaceae taxa including logwood (*Haematoxylum sp.*) and probably *Albizia*, along with some undetermined taxa. Taxa distribution is

not homogeneous between these different deposits. In particular, pine is predominantly located in the north-west corner deposit. This one also contains a substantial quantity of seed remains, more precisely of endocarp fragments of a probable palm species (Arecaceae). Fragments of endocarps have also been identified in the deposit located in the door axis, this time in association with Sapindaceae charcoal. The small deposit located at the foot of the western wall presents a higher proportion of craboo. In the eastern part of the room where ashes were more dispersed, the density of macrobotanical remains was much lower and the spectrum more heterogeneous. It was marked by a higher proportion of Fabaceae taxa. Finally, the deposit located on the platform in front of the room entrance (Deposit #3) and associated with a spiked censer fragment was composed exclusively of large charcoal pieces of well-preserved Sapotaceae branches of approximately 1–2 cm in diameter (Figure 8). These could only have been produced through limited-air burning and are thus unlikely to result from an *in situ* open-air fire, especially as the floor was devoid of intense burning evidence. A similar deposit could have been placed in front of the central room, but it could have disappeared because of looting carried out through the structure axis.

The differences observed in the vegetal composition of the east room's ash deposit indicate that it results from at least three different fires, the first one built mainly with Sapindaceae wood, the second one with pine and the third one with craboo. There is no guarantee that these events were simultaneous. The predominance of Sapotaceae in all deposits does not indicate a link between them as these wood species were most commonly used for firewood at Naachtun (Dussol et al., 2017a). We can assume that the deposits located in the door axis are of ritual origin because of their axial position. However, those located in the north-west corner and at the foot of the west wall could be the remains of profane fires built by squatters. We know that several decades passed between the end of activities in this sector and the time when the ritual was performed in the central room during the Early Postclassic period (1033–1254 CE). Interestingly, the three main taxa (Sapindaceae, pine and craboo) and others among those identified in the east room (dogwood, breadnut, goncalo alves and Euphorbiaceae) were all found in the central room deposit, which results from an independent fire. Without guaranteeing their contemporaneity, such a situation cannot be mere coincidence resulting from opportunistic wood gathering. The vegetal biodiversity in Neotropical regions is extremely high, which makes it unlikely to find the same set of taxa in different contexts by accident. These deposits can be the undisturbed remains of fires made simultaneously with the same wood species. Alternatively, the remains of several fires could have been intentionally moved and mixed with each other. In all cases, it confirms the link that exists between the deposit of the central room and those of the east room.

5.2 Structure 60-5, Río Bec Plaza

The “Río Bec” Plaza received that name because some of the architectural features of Structure 60-4 are reminiscent of the Río Bec style. Its construction is dated to the first half of the 8th century. Toward

the end of the royalty and during the post-dynastic period (from the final Late Classic to the Terminal Classic), this was the political and ceremonial center of Naachtun, with Structure 6O-5 probably supplanting Structure 5O-5 in its political functions (Nondédéo et al., 2013b, n.d.; Sion, 2016).

Structure 6O-5 delimits the public space to the south (Figure 2). It comprises several rooms, some of which open to the north on the plaza, while others open on Patio 28 and the Southern Complex. Structure 6O-5 and adjacent areas were excavated between 2011 and 2013 (Díaz and Sion, 2014; Michelet and Nondédéo, 2012). Some of its architectural features, such as direct access to the plaza via a large stairway and the absence of an inner bench, reproduce those of Structure 5O-5 in smaller dimensions and attest to its public function. It also played a ceremonial role as evidenced by the axial niche built in the back wall. Inside the niche, melted remains of burnt resin and pine wood chips were uncovered, likely resulting from the burning of incense (Figure 9). Whether these remains can be attributed to the regular rituals that were certainly performed in this building or to its ritual abandonment is unresolved (Michelet and Nondédéo, 2012). However, a large ash and charcoal deposit (Deposit #5) was found on the intensely burnt floor just in front of the niche (Figure 4b), and this was clearly identified by radiocarbon dating as related to a post-abandonment fire (Table 3).

Just like the deposits of Structure 5O-5, this one proved to be richer in taxa than might be expected for a single fire. Eight taxa were identified among only 55 charcoal fragments: Sapotaceae (47 %), Sapindaceae (22 %, Figure 7.d, 7.e) including possibly canchunup (*Thouinia paucidentata*) and guaya (*Exothea sp.*), craboo (*Byrsonima sp.*, 11 %), guayabillo (Myrtaceae, *Myrciaria* type, 7 %), pine (*Pinus sp.*, 5 %), Mexican alvaradoa (*Alvaradoa amorphoides*, 5 %, Figure 7.f, 7.g) and marlberry (*Ardisia sp.*, 2 %). A second deposit of large charcoal fragments that did not result from an *in situ* fire was located on the outdoor platform (Deposit #6). It was associated with spiked censer fragments, suggesting its ritual function, and contained only 13 charcoal fragments: one of Sapotaceae, the others of Mexican alvaradoa. This latter wood taxon is quite uncommon in the Naachtun charcoal record. Its presence in these two on-floor deposits suggests that they are probably part of a same set.

In sum, the sets of deposits in these two buildings distinguish themselves from the other Naachtun deposits not only by their late date but also by their atypical pattern of formation and deposition: they are associated with censer fragments and vegetal resin, probably a type of incense, and they are composed of a high number of taxa despite the fact that they result from single fires.

6. Tracing late fire ceremonies at Naachtun

Such deposits as those of Structures 5O-5 and 6O-5, unique in their context and composition, have never been identified in other structures of Group B. The axial position of the main deposits, the deposition of charcoal with censer shards on the platforms and the richness of the wood species burnt are elements that suggest real staging in which fire, censers and plants are intertwined. Based on Classic Maya texts and imagery, scholars have assumed that there is a symbolic link between censers

and the *axis mundi* represented by the ceiba tree (*Ceiba pentandra*) (Freidel et al., 1993; Stuart 1998; Taube 1998). In particular, spiked censers have been interpreted to be representations of the spiny trunk of the ceiba (Rice, 1999). Taube (1998) showed that the association between the censer and the *axis mundi* is repeatedly featured in buildings and rituals, notably through the tree-censer motif. He hypothesized that the domestic hearth, traditionally placed at the center of the house, represents the world's center. In Structure 5O-5, the censers were burned together with the ritual fire components. This suggests that their role extended beyond that of simple containers for the burning of incense, and that their placement in the room center could have symbolized the domestic hearth as a locator of the world's center.

Exactly as ritual objects can hold several practical or symbolic functions in the ritual sequence, the wood burnt may have been more than simple fuel. The use of pine, for example, is well documented in pre-Hispanic and contemporary Maya societies, especially for its high flammability and fragrant smoke, which makes it a prime choice for ritual fires (Dussol et al., 2016; Lentz et al., 2016; Morehart et al., 2005). In the case of Structures 5O-5 and 6O-5, the high number of taxa gathered in single fires seems to contradict the principle of the least effort (Shackleton and Prins, 1992). If the only need was to provide fuel for a fire, only few different dead pieces of wood in the close woodlands would more probably have been collected. Moreover, while the predominance of Sapotaceae, craboo and pine is consistent with the usual fuel economy of the Terminal Classic Naachtun society, other wood species such as marlberry, Mexican alvaradoa, Euphorbiaceae, or those identified as possibly fustic, annatto and rosewood, were not or only occasionally used as firewood (Dussol, 2017; Dussol et al., 2017a). This suggests that fuel supply was not the only concern when these fires were built.

