2 DISTRICTING AND URBAN SERVICES AT CARACOL, BELIZE: INTRA-SITE BOUNDARIES IN AN EVOLVING MAYA CITYSCAPE

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Urban research in the Maya area often focuses on either the city as a whole, individual house groups, or neighborhoods as clusters of house groups; however, administrative districts provide another level of urban analysis. Administrative district identification rests on the assumption that specific architectural features and civic planning can be used as proxies for administrative services provided by the city and, as such, can be used to identify districts. With this simplification in mind: formal plazas served as spaces for markets and other large gatherings; ballcourts allowed spectators to watch ballgames; formal reservoirs stored rainwater runoff; and, E Groups provided ceremonial and ritual services. Each of these architectural features provided a service to city residents, occurs exclusively within nodes of monumental architecture often integrated by the causeway systems, and are easily distinguished and identified within the maps and LiDAR derived DEM datasets of Caracol, Belize. This investigation demonstrates that four of these features exhibit a strict scaling relationship. At Caracol, any node of monumental architecture with an E Group or a formal reservoir possessed a ballcourt, and all centers with ballcourts possessed formal plazas. The converse of the above statement does not hold. Thus, using feature distribution and two allocation methods, this paper identifies potential political or economic districts at Caracol.

Introduction

The cities of the ancient Maya have long proved difficult to understand, as highlighted by the inability of V. Gordon Childe's (1950:9) comparative definition of urbanism to reconcile both Mesopotamian and Maya urban traditions. Once thought to be vacant ceremonial centers (Vogt 1961; 1964), we now recognize these sites as cities, some with large populations (A. Chase and D. Chase 1994; A. Chase et al. 2011). The Maya interspersed households within agricultural areas (Healy et al. 1983; A. Chase and D. Chase 1998) with a density characteristic of modern suburban settlement. Maya cities are classic examples of what has been termed "low-density urbanism" (Fletcher 2012; Isendahl and Smith 2012). While a cursory examination of this concept insinuates something barely urban, it also applies to contemporary cities and their greater urban areas, such as Boston and Philadelphia (Table 1). Unlike more "typical" urban centers like New York, London, or Paris – these cities possess urban sprawl and low overall population densities; however, with the inclusion of greater city areas, downtowns and their outlying suburbs, even some of these contemporary cities have the density of low-density urban settlements (Gober 2005:107-108 and Table 2).

More recently, in order to advance comparative urban studies, some researchers have begun to investigate the underlying features of urban organization including sprawl, sustainability, longevity, resilience, and inequality (Barthel and Isendahl 2013; Stanley et al. 2015; Smith 2010a, 2012; Smith et al. 2012; York et al. 2011). Others have created comparative typologies of urban open spaces and their distribution throughout the cityscape (Stanley et al. 2012: Figure 1). This study emphasizes the idea that analysis of urban architectural features permits comparisons of urban forms, functions, and boundaries across time and space. As such it allows modern and archaeological cities to be compared (Stanley et al. 2015). Utilizing this comparative idea, this paper applies similar urban service methods in order to analyze a series of high-level replicative architectural features: formal plazas, ballcourts, formal reservoirs, and E Groups as centroids of urban services at the ancient city of Caracol in modern day Belize (Figure 1).

Caracol was occupied from roughly 600 BCE to 900 CE. It reached its peak population of over 100,000 people around 650 CE (A. Chase and D. Chase 1994:5). The lack of occupation for the region after the city's abandonment has preserved its palimpsest of archaeological significance under the rainforest canopy. The basic residential unit at Caracol, the *plazuela* group, consisted of four or more structures built surrounding a central plaza in which an extended family lived (D. Chase and A. Chase 2004; A. Chase and D. Chase 2014). Urban integration occurred through a network of causeways linking monumental architecture

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Table 1. Densities of Greater Metropolitan areas of modern cities (Gober 2005:107-108 and Table 2) juxtaposed with Caracol's population density near the epicenter.

City	Density (people per sq. km.)
Atlanta	~ 690
Boston	~ 890
Caracol (Near Epicenter)	**~ 940**
Philadelphia	~ 1100
Washington D.C.	~ 1310
Phoenix	~ 1400
Chicago	~ 1500
New York City	~ 2050

