PREHISPANIC AND COLONIAL SETTLEMENT PATTERNS OF THE SOGAMOSO VALLEY

by

Sebastian Fajardo Bernal

B.A. (Anthropology), Universidad Nacional de Colombia, 2006

M.A. (Anthropology), Universidad Nacional de Colombia, 2009

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This dissertation was presented

by

Sebastian Fajardo Bernal

It was defended on

April 12, 2016

and approved by

Dr. Marc Bermann, Associate Professor, Department of Anthropology, University of Pittsburgh

Dr. Olivier de Montmollin, Associate Professor, Department of Anthropology, University of Pittsburgh

Dr. Lara Putnam, Professor and Chair, Department of History, University of Pittsburgh

Dissertation Advisor: Dr. Robert D. Drennan, Distinguished Professor, Department of Anthropology, University of Pittsburgh

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Sebastian Fajardo Bernal, PhD

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This research documents the social trajectory developed in the Sogamoso valley with the aim of comparing its nature with other trajectories in the Colombian high plain and exploring whether economic and non-economic attractors produced similarities or dissimilarities in their social outputs. The initial sedentary occupation (400 BC to 800 AD) consisted of few small hamlets as well as a small number of widely dispersed farmsteads. There was no indication that these communities were integrated under any regional-scale sociopolitical authority. The population increased dramatically after 800 AD and it was organized in three supra-local communities. The largest of these regional polities was focused on a central place at Sogamoso that likely included a major temple described in Spanish accounts. Demographic estimates for the pre-contact period (1200-1600 AD) and for the Colonial times indicate a density similar to the demographic estimates calculated for 800-1200 AD. Regional-scale political organization shifted, however, without sign of overall political integration of the entire survey area. This scenario suggested political dynamics with only moderate levels of sociopolitical differentiation. The strongest and most intensive social interaction occurred in the local community around which the largest regional polity gravitated. This interaction responded to social and religious activities related to burial practices and the use of large communal structures where people from across the valley gathered regularly in the central place at Sogamoso, but did not live there as permanent residents. Economic activities were also probably at play as centripetal forces that attracted population to different places of the survey area but they seemed less important than social activities and religious practices. This evidence indicates that the polity centered in Sogamoso during prehispanic times was demographically smaller and less central than indicated by interpretations based on the historic

accounts. This data suggests that the Spaniards classified as important prehispanic communities that were both large and small and based on varied centralizing forces affecting daily and supra-local interaction. The comparison of the Sogamoso valley with other trajectories in the Eastern Highlands suggests that economic and non-economic centralizing forces acting on human interaction create different degrees of nucleation, inequality and system survivability.

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Students, Archaeologists and other Professionals Who Participated in Fieldwork 2013-2014

Name	Institution	Number of Field Seasons
Adam Berrey	University of Pittsburgh	1
Alexander Zapata Gaviria	Universidad de Caldas	1
Ana Prada	Universidad de los Andes	1
Ana Isabel Pérez Naranjo	Universidad de los Andes	1
Angel Cadena	Universidad Externado	1
Arley Jacobo Hidalgo Tejada	Universidad de los Andes	1
Caitlin Payne	University of Tennessee	3
Camila Vásquez Ramón	Universidad Nacional de Colombia	1
Camilo Acosta	Universidad de los Andes	1
Carlos Reina	Universidad Externado	1
Carrie Perkins	Southern Methodist University	1
Cristóbal Oyarzo	Universidad de Chile	2
Daniel Santiago Cotrino	Universidad de los Andes	1
Daniela Orozco Ramelli	Universidad de los Andes	2
Daniela Padilla Santander	Universidad de Chile	2
David Barliza	Universidad Nacional de Colombia	1
Diana Margarita Chíquiza	Universidad Nacional de Colombia	1
Diego Gutiérrez	Universidad Pedagógica y Tecnológica de Colombia	1
Elisa Mildred Hincapié	Universidad de Antioquia	1
Erika Gutiérrez	Universidad Nacional de Colombia	2
Fernando Franchetti	University of Pittsburgh	1
Francis Dayana Díaz Tavera	Universidad Externado	1
Irene del mar Gonima	Universidad de los Andes	2
Jessica Rodríguez Gómez	Universidad Nacional de Colombia	2

Students, Archaeologists and other Professionals Who Participated in Fieldwork 2013-2014 (continued)

Name	Institution	Number of Field Seasons
Jesus Mahecha	Universidad Externado	3
John Vargas	Universidad Nacional de Colombia	1
Juan José Quintero	Universidad de los Andes	1
Juliana Quiceno Arboleda	Universidad de Antioquia	3
Laura Johnson	Pacific Lutheran University	1
Laura Vargas	Universidad Javeriana	1
Lina Fernández Moreno	Universidad Externado	1
Luis Felipe Navarro Páez	Universidad Externado	3
Luisa Fernanda Yaso	Universidad de los Andes	1
María Camila Correal	Universidad de los Andes	1
Maria Cristina Salas	Universidad de los Andes	1
María Juliana Rubiano	Universidad de los Andes	2
Marta Juliana Guarín	Universidad Javeriana	1
Melissa Merchán	Universidad de los Andes	1
Natalia Bedoya	Universidad de Antioquia	1
Natalia Rodríguez	Universidad de los Andes	1
Natalia Tavera	Universidad Minuto de Dios	1
Paula Orozco	Universidad del Cauca	1
Renzo Moyano	Colby College	1
Ricardo Sánchez	Universidad Pedagógica y Tecnológica de Colombia	1
Rodolfo Eduardo Cepeda	Universidad Nacional de Colombia	3
Roman Fernando Pineda	Universidad Nacional de Colombia	1
Sara Fernández Padilla	Universidad de los Andes	1
Sergio Vargas	Universidad Externado	2
Zdena Porras	Universidad Nacional de Colombia	1