Some of these trees have long been used in the Yucatan Peninsula for their high-value products. Rosewood, in particular, has been a major source of precious timber; fustic also provides timber as well as a yellow to green dye used in textile craft; annatto fruits serve as condiment in traditional cuisine and as red dye for textile (Atran et al., 2004; Hellmuth, 2014). As highly valued trees, they may have had a symbolic meaning and could have been purposely burned for the occasion. Or, all these wood species (perhaps with the exception of pine that grows naturally in savannas) could have been randomly collected in the surrounding forest and burned together with the censers as a world center symbol, as if to evoke the territory and its rich vegetation (Dussol et al., 2016). Or even, charcoal remains from former fires could have been collected in other and perhaps remote abandoned structures and mixed with these ritual fires, explaining their high taxa richness. Such a practice could have been intended to express ancestral ties with the former Naachtun's inhabitants through the domestic hearth symbol (Pereira, 2013). Whatever the process and meaning, such as variety of wood species allows us to assume that there was an intentional effort to bring together multiple elements in single fires. Indeed, the ritual components may have no particular meaning when considered separately, but they might become meaningful once combined (Bonnardin et al., 2009).

445 Deposits #3 and #6 on the outdoor platforms stand out from this general pattern. The homogeneity of
the charcoal fragments which compose them and their secondary deposition suggest that they are the
remains of actual charcoal fuel produced elsewhere and used in this place to serve a specific function.
Can the incomplete censers placed in these deposits be an evocation of their role as incense burners?
Burning incense or aromatic wood chips on smoldering charcoal is an ageless practice throughout
450 Mesoamerica and the entire world (Niebler, 2017). No resin remains were detected in these deposits,
but the combustion process may have resulted in a differential preservation of materials depending on
their structure, chemical components and quantity. Although currently unverifiable, this assumption
appears quite plausible and could also explain the very localized deposition or *in situ* combustion of
large charcoal fragments in some of the household deposits (e.g. Deposits #7, #17, #19 and #20).

455 The symbolic meaning of these rituals clearly exceeds our understanding. But the common points
shared by the deposits in these two structures lead us to believe that the ceremonies in which they
originated were part of a unique event. Pagliaro and colleagues (2003) have envisaged the possibility
that termination rituals could have embraced several buildings in the same site, a feature not always
perceptible through limited excavations. The authors refer to contexts identified at Cerros and
460 Blackman Eddy, Belize, or at Yaxuná, Yucatán, where fragments of the same vessel were scattered in
several abandonment deposits. A similar layout was also noticed at El Palmar, Campeche, in a
Terminal Classic group (Tsukamoto, 2014: 386-390). In Naachtun, a set of deposits of this nature was
documented in Patio 28 in the Southern Complex, where human bones were removed from Burial 34
and dispersed in different sectors of the patio at the time of abandonment, resulting in apparently
465 distinct abandonment deposits (Sion, 2016). This particular case confirms that some ritual practices of
abandonment may have had a larger dimension than what is often perceived through single deposits,
as a same event might leave multiple deposits dispersed throughout several structures (Sion and
Arnauld, 2015).

In spite of their ritual origin, these rich spectra provide insights into past vegetation changes and help
470 us understand the environmental context in which these ceremonies took place. The overall low
proportion of Moraceae and of breadnut in particular could seem inconsistent compared with the wide
distribution of these trees in the present forests and with their frequent representation in the Central
Lowland pollen records. However, the socio-ecological significance of these results is difficult to
assess. We know through experimentation that breadnut wood (*Brosimum alicastrum*) almost
475 completely disappears during the combustion process in open-air conditions (Dussol et al., 2017b).
Consequently, it naturally leaves very few charcoal fragments compared to other wood species. On the
contrary, the presence of Sapindaceae in the deposits of both Structures 5O-5 and 6O-5 is noteworthy.
Their use as firewood at Naachtun decreased progressively from the end of the Preclassic period to the
Terminal Classic when they practically disappeared from the charcoal samples (Dussol, 2017).
480 Nowadays, these small trees are widespread throughout the Maya Lowlands in both the seasonally

flooded swamps and the upland forests, and they are among the most frequent species in the site's environment. Mentions of their uses are limited in ethnographic records to timber and firewood, excepting the species *Allophylus cominia* (*chile chachalaca*) which bears edible fruit. These trees may have been part of the wild vegetation around Naachtun during the Classic period that must have
485 regressed as the city was growing, since agroforestry practices tend to eliminate species considered less useful (Wiersum, 1997). Therefore, their resurgence in the late deposits probably reflects the return of the forest cover concomitantly to the city's abandonment and agricultural demise, which made them available again in the close environment.

Structures 5O-5 and 6O-5 are both edifices that dominated Naachtun's seat of power as materialized
490 by the Eastern Plaza during the Late Classic, then by the Río Bec Plaza during the second part of the Late Classic and later on. Built one after the other, both of them along with their annexes are devoid of any internal arrangement such as a bench that would suggest a residential function at any time of their history. Instead, these buildings were directly accessible from public spaces that have no equivalent structure, indicating that they likely served first and foremost as primary places where rulers
495 assembled and public ceremonies were held. The very proximity of vast residential complexes that were certainly home to Naachtun's elite members reinforces this assumption. Structure 6O-5 also regularly hosted religious ceremonies as demonstrated by the presence of the central niche, which could represent an architectural improvement compared to the former Structure 5O-5. Their analogous trajectories were concluded during the same period, after the demise of the city, through fire rituals
500 that surprise by their commonalities. This is evidence of an institutional continuum between the two buildings, linked to the exercise of power. Although the contemporaneity of these deposits is impossible to ascertain, these late rituals performed in some of the most prestigious buildings of Naachtun's public spaces also attest to the continuity and stability of collective memory and rites
505 (Nondédéo et al., 2018). Such ceremonies could have played a specific role in materializing the final abandonment of the city, distinct from that of the abandonment deposits usually found in houses, at a time when the site was already entering a process of reforestation.

7. Concluding the history, rising above the past

Historically, people have universally used rituals to invoke immaterial entities in order to control natural forces, prepare themselves for the unforeseen, reduce the impact of dramatic events and find
510 help through bad times. In such a troubled period as the Terminal Classic, the multiplicity of ritual acts in Maya cities informs us about the way people must have lived the slow disintegration of societal and political systems. The fall of the Naachtun dynasty seems to have led to critical divergences in occupation dynamics across the city and to its progressive abandonment from approximately 800 CE (Nondédéo et al., n.d.). While the majority of residential and civic-ceremonial spaces linked to the
515 royal family were subject to abandonment rituals, other residential complexes, particularly those

surrounding the Río Bec Plaza, underwent architectural transformations related to the contraction of the remaining population (Hiquet et al., 2018, n.d.). The social-political and economic reorganization that occurred from the end of the Late Classic did not suffice, however, to pull Naachtun's society through the crises that impacted most of the Central Lowland cities towards the end of the Classic period.

The majority of the inhabitants deserted Naachtun's urban area during the 9th and 10th centuries. The moment of their departure was accompanied by numerous rituals performed in their houses and amidst the ruins of already abandoned neighboring houses. The presence of deposits laid on the rubble of several structures, some located just above the remains of former abandonment rituals, demonstrates how very gradual the process was (Sion, 2016). It also highlights the importance of such actions for the people who kept in their memory the location of every deposit and went back to the ruins of their former residences to perform rituals (Schwake and Iannone, 2010). Termination rituals in houses and their accesses were probably performed to mark the completion of the sedentary life cycle within the city as represented by masonry residences. The incorporation of elements such as domestic trash or ancestor bones may have symbolized the successive generations that used to live there (Arnauld et al., 2013; Barrientos et al., 2015).

The case of the deposits found in Structures 5O-5 and 6O-5 was probably quite different. They are the remains of ceremonies performed several decades, perhaps one or two centuries, after the cessation of activities in these buildings and the departure of the last inhabitants of Group B, at a time when the ancient political core had already been overgrown by vegetation. Therefore, these rituals cannot be considered as a way of materializing the abandonment of the buildings themselves. They rather seem to have played a role in the veneration of the buildings that used to represent the greatness of the city and of its last leaders, and would thus express some collective memory built on Naachtun's history (Mixer, 2017; Nondédéo et al., 2018b). How does this memory express itself in the ritual sequence and can it be perceptible through the archaeological record are questions that will probably remain unanswered. Despite some distinctive features (i.e. their late dating, their location in public buildings, and their association with censers and incense remains) which make these particular deposits unique in Naachtun, the limits could seem blurred between the different patterns of deposition in both the households and the public buildings. The tendency to gather various elements to build unique fires, which is visible in their rich vegetal composition, could also be reflected, although to a lesser extent, in some of the household deposits which were defined as intermediate cases (Deposits #8, #9 and #11). Moreover, it is possible that these late deposits include the remains of former fires, which would bring them closer, in terms of action and meaning, to usual termination rituals in which ashes from middens are relocated inside houses. Finally, deposits in these two structures seem to be extreme cases within an extensive range of possible deposition and formation processes of ritual deposits.