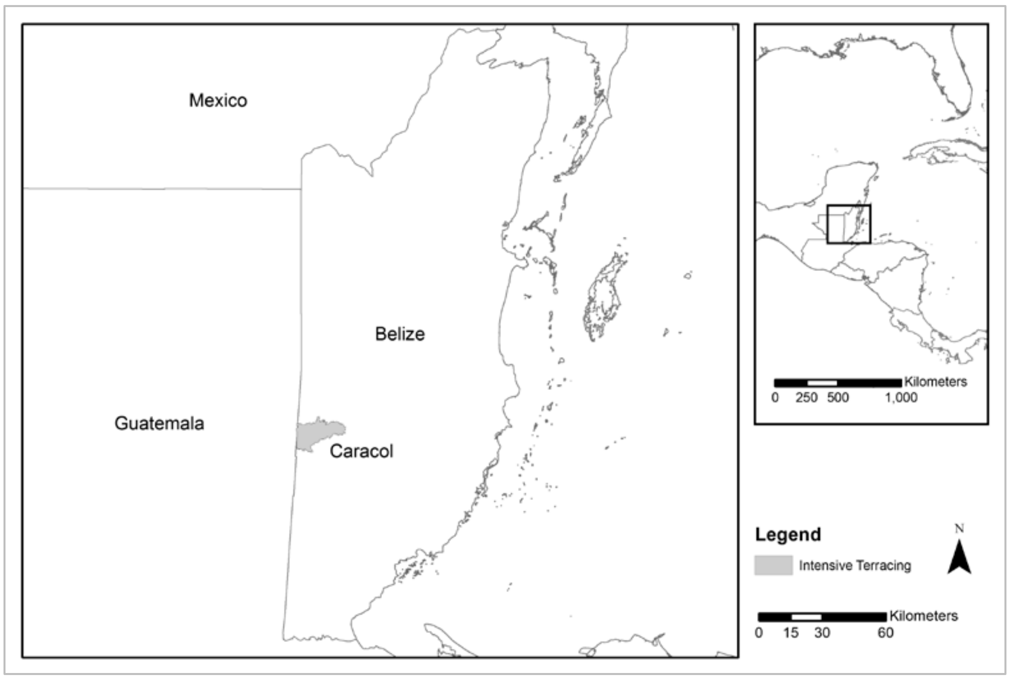

Figure 1. The location of Caracol and the extent of intensive terracing around the city. Terraces extend in valley bottoms beyond this boundary.

across the city (A. Chase and D. Chase 2001, A. Chase et al. 2011). The monumental architecture at the nodes of the causeway system incorporated exaggerated forms of the *plazuela* unit with much larger formal plazas, ballcourts, reservoirs, and ritual horizon-based astronomical observatories called E Groups.

Causeways link the epicenter, the city's central hub and the location with the largest concentration of monumental architecture, to outlying termini groups, locations with large formal plazas and additional monumental architecture. The people of Caracol constructed this monumental architecture exclusively in specific nodes. The rest of the urban landscape consisted of residential *plazuelas*, agricultural terraces, and small reservoirs for rainwater storage. The causeways fully integrated these nodes within the agricultural and residential space of Caracol.

The uniformity of these house groups, terraces, and reservoirs provide no clear indication of diagnostically neighborhood-level architectural features. While some researchers use settlement clustering or other metrics to identify neighborhoods (see overviews in Robin 2003:330-331 and Smith and Novic 2012:11-12), districts provide an alternative unit of intermediate settlement analysis that is well-suited to the study of large-scale settlements (Smith 2010b; Smith and Novic 2012:4-5). Districts provide for the administrative needs of the governing system and divide the city into sub-units comprised of multiple neighborhood groups. The top-down nature of this sub-division requires the construction of specialized spaces for administrative functions to take place.

As such, the uniqueness and repetitive occurrences of architectural features exclusively in the epicenter and monumental nodes of architecture is used to argue for potential services that could have been provided. Christaller's Central Place Theory (1966) and Fletcher's "Limits of Settlement Growth" (1995) both provide the theoretical basis for analyzing formal plazas, ballcourts, large reservoirs, and E Groups as features that provided services and allow us to identify potential intra-site boundaries at Caracol based on service areas and potential administrative districts.

The Theory of Urban Services

Central Place Theory (Christaller 1966) attempts to explain the distribution of goods and services in modern cities based on two essential but opposing forces. First, consumers will travel different distances for different types of services. For instance, people travel farther to buy a car than to buy bread. Second, service providers naturally tend toward centralization to maximize the economy of scale. Consumers "pull" services toward themselves based on willingness to travel specific distances, and the service providers "pull" services away from consumers through their desire for centralization. The resulting balance determines the locations of service features according to this model (Krugman 1996:13-15).

Fletcher's (1995) model of city size focuses on factors determining the limits of settlement instead of service features. In his model, two limiting factors determine the ultimate extent of an urban settlement's size. The communication limit (C-limit) restricts settlement size based on the communication technology available and the interaction limit (I-limit) represents the mental capacity and associated costs for social interaction based on the built environment of the settlement, for example through the construction of walls. Following Fletcher, these two limiting factors can only be exceeded or altered by introducing new technologies thereby increasing the distance of communication, or through cultural changes reducing the cost or frequency of social interaction. While these factors can be used to describe the maximum extent of most cities, low-density urban cities ignore these limits (A. Chase et al. 2011, Fletcher 1995 Figure 5.12, and Figure 2), and exceed Fletcher's one-hundred square kilometer urban limit on pre-industrial settlement (Fletcher 1995:93-94).