During the Late Postclassic, Colonial and Contemporary periods, people went on pilgrimage to Maya ruins even though they had probably lost all direct connection with the places they visited. This explains why offerings were mainly deposited at the foot of stelae and on decayed pyramids (e.g. Hansen et al., 2008; Palka, 2014). Both are buildings that shape the landscape by their imposing dimension and strategic location (Halperin, 2014; Walker, 1990) but whose genuine political, religious or cultural significance was lost. In Naachtun, remains of deposits dated to the Late Postclassic period – including *Chen Mul Modeled* censers – were uncovered in Group A at the top of the city’s highest pyramid (Structure XX), which belongs to the time of the city’s foundation at the beginning of the Early Classic period (150–300 CE) (Walker, 2013: 113; Walker and Alvarado, 2005: 137). Significant quantities of resin remains (possibly of copal incense) were also discovered in the superficial debris of other monumental buildings of Group A and C. All these deposits were certainly part of Postclassic and latter pilgrimages to the site. Conversely, we believe that the late deposits in Structures 5O-5 and 6O-5 are not the remains of pilgrimages per se, especially as they lay on the original floors of the still standing buildings. Pilgrimage rituals are characterized by repeated acts of devotion sometimes related to vestige accumulation phenomena (e.g. Palka, 2014; Woodfill, 2010). The deposits in Structures 5O-5 and 6O-5 reflect instead single ceremonies that were probably held by people who were aware of the focal points of Naachtun’s society before its collapse, and thus, who were probably still tied to some degree to the history of the city.

We have discovered through recent surveys that populations persisted in the area of Naachtun after the 10th century, since a typical C-shaped Postclassic structure (dated to 950–1150 CE) was identified and excavated in Group C (Sion, 2019). No other clear Postclassic structure was evidenced in the urban area despite extensive field surveying. But this nevertheless means that it is possible that the late ceremonies were performed by people who still lived around the abandoned city. Furthermore, all successive residential abandonments were not necessarily definitive departures at the scale of the city and its surroundings (Arnauld et al., 2017b; Nondédéo et al., 2013a). Some families living near the epicenter may have gone closer to the last powerful groups established around the Río Bec Plaza, by settling in neighboring houses or reinvesting formerly abandoned places, while other families would have returned to a rural life in the hinterland (Hiquet et al., 2018, n.d.; Sion, 2016). This time of internal mobility or relocation within the city concomitantly to the progressive desertion of the urban area may have played a part in the preservation of the memory among the last occupants.

Living near the ruins and fallow lands is not inconsequential (Stanton and Magnoni, 2008), and the general abandonment of the Central Lowlands during the Terminal Classic certainly triggered severe identity crises among the population. The late ceremonies performed in the political buildings of Naachtun seem to express the need of the last occupants to celebrate for the last time the memory of the past glory of the city. In contrast with the termination rituals performed in households, these ceremonies would not have been the way to irrevocably prohibit entry into these particular buildings.

Instead, they would have terminated the occupation of the city and of its territory as a whole, in order to turn the page on the past before permanently leaving a region that had long been largely deserted. Equivalent to private rituals performed in the domestic sphere, these highly ritualized activities, probably related to the departure of the final families of Naachtun, would have marked the end of a time and the beginning of a new cycle, and prevented any temporal break (Baudez, 2002: 323-330).

8. Conclusion

This paper deals with a little-known aspect of ancient human livelihoods, which is the way people actually lived in troubled times and went through the multi-faceted changes inherent to the perpetual cycle of rise and fall of civilizations. The long crisis that definitively transformed the Maya Lowland landscapes at the end of the first millennium gave place to multiple behaviors of mobility, revealed through an extraordinary panel of complex and diverse abandonment deposits.

The thorough examination of the material and plant composition of deposits resulting from abandonment and post-abandonment rituals in Naachtun provides an additional degree of understanding of the behaviors involved in the process of abandonment. This study allows us to put forward the institutional continuity that existed between the two political buildings 5O-5 and 6O-5, as well as the continuity of rites and the persistence of a local memory. Ritual practices participated in the construction of cultural and social identities, and ensured permanency. Between the two extremes represented by the very rich ritual fires that were lit in these buildings, and the mono-specific charcoal deposits that were placed in precise locations of some houses, the range of possible deposits is wide and could probably expand as other deposits are excavated and analyzed. Other political buildings of the site were also certainly used for ceremonies of abandonment that could have been more varied than we can imagine (Nondédéo and Dussol, 2019). Some ritual acts performed in distant places may have been related with each other as suggested by the similarities between the deposits of Structures 5O-5 and 6O-5.

We argue that these late ceremonies were held by people who were still tied to the city. This allows us to advance the hypothesis that they played a role in materializing the final abandonment of Naachtun and of its territory, as they seem to have symbolically closed the buildings which had made the glory of the city and of its rulers. This study thus provides indirect evidence that human settlements persisted around the abandoned cities for some time after the collapse of Classic political systems. Future field survey and excavations in Naachtun's hinterland based on LiDAR imagery will certainly expand our views of the dynamics of occupation and mobility at a more regional level during the post-collapse period.

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Table 1. Details of Group B deposits that underwent charcoal analysis. Density of macro-botanical remains is indicated only for flotation samples.

Dep#	Nature of deposit	Location and description	Macro-botanical remains density (g/L)
Political buildings			
1	<i>In situ</i> burning	Structure 5O-5, axial hearth, central room	-
2	<i>In situ</i> burning	Structure 5O-5, multiple on-floor deposits, east room	0.36
3	Secondary deposit	Structure 5O-5, exterior deposit in front of east room entrance	-
4	<i>In situ</i> burning	Structure 5O-4, exterior hearth in front of back entrance	1.82
5	<i>In situ</i> burning	Structure 6O-5, on-floor deposit in front of wall niche	-
6	Secondary deposit	Structure 6O-5, exterior deposit in front of entrance	-
Households			
7	<i>In situ</i> burning	Patio 6, on-floor deposit in front of bench	2.73
8	<i>In situ</i> burning	Patio 22, on-floor deposit inside room	0.57
9	<i>In situ</i> burning	Patio 21, deposit inside bench niche	1.86
10	Secondary deposit	Patio 21, deposit inside unsealed hole	1.95
11	<i>In situ</i> burning	Patio 22, on-floor deposit inside room	0.72
12	Secondary deposit	Patio 22, thick ash layer inside room	1.19
13	Secondary deposit	Patio 28, exterior on-floor deposit	0.21
14	Secondary deposit	Patio 28, exterior on-floor deposit	0.45
15	Unclear	Patio 28, deposit inside bench niche	-
16	Secondary deposit	Patio 31, on-floor deposit in front of bench	0.01
17	<i>In situ</i> burning	Patio 31, axial deposit in rubble	1.14
18	Secondary deposit	Patio 31, axial on-floor deposit	0.14
19	Secondary deposit	Patio 31, exterior deposit in unsealed hole	4.06
20	<i>In situ</i> burning	Patio 32, axial deposit in rubble	2.04

Table 2. Anthracological data: number of charcoal fragments per taxa in Group B abandonment deposits.