Finally, following Smith (2010b:140) I use the administrative districts concept to investigate urban structure of a zone with management functions that aggregates smaller neighborhood-level organization. Districts provide for administrative subdivision of primarily residential urban areas and may have unique architectural features. Often these areas have unique social identities and consolidate multiple neighborhood groups together (Smith 2010b:140). One product of district research is the urban open spaces model created by Stanley, Stark, Johnson, and Smith (2012). This model creates a system for discussing open space urban features – transport facilities, streets, plazas, recreational space, incidental space, parks and gardens, and food production – some of which provide urban services at different scales: citywide, intermediate, and residential (Stanley et al. 2012: Figure 1). While many of the specific features within this application are not present or easily identifiable for the ancient Maya, the open spaces approach provides

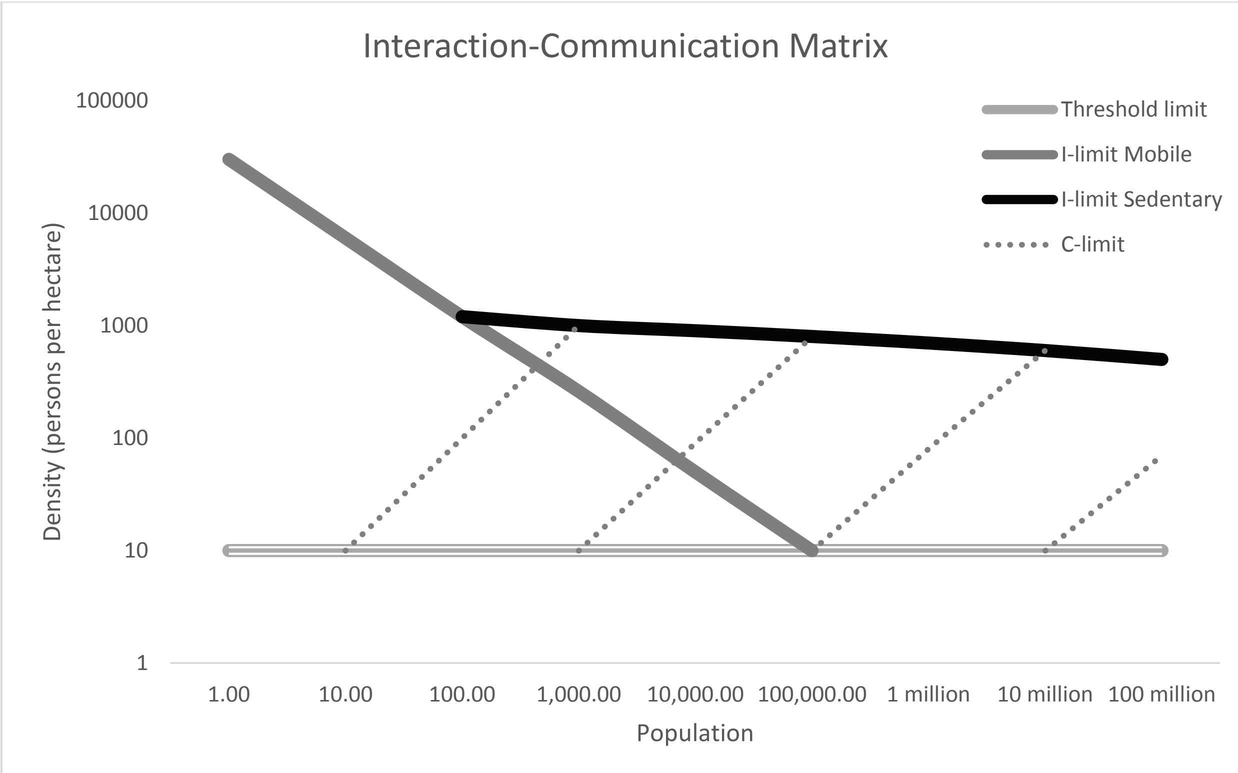

Figure 2. Re-creation of the graph of settlement trajectories after The Limits of Settlement Growth (Fletcher 1995: Figure 7.5). Low-density urbanism falls under the threshold limit and thus slips underneath the interaction and communication boundaries that would ordinarily limit settlement size.

archaeologists with a basic framework for investigating potential urban services.

Open Spaces Model of Ancient Caracol

Three types of open spaces can be identified at Caracol: causeways, plazas, and terraces; the first two of these features provided urban services. The streets of Caracol, the *sacbeob*, connected all of the termini groups to the city center. There are a few causeways at Caracol which act as spurs that attach households or potential neighborhoods to the main road system (A. Chase and D. Chase 2001). The causeways do not connect every household into the larger road system. While routes from the houses to other houses, to terraced fields, or to the main road system must have existed, such informal paths have long since been erased by time.

Two types of plazas occur at Caracol with no easily identifiable intermediate level. Large, formal plazas exist in the epicenter and at nodes of monumental architecture (see Figure 3), while small residential plazas exist within the basic *plazuela* unit. There are no mid-range plazas, which may have served as neighborhood-level plazas, and there are insufficient formal plazas for those locations to have served as neighborhood-level features. Thus, the number and distribution of formal plazas may be used to subdivide Caracol into potential administrative or economic districts (Figures 4, 5).