Taxon	Common name	Deposit #																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Shrubs or small trees																					
<i>Byrsonima sp.</i>	Craboo	4	18	-	-	6	-	-	-	7	7	1	28	7	4	4	-	-	-	-	2
<i>Cordia cf. dodecandra</i>	Siricote	-	-	-	-	-	-	-	6	-	4	4	-	-	4	-	-	-	-	-	-
<i>Eugenia/Psidium</i>	Guayabillo/Guayava	-	1	-	2	-	-	-	3	2	-	16	2	-	1	-	-	-	-	-	-
<i>Myrciaria type</i>	Guayabillo	-	1	-	-	4	-	-	2	-	3	1	3	2	9	-	-	-	-	-	-
<i>Haematoxylum sp.</i>	Logwood	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Diphysa cf. carthagenensis</i>	Guachipilin	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-
<i>Gliricidia sepium</i>	Gliricidia	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	30
<i>cf. Gliricidia sepium</i>		-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
<i>cf. Caesalpinia yucatanensis</i>	Cocoite	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
<i>cf. Indigofera suffruticosa</i>	Anil indigo	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
<i>Albizia/Acacia</i>	Legume	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-
<i>Acacia/Vachellia</i>	Legume	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>Alvaradoa amorphoides</i>	Mexican alvaradoa	-	-	-	-	3	12	-	-	3	-	-	5	-	-	3	-	-	-	-	-
<i>Adelia/Gymnanthes/Sebastiania</i>		9	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Adelia/Sebastiania</i>		-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Croton sp.</i>		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
<i>Allophylus sp.</i>		3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>cf. Allophyllus</i>		-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Maytenus sp.</i>		-	-	-	-	-	-	-	2	-	-	4	2	1	-	-	1	-	-	-	-
<i>Gymnopodium cf. floribundum</i>	Dzidzilche	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-
<i>Coccoloba sp.</i>		-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
<i>Ardisia sp.</i>	Marlberry	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
<i>Zanthoxylum sp.</i>		-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
<i>Semialarium mexicanum</i>	Guaracho	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
<i>Cynophalla/Quadrella</i>		-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
<i>Astrocasia/Phyllanthus</i>		-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
<i>cf. Bixa sp.</i>	Annatto	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>cf. Euphorbia sp.</i>	Spurge	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-

Taxon	Common name	Deposit #																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Trees																					
Sapotaceae	Sapote	123	237	39	134	26	1	102	65	-	9	26	28	13	22	-	7	81	15	52	-
<i>Pouteria</i> type	Sapote	-	5	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-
<i>cf. Pouteria durlandii</i>	Sapote	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-
<i>Pinus</i> sp.	Pine	16	172	-	4	3	-	-	1	59	-	2	-	40	28	3	8	-	1	-	-
<i>cf. Thouinia paucidentata</i>	Canchunup	21	49	-	-	5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
<i>cf. Exothea</i> sp.	Guaya	-	-	-	-	3	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
<i>Astronium</i> sp.	Goncalo alves	16	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45
<i>Metopium cf. brownei</i>	Poison wood	-	-	-	-	-	-	-	-	-	2	1	-	-	-	3	-	-	-	-	-
<i>Brosimum cf. alicastrum</i>	Breadnut	-	2	-	-	-	-	-	-	-	26	13	2	-	-	-	-	-	-	-	-
<i>Brosimum/Pseudolmedia</i>		-	8	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
<i>Brosimum/Trophis racemosa</i>	Breadnut	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>cf. Maclura tinctoria</i>	Fustic	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Piscidia piscipula</i>	Jamaican dogwood	11	14	-	2	-	-	-	-	-	10	-	3	-	1	-	-	-	-	-	-
<i>Lonchocarpus</i> sp.	Legume	-	-	-	-	-	-	-	1	-	4	-	-	-	-	-	-	-	-	-	-
<i>Lonchocarpus/Pisicidia</i>	Legume	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Enterolobium/Lysiloma</i>	Legume	-	-	-	-	-	-	-	-	4	-	-	3	-	-	-	-	-	-	-	-
<i>cf. Lysiloma aurita</i>	Legume	-	-	-	-	-	-	-	-	6	23	-	-	-	-	-	-	-	-	-	-
<i>Havardia/Pithecellobium</i>	Legume	-	-	-	-	-	-	-	-	-	12	-	6	1	1	-	-	-	-	-	-
<i>Cojoba/Pithecellobium/Zygia</i>	Legume	-	-	-	-	-	-	-	-	-	1	-	4	-	-	8	-	-	-	-	-
<i>cf. Albizia</i> sp.	Legume	-	5	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
<i>cf. Inga</i> sp.	Legume	-	-	-	-	-	-	-	-	-	4	-	3	-	-	-	-	-	-	-	-
<i>Dalbergia cf. stevensonii</i>	Rosewood	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Bucida buceras</i>	Black olive	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
<i>Licaria/Nectandra</i>		-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
<i>cf. Protium</i> sp.		-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Other/Undetermined																					
Monocotyledones		-	-	-	-	-	-	-	-	-	4	1	-	-	-	-	11	-	-	-	-
<i>cf. Bambusoideae</i>	Bamboo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Und. Fabaceae	Legume	-	-	-	3	-	-	-	-	-	2	1	2	-	-	-	-	-	-	-	-
Und. Sapindaceae		1	16	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-

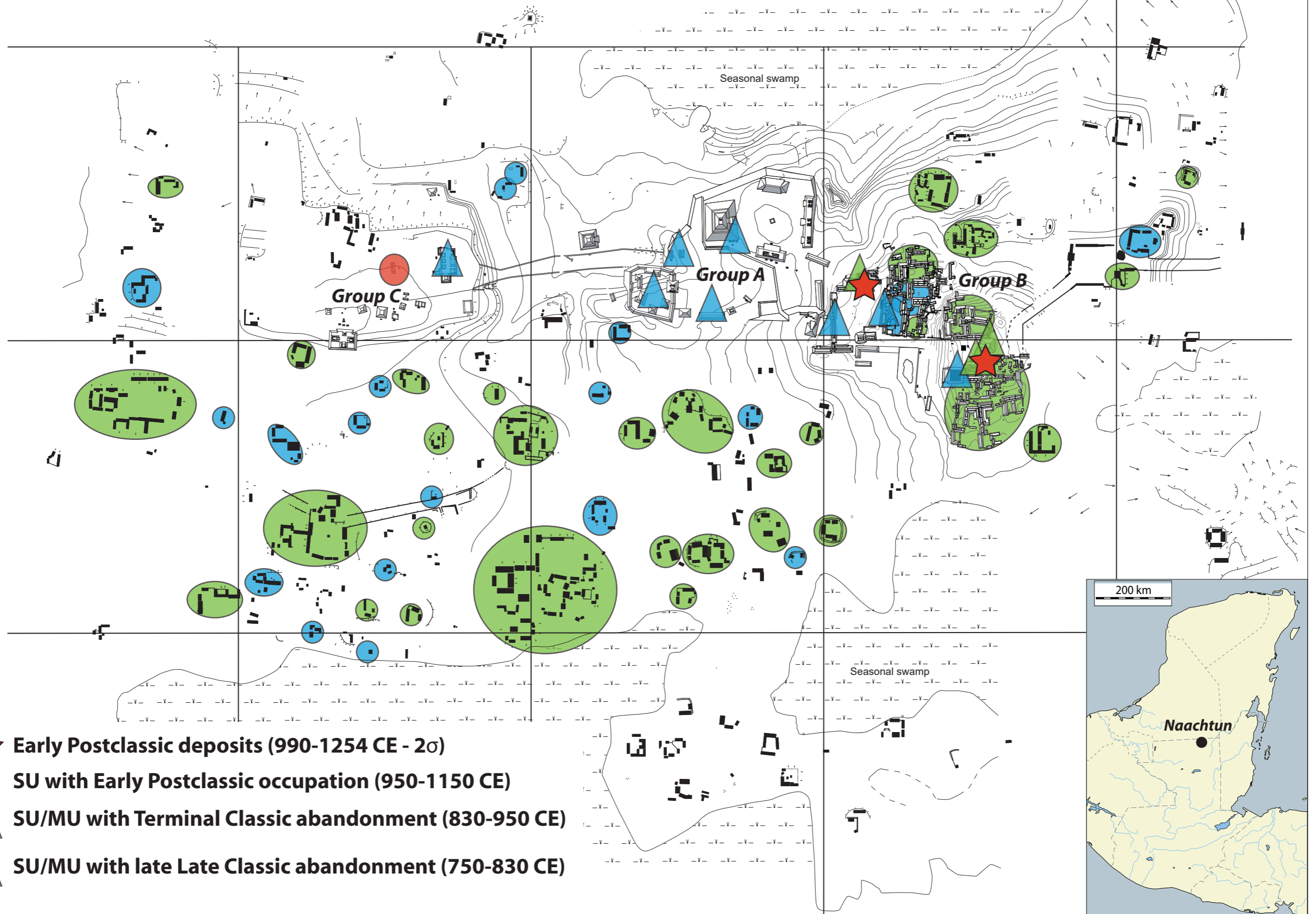
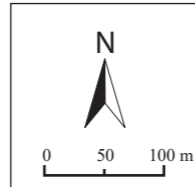
Taxon	Common name	Deposit #																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Und. Anacardiaceae		-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cf. Myrtaceae		-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Undetermined Type 1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-
Undetermined Type 2		-	1	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-
Undetermined Type 3		-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-
Undetermined Type 4		-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Undetermined Type 5		-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Undetermined Type 6		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Undeterminable		12	24	-	3	5	-	-	1	-	7	3	19	12	6	-	3	6	2	-	3
Total number of charcoal fragments		225	571	39	148	60	13	103	90	81	153	75	120	78	80	21	33	98	24	52	80