The final open feature at Caracol, which is easily seen but difficult to measure, is the agricultural terrace system (A. Chase and D. Chase 1998; Murtha 2002). Given their extent at the site, their role in maintaining site population, and the labor that would have been required to build and maintain them, an argument that they likely served a city-level open-space function would not be unjustified (A. Chase and D. Chase 1998:73). Even so, insufficient evidence exists to attribute terraces to a citywide, district, neighborhood, or household scale without additional data, excavation, and computational pattern matching.

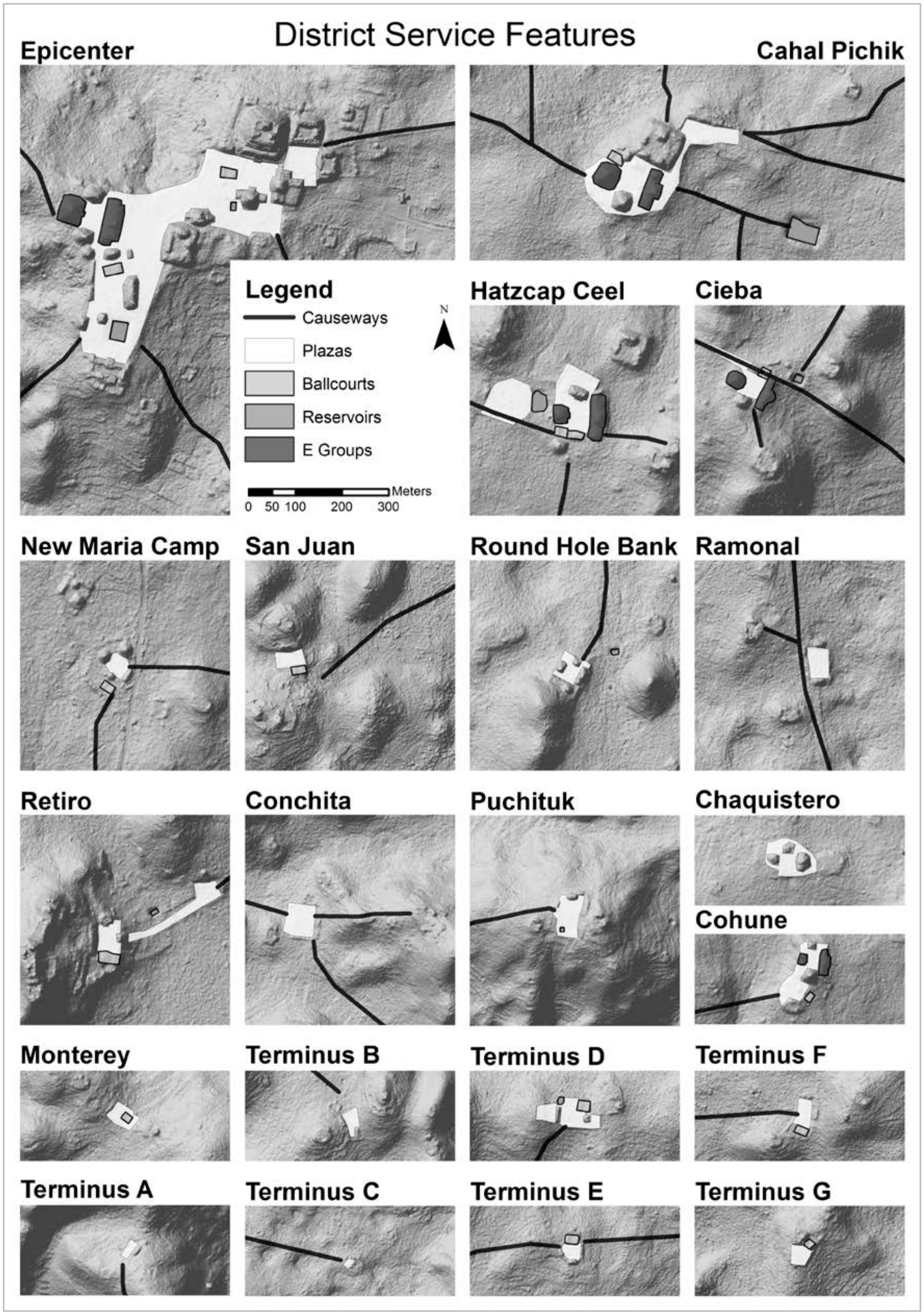

Figure 3. Service features at Caracol's epicenter and monumental groups to the same scale.

Figure 4. Service areas represented by Voronoi diagrams (Thiessen polygons) of architectural features present at the monumental groups. The edges are bounded by the extent of either intensive terracing or the 2013 LiDAR dataset.