870 Table 3. Radiocarbon dates for Group B deposits and domestic middens (IntCal13 atmospheric curve [Reimer et al. 2013]).

Id number	Description and location	Age BP	Calibrated intervals 2σ
UBA-24869	Deposit #1. Structure 5O-5	860 \pm 27	1051–1082 CE (7.9 %) 1129–1132 CE (0.6 %) 1151–1254 CE (91.5 %)
Poz-89390	Deposit #1. Structure 5O-5	910 \pm 30	1033–1090 CE (94 %) 1198–1204 CE (1.4 %)
Poz-89391	Deposit #5. Structure 6O-5	985 \pm 30	990–1056 CE (51.3 %) 1077–1154 CE (44.1 %)
UBA-24874	Deposit #12. Patio 22	1141 \pm 27	777–792 CE (5.2 %) 802–845 CE (10 %) 856–979 CE (84.8 %)
Poz-89844	Deposit #8. Patio 22	1155 \pm 30	775–969 CE (95.4 %)
UBA-24873	Deposit #20. Patio 32	1169 \pm 29	772–902 CE (84.9 %) 919–963 CE (15.1 %)
UBA-24871	On-floor domestic midden, Patio 28	1143 \pm 38	776–794 CE (7.7 %) 797–980 CE (92.3 %)
UBA-25218	On-floor domestic midden, Patio 34	1194 \pm 27	725–738 CE (2.2 %) 768–894 CE (96.6 %) 930–938 CE (1.2 %)

Map of Naachtun

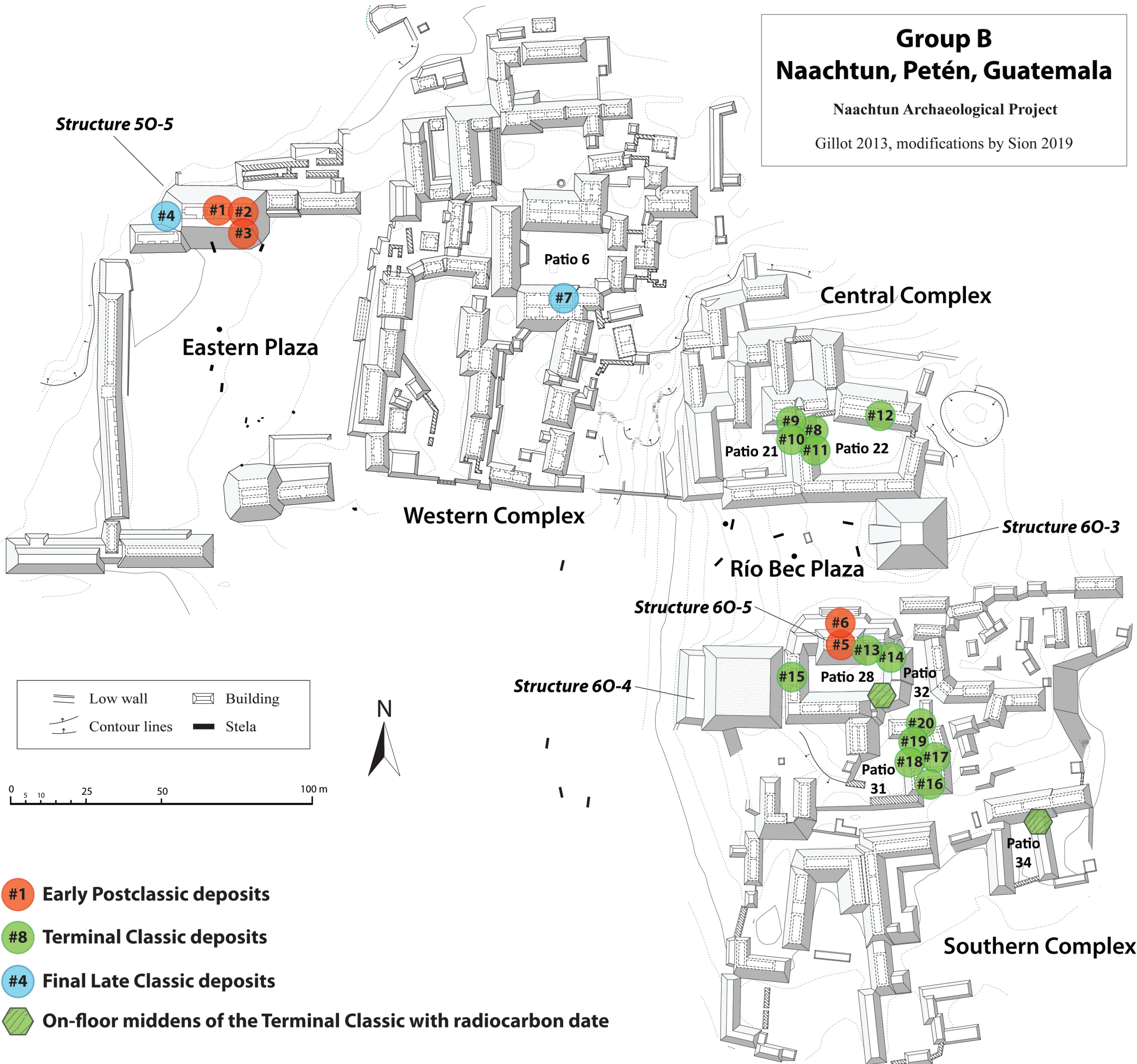
Ruppert and Denison 1943; Morton 2007; Lemonnier 2013;
modifications by Hiquet, Sion and Perla-Barrera 2019



Group B Naachtun, Petén, Guatemala

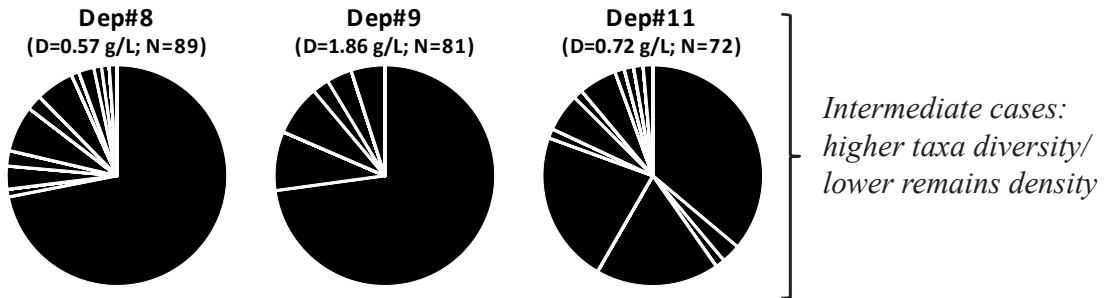
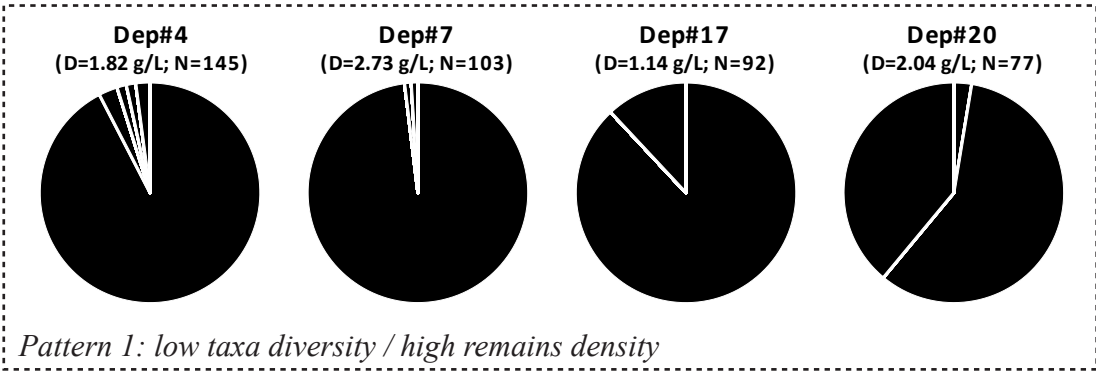
Naachtun Archaeological Project