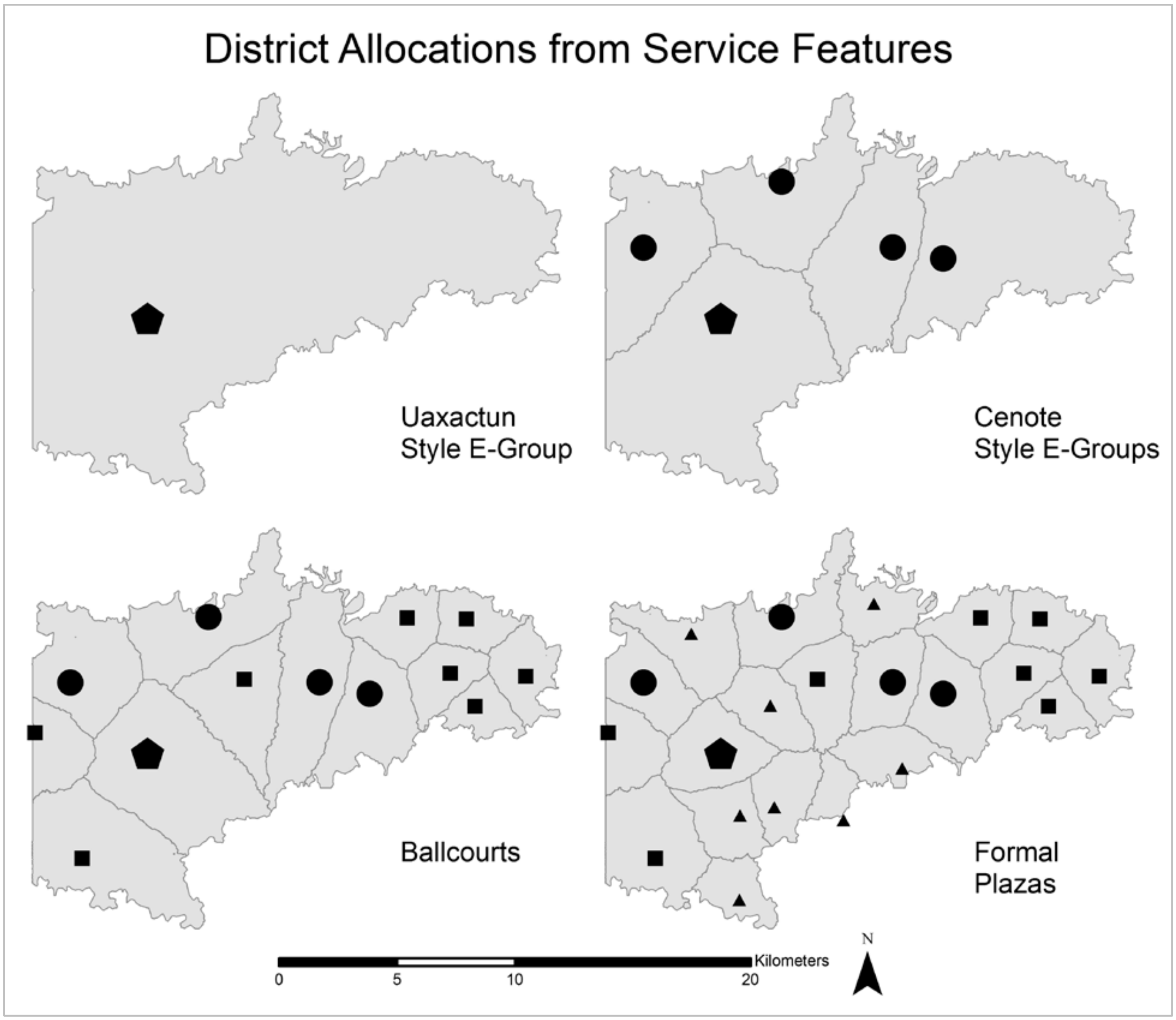

Figure 5. Service areas represented by the least cost path allocation of architectural features present at the monumental groups. The friction surface was generated from applying Tobler's hiking function on slope. The edges are bounded by the extent of either intensive terracing or the 2013 LiDAR dataset.

Additionally, terraces do not act as an urban service facility and, as such, they are not part of this analysis.

The resulting dichotomy of either district or household level features from application of the Stanley et al (2012) open spaces model demonstrates the lack of permanent neighborhood-level architectural, open-space features. The service features that are present – causeways and plazas – seem to exist predominantly at either the residential or the city scale. Intermediate scale neighborhood open space architectural features cannot be confidently identified based on existing survey data or the Digital Elevation Model (DEM) derived from the LiDAR dataset (A. Chase et. al 2011). This is not used to argue against the existence of neighborhoods at Caracol or that neighborhood groups could not be identified through household clustering, local topography, or similar artifact assemblages. Instead, there appears to be a lack of any preserved formal structure indicating a neighborhood-level administrative function. The lack of neighborhood-level intermediate features may indicate that the spacing of the households at the residential scale and the spacing of the nodes of monumental architecture at the city level scale helped the site exceed the potential integration and communication limits (Fletcher 1995) on settlement growth. Alternatively, intermediate level neighborhood features may have been constructed out of perishable materials that have not been preserved.