Gillot 2013, modifications by Sion 2019

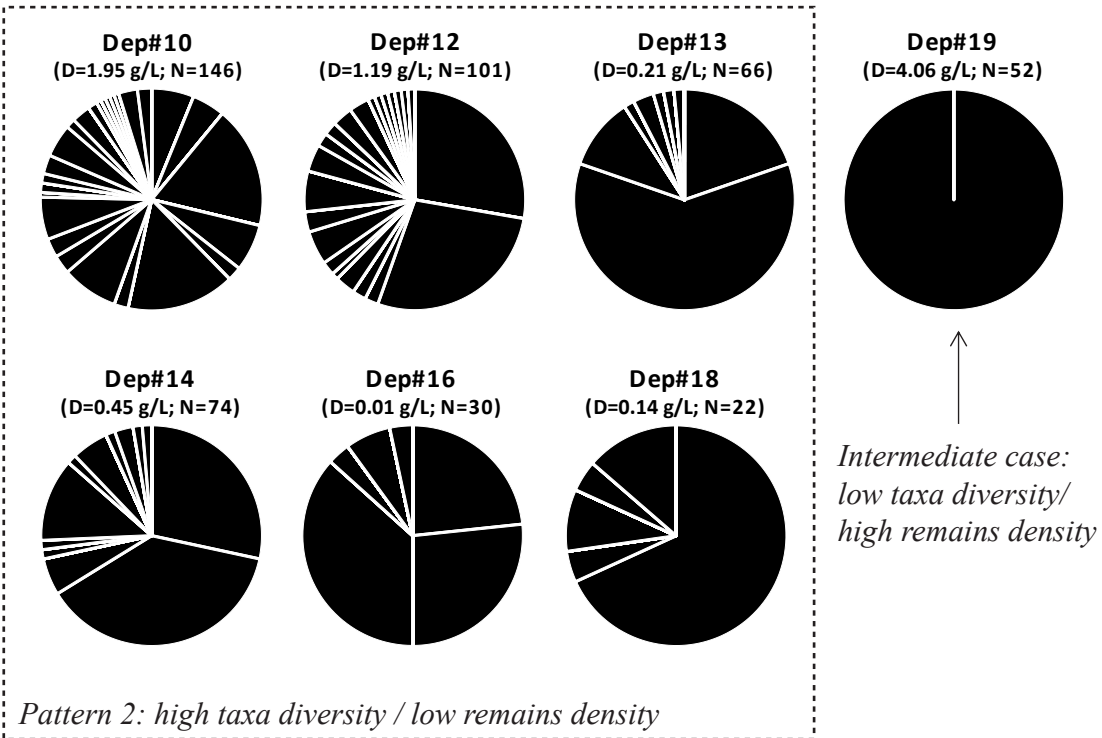


- #1 Early Postclassic deposits
- #8 Terminal Classic deposits
- #4 Final Late Classic deposits
- ▣ On-floor middens of the Terminal Classic with radiocarbon date

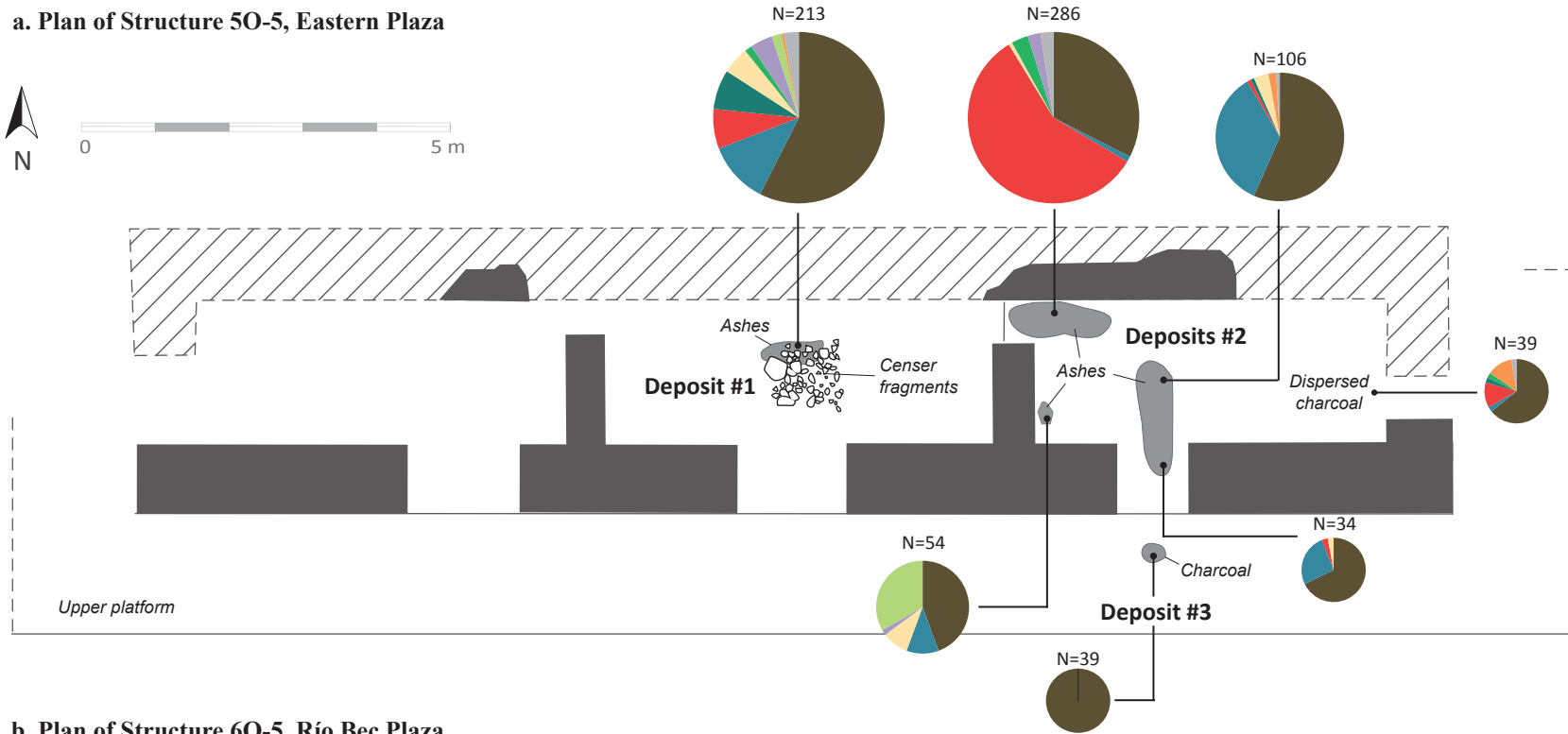
In situ burning



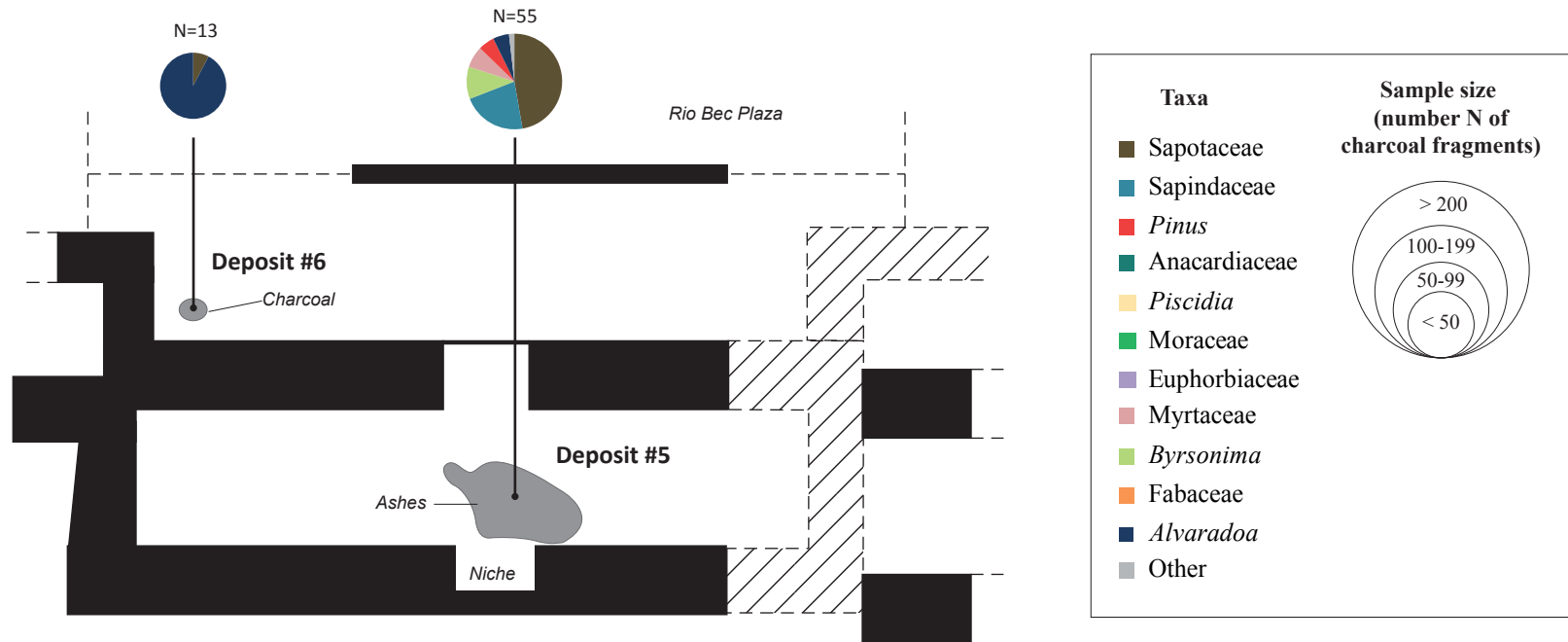
Secondary deposits



a. Plan of Structure 50-5, Eastern Plaza

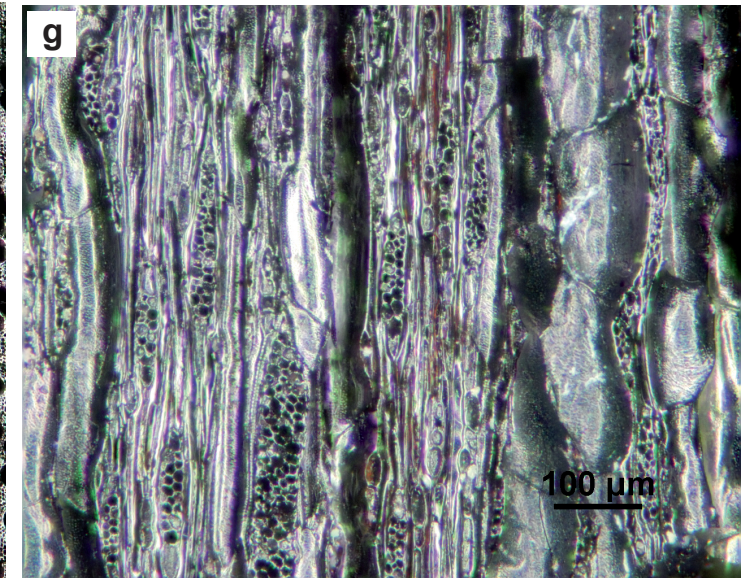
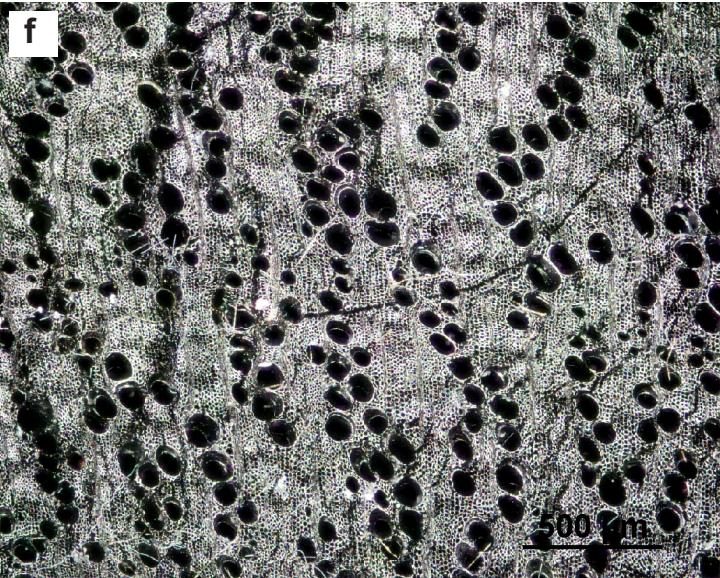
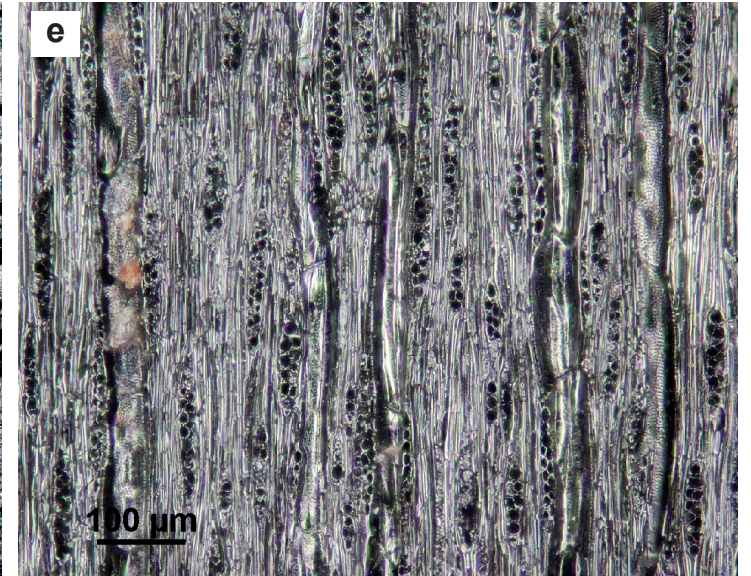
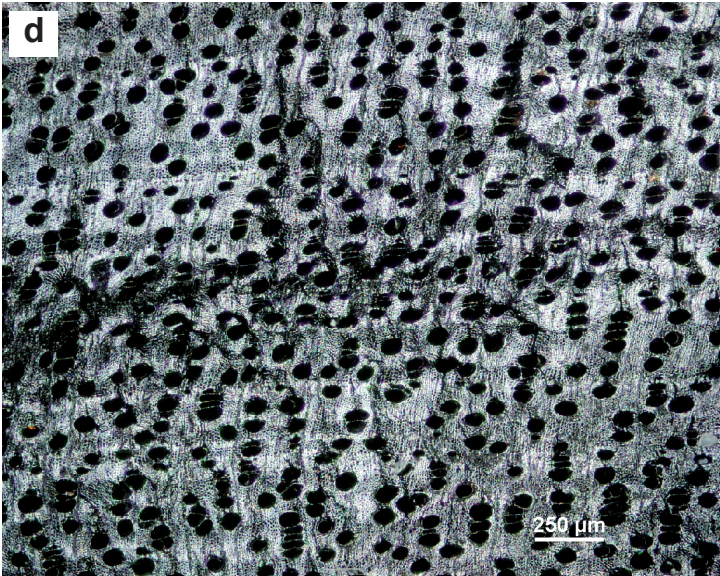
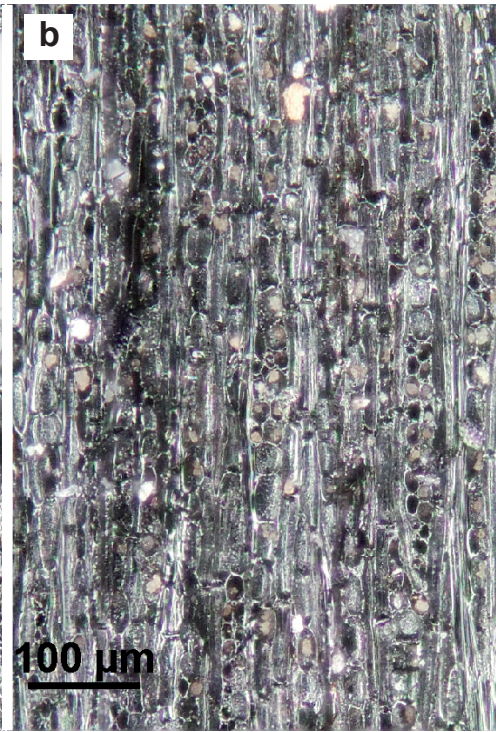
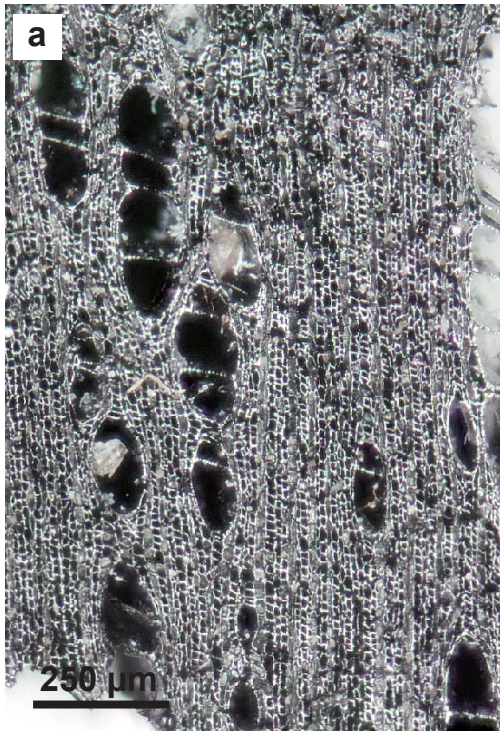