Urban Service Features

An identification of urban surface features provides additional specificity to the determination of mid-level organizational districts. Four specific architectural features characteristic of the Caracol epicenter and nodes of monumental architecture are used in this analysis because of scholarship linking these features to urban services and because they can be identified in the mapping and DEM datasets. Each feature is briefly introduced here and detailed further in the following paragraphs. Large, formal plazas existed at all of these nodes and, as large open spaces, these gathering places were likely used for multiple purposes as markets, ceremonial spaces, political theaters, and locations of social events. The pan-Mesoamerican ballgame necessitated the presence of ballcourts; ballcourts at Caracol existed at the epicenter or in nodes of monumental architecture. While residential reservoirs existed throughout the landscape, large formal reservoirs only occurred at the epicenter and nodes of monumental architecture. Finally, E Groups were also highly spatially restricted; they may have been important in social, political, ceremonial, or economic interactions – as well as in the integration of the city. Each of these architectural features can be located in both the site maps and the LiDAR-derived DEM of Caracol through sky-view factor (Kokalj et al. 2011; Zakšek et al. 2011) and local relief model (A.S.Z. Chase 2012:42-45; Hesse 2010) visualizations.

Plazas are flat open spaces covered with lime-plaster and usually raised above the surrounding landscape. While every residential *plazuela* group has a tiny plaza at its center, only monumental architectural nodes, including those in epicenter and monumental groups, contain large, formal plazas. These large, formally defined spaces may have been utilized as marketplaces (A. Chase and D. Chase 2004:121; A. Chase et al. 2015), as the locations for political taxation and control (D. Chase and A. Chase 2014:240), as spaces for community-building rituals and ceremonies (Inomata 2014:19-33), or as a multi-purpose space for all these needs and others that may have arisen. While a wide variation in plaza size exists (Table 2), even the smallest formal plaza is twice as large as a residential plaza, and the largest plazas are orders of magnitude larger still.

Ballcourts are common across Mesoamerica. The shapes and sizes of ballcourts change over time and across space, and there are a variety of theories about ballcourts and their use in the New World (Scarborough and Wilcox 1991). At Caracol, ballcourts are clearly visible on the ground and in the DEM as parallel spaces between structures. When another structure's sidewall is utilized as one edge of the ballcourt, they are harder to identify, but all of the parallel narrowly spaced buildings at the site form ballcourts. They exhibit a semi-standard size for the playing area of roughly 120 through 150 square meters, but the sizes of the two side structures vary widely. In the Maya area, interpretations suggest that ballcourts had numerous ritual associations and that ballgames even ended with human sacrifice (e.g. Rice 2004:253). Hieroglyphic texts on the Caracol B Group ballcourt provide various references to accession (Helmke et al. 2006), suggesting the association of ballcourts with rites of rulership.

Reservoirs, rectilinear features excavated into or constructed above the landscape were lined with stone and then water-sealed with plaster or clay; they aided in the capture and storage of rainwater for human consumption and use. Reservoirs come in a variety of shapes and sizes, but this study focuses on the largest and most formally designed reservoirs, features often associated with elite control (Lucero 2006a, 2006b; Scarborough 1998, 2006). Because even the smallest formal reservoir is over seven and a half meters on its shortest side, they appear in the one meter resolution DEM visualizations and on survey maps. Rain feeds both the reservoirs and the agricultural terraces at Caracol. The plastered plazas often drained into reservoirs, providing additional surface area impervious to infiltration to aid in rainwater capture. Previous research has shown that residential reservoirs played a much larger part in the provisioning of

Table 2. This table shows surface areas (rounded to the nearest ten meters squared) and presence or absence for the service features in monumental nodes of architecture at Caracol.

Name	Formal Plaza Area m^2	Ballcourt & Structure Area m^2	Large Reservoir Area m^2	E Group Area m^2	Causeways Present
Service Feature Tier 1: Uaxactun E Group					
Epicenter	72,150	1,570	1,530	**6,920**	Yes
Service Feature Tier 2: Cenote E Groups					
Cahal Pichik	17,840	640	2,530	**5,240**	Yes
Hatzcap Ceel	15,900	1,140	1,230	**4,370**	Yes
Ceiba	3,960	450	260	**2,910**	Yes
Cohune	5,080	280	-	**1,530**	-
Service Feature Tier 3: Ballcourts					
Retiro	8,040	**1,050**	160	-	Yes
Terminus D	4,920	**590**	180	-	Yes
Terminus E	930	**550**	-	-	Yes
San Juan	2,100	**530**	-	-	Yes
New Maria Camp	1,730	**510**	-	-	Yes
Terminus F	1,920	**470**	-	-	Yes
Monterey	2,100	**320**	-	-	-
Terminus G	1,600	**290**	-	-	-
Service Feature Tier 4: Plazas					
Chaquistero	**4,820**	-	-	-	-
Conchita	**4,430**	-	-	-	Yes
Puchituk	**4,070**	-	70	-	Yes
Ramonal	**2,860**	-	-	-	Yes
Round Hole Bank	**2,190**	-	180	-	Yes
Terminus B	**1,380**	-	-	-	Yes
Terminus A	**560**	-	-	-	Yes
Terminus C	**280**	-	-	-	Yes

drinking water at the site (A.S.Z. Chase 2012:52-54). While the large formal reservoirs found at Caracol's epicenter and monumental nodes may not have been the primary source of elite power and control, they certainly suggested the clout of the elite to visitors and residents.

E Groups have intrigued Maya archaeologists since the first one was discovered at Uaxactun (Ricketson 1928: Ricketson and Ricketson 1937). These architectural groups occur as one of two stylistic types based on the site they were first identified at: Uaxactun or Cenote. Most theories focus on E Groups as horizon-based astronomical observatories (Aveni 2001: Figure 109). E Groups consist of two basic structures, a western pyramid and an elongated eastern structure. No other architectural configuration has this appearance. The Maya constructed these architectural complexes in the Middle Preclassic Period (prior to 300 BCE) with later construction and expansion continuing into the Early Classic Period (A. Chase and D. Chase 2012). The cosmological significance of these features has also been tied into Maize God iconography (Estrada-Belli 2006) with the power of the ruler being iconographically conflated with the Maize God (Saturno et al. 2005). Analysis of the alignments of some of these structures suggests that they may not have been used as astronomical observatories (Aimers and Rice 2006). The limited spatial and temporal diversity (A. Chase and D. Chase 1995) suggests that they may have been tied to initial legitimization of the local elite.

As previously mentioned, all four feature groups possess distinctive architectural plans that facilitate confident remote identification. In addition, these forms can also be identified for unexcavated structures because of their unique spatial layouts and the manner in which they altered their landscapes. This is due in part to the ground-truthing provided by the survey maps for the remote identification.

Methods

This investigation required detailed analysis and expansion of the GIS database for Caracol. Survey maps were utilized to digitize architectural features in conjunction with the LiDAR-derived DEM visualization products (results visible in Figure 3). Only a few locations outside of the surveyed monumental nodes were added. For example, Terminus G has not been ground-truthed but the architectural signature for a formal plaza and ballcourt are very iconic and unique at this locus.

The analysis required GIS polygons to digitize each service feature to obtain surface area and a centroid. In order to analyze the spatial distribution of service features Voronoi diagrams, also known as Thiessen polygons, were created from these centroids (Figure 4). The areas under analysis were also limited to the extent of intensive terraced agriculture around the site. While settlement and terraces occur beyond this delineation, the intensive terracing seems to correspond well with the spatial extent of the monumental nodes of architecture.

While the Voronoi diagrams provide an easy-to-understand metric for spatial area, the desire to factor in the cost to traverse the landscape seemed appropriate given its rugged and hilly nature. Thus, I also computed the least cost path allocation from each of the service feature centroids (Figure 5). Application of Tobler's Hiking function (Tobler 1993: paper 1) to slope provided the friction surface for determining traversal costs in kilometers per hour (White 2015). While the friction surface on slope is anisotropic, the travel cost ignores differences in directionality, but still provides a better indicator of easiest travel to the closest district center than Voronoi diagrams can provide.

To complement the spatial distribution of features in site-wide maps, the surface area of each architectural feature was also calculated (Table 2). Analysis of the GIS polygon features provided these measurements. While they only show surface area without any sense of volume or depth, they do sufficiently provide a quick method for comparing the scale of architecture in the epicenter and monumental nodes.

These data illustrate the architectural scale and spatial extent of these service features; however, they only show a single snapshot of this landscape after its abandonment. The resulting survey and LiDAR data uncovered only the final phase of this city. Neither the survey nor the LiDAR alone incorporate the chronology of construction without the addition of archaeological excavation.

Insights from the Chronology at Caracol

The Maya built E Groups as early architectural forms, (A. Chase and D. Chase 1995, 2012) and archaeological evidence shows that at least the epicenter and two monumental nodes, Cahal Pichik and Hatzcap Ceel, began as independent polities. The epicenter later incorporated these polities into its urban area. This pattern can help explain why the E Groups occur where they do and how the political unification of these once independent units is reflected in Caracol's epicentre. The epicenter contains the only Uaxactun-style E Group at Caracol and underneath its façade sits a previously constructed Cenote-style E Group. Possibly after urban integration, the city only needed one E Group with the others providing redundant services.

Investigating the construction of monumental nodes helps explain their location and scale. The nodes of Puchituk, Ramonal, and Conchita were all constructed in the same timespan (early Late Classic Period, ca. CE 500-600) and exist in the densely populated areas to the south, southeast, and northeast of the epicenter. The smallest monumental nodes, Terminus A, Terminus B, and Terminus C, saw the latest construction at the site. They only possessed plazas. It appears that those three nodes might have resulted from an attempt to instigate new household settlements near the periphery. New Maria Camp very likely predates these latest monumental nodes as it has a ballcourt and connects Termini D into the site. As a whole this suggests that ballcourts may only have been required after the surrounding population reached certain density thresholds.