b. Plan of Structure 60-5, Río Bec Plaza



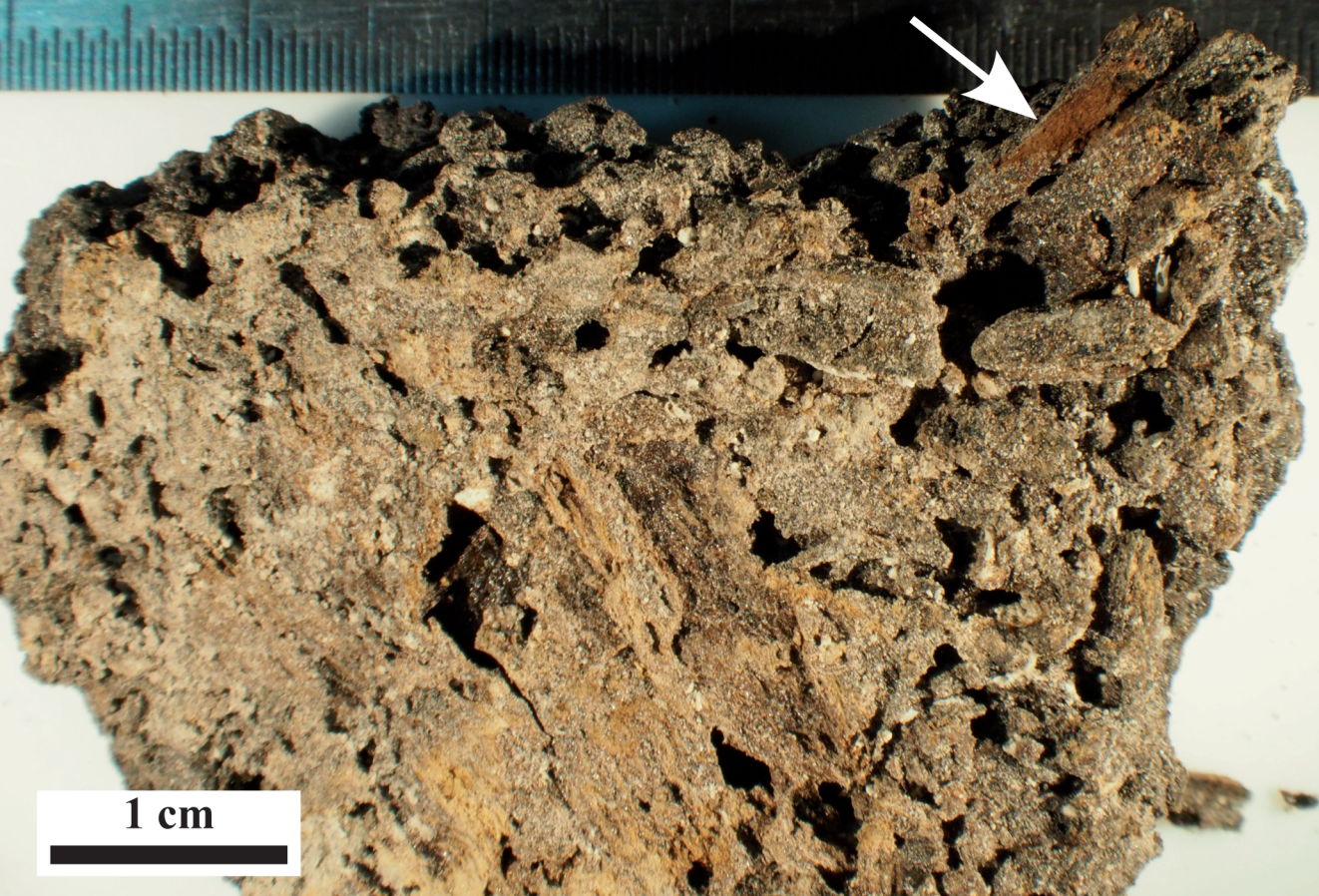
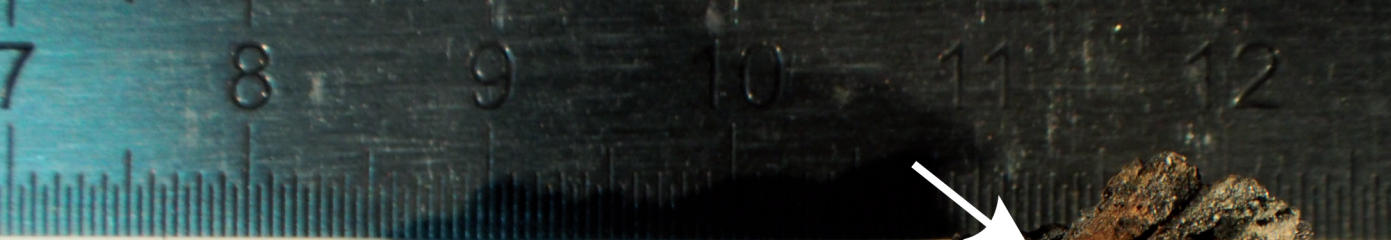








2 cm



1 cm