The Hierarchy of Urban Service Features

Central Place Theory predicts that services will exhibit a scaling relationship. Less frequent services will be more centralized while more frequently used services will be more widely distributed, but they will co-occur in strict hierarchies of use. Based on the surface areas and presence of service features (Table 2), a few significant breakpoints occur. The first two tiers includes those locations that have E Groups, ballcourts, and formal plazas; the third tier includes those locations that have ballcourts and formal plazas; and the fourth tier includes those locations that have only formal plazas. While this set of tiers aids in explaining the co-occurrence of service features, the feature sizes themselves do not neatly scale and may be based on surrounding population densities.

While the epicenter was larger with more service features than the other monumental nodes, the city focused on architectural features to provide integrative services and on built roads, *sacbeob*, to facilitate this integration, as can be seen in Figure 4. Additional excavation and computational analysis is required to help explain the patterns that emerge, especially in terms of establishing the role of time depth in service feature construction. However, from the distribution of architectural features, a strict hierarchy is evident. All districts required formal plazas; however, a smaller fraction had ballcourts with their formal plazas, and an even smaller fraction had formal reservoirs or E Groups along with their ballcourts and formal plazas. The distribution of features suggests that Caracol's residents were willing to walk substantially farther to see a ballgame than to go to a plaza. This follows Central Place Theory's model of service distribution with plazas providing services more necessary for daily life than ballcourts.

In terms of surface area, all of the termini and nodal monumental architecture groups pale in comparison to the epicenter's gigantic formal plaza spaces. However, the second tier also includes Cahal Pichik and Hatzcap Ceel which were once independent polities. Retiro is a bit of an outlier in terms of size, but fits relatively neatly with Ceiba, Cohune, Chaquistero, Conchita, and Puchituk. These monumental nodes are located among higher densities of settlement than the next tier of San Juan, New Maria Camp, Monterey, Ramonal, Round Hole Bank, and Termini D through E. The final set of plazas includes Termini A, B, and C and these are confirmed to be the latest monumental nodes at Caracol. While plaza size may have been conditioned by an element of time with older settlements possessing larger plazas, it may also have been related to the number of people that used these plazas, at least at the time of construction. Additional investigation will be required to determine the actual population associated with these features based on household counts near each plaza.

As with plazas, the epicenter is unique in regard to ballcourts. While only one ballcourt exists at any given terminus or monumental architecture node, the epicenter possesses two ballcourts. Every location with a ballcourt also contains a formal plaza. Ballcourts tend to be located in areas of greater population and centrality except for the ballcourts in New Maria Camp and Cohune (Figure 3). This aspect could mean that ballcourt construction is related to the surrounding population density, length of establishment, or specific temporal windows when they were constructed. Since ballcourts tend to be associated with the ruling elite, the widespread distribution around the site could be related to local elites vying for socio-political power or, alternatively, to the central elite demonstrating their power throughout the city.

The epicenter possessed two formal reservoirs while other locations with a formal reservoir only possessed a single large reservoir. The largest reservoir (surface area only) occurred at Cahal Pichik (Table 2). Reservoirs tend to be located near the causeways and adjacent to the plazas in highly visible locations.

This placement within locations of high visibility may have been a means to showcase the power of the elite, or it may have been utilized as the water source for additional construction at these places. While some theories base elite power on the redistribution of water from these formal reservoirs (Lucero 2006a, 2006b and Scarborough 1998), the lack of these features at every monumental group may suggest that distribution of water by the elite was not the primary strategy for socio-political control at Caracol (see A.S.Z. Chase 2012 for information on residential reservoirs). These reservoirs also likely provided water for lime-plaster construction; if so, then Cohune, Chaquistero, and Conchita seem out of place as these groups lack a reservoir but contain over 4,000 square meters of plastered plaza surfaces.

E Groups, like the large formal reservoirs, only occur at five groups. Even though there are five E Groups at the site, the only Uaxactun style E Group at the site exists at the epicenter (A. Chase and D. Chase 1995). Excavation has revealed that the epicentral E Group was converted into a Uaxactun-style E Group over time. Initially it was an E Group that was the same size and shape of the E Groups at the other monumental groups, a variation on the earlier Cenote-style E Group. This additional construction and build-up of the epicentral E Group may indicate that over time only one E Group was needed to provide services, or that this E Group gained preeminence and special significance. The E Group distribution reinforces the theme of both the centralized organization and the uniqueness of the epicenter over the other monumental nodes in a fourth feature category.

Conclusion

In sum, this analysis describes the spatial extent and scale of four different urban services as represented by the architecture these services required representing potential districts and intra-site boundaries. The resulting features demonstrate a strict scaling relationship. Formal plazas are commonplace concurrent with all locations of monumental architecture; larger more centralized monumental nodes possessed ballcourts; and, only that subset of locations with ballcourts had formal reservoirs or E Groups. Correspondingly, E Groups could serve a larger segment of the population than ballcourts and people were willing to travel further to a ballcourt than to a formal plaza. This strict scale of features follows the expectations of using Central Place Theory on urban services. The idea that these structures were “efficiently” placed will, however, require additional analysis to test.

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