1 HIERARCHY, INTEGRATIVE FORCES AND SOCIAL CHANGE IN EARLY COMPLEX SOCIETIES

Several decades of archaeological research on social change have documented that the way in which organization above the household level is structured, varies considerably. The range of variability of human social organizations seems to increase after the earliest sedentary communities emerged in different places and moments around the world. Studies in pre-industrial societies have identified that these communities settled the basis for the formation of early complex societies, which in turn were often integrated through hierarchical structures. A substantial number of studies have suggested that the emergence of these structures was triggered by different factors, followed multilinear paths and was supported by diverse sources of power (Bandy and Fox 2010; Drennan and Uribe 1987; Feinman and Neitzel 1984; Price and Feinman 2010; M. E. Smith 2011). Identifying these triggers and the sources of power used by elites to maintain their social status has been a common research topic in order to understand variability in early complex societies. Particularly relevant in this approach are those studies that have provided some theoretical expectations about the social consequences derived from certain combinations of triggers, paths and sources of power. These approaches are important as they identify possible outcomes created by the different types of integrative forces involved in human social interaction. Since they can be tested against archaeological data, these theoretical models are relevant to study the nature of early complex societies.

One of these theoretical expectations connects weak political integration at the regional level, instability and small populations with polities based on non-economic forces. Conversely, strong political integration, stability and large populations among early complex societies are understood

as usually shaped by economic forces pulling individuals and households toward intense patterns of interaction. Within this perspective, it has been argued that large-scale polities that control sizeable populations through more than two decision-making levels emerge on the basis of staple finance sources (Anderson 1994; Gilman 1987, 2001; Steponaitis 1978; Wright 1984). Other examples of the importance given to economic interaction are those models where competition and exchange networks play an important role in the rise of complex social systems (Blanton, et al. 1996). Prestige economies, based on valuables like those described for the *Kula* system in the Trobriand Islands, could easily have forged extensive confederacies of different polities where status and position are determined by social, economic and political relationships (Johnson and Earle 2000:258). In very few words Johnson and Earle illustrated how strong they consider the role of economic forces in the emergence of inequality and hierarchy. For them stratification is based on "restricted access to critical economic resources" and that control is what allows elites to restrict access to leadership (Johnson and Earle 2000:302). Deeply rooted in historical materialism, these perspectives implicitly consider economic interaction between individuals and households as the structuring principle of social relationships and the strongest force in social interaction. This expectation, however, can be questioned. In the Alto Magdalena of Colombia, for example, large communities were attracted toward places where ideological or religious bases were more likely sources of elite power (Drennan 2000). This kind of social sequence highlights that economic forces are not necessarily the only force through which sizeable populations were organized in hierarchical structures with some degree of social inequality.

For prehispanic populations found in the Eastern Highlands of Colombia, two main alternatives have been outlined to explain political integration (Langebaek 2008:65). The theoretical expectation behind these alternatives understand economic forces as the strongest principle by which social interaction can forge large complex societies in pre-industrial times. The first

alternative suggests that hierarchical organization above the household level might have emerged late in the prehispanic sequence between relatively small regional populations, without monopolization of power and authority and with only modest differences in wealth between commoners and elites. Social competition expressed through redistributive strategies and inter-community activities, centered on feasting and rituals at ceremonial sites might have been the means used by elites to support their social status (Langebaek 1995, 2001).

The second alternative proposes that prehispanic societies in the Eastern Highlands created local and supra-local communities based on hierarchical principles from very early in the social sequence. This alternative suggests that the differentiation between social groups was based on control of the best soils for agriculture located in areas that also allowed easy access to wild resources. Early settlers or others established in these suitable areas started to accumulate wealth and prestige by controlling new populations settled near them. Activities within sites where people were aggregating could have included craft production, economic diversification through access to diverse resources and strategies of agricultural intensification such as raised fields. It has been suggested that this process could explain inequality within the large regional polities found by the Spaniards (Boada 2006, 2007, 2013a, 2013b). This alternative emphasizes environmental variability and control of resources as the most expeditious paths for building large political organizations based on hierarchical principles. This alternative is consistent with those arguments that see environmental heterogeneity, especially in regard to subsistence resources, as the initial context for economic differentiation and relationships of competition and cooperation between groups and individuals (Boone 1992; Kennett, et al. 2006a, 2006b; Kennett, et al. 2009; E. A. Smith and Choi 2007).

1.1 MUISCA SOCIETIES: A COMPARATIVE STUDY IN THE EASTERN HIGHLANDS OF COLOMBIA

During prehispanic times, the Eastern Highlands were occupied by a group of societies labeled as Muiscas. These societies shared cultural roots and similar environmental contexts but they were apparently different in their size and degree of political integration. The area they inhabited included more than 40,000 km^2 composed of small valleys and piedmont areas. The Spaniards suggested that most of the Muisca territory was controlled by the powerful and rich chiefdoms of Bogotá, Tunja, Sogamoso and Duitama (Aguado [1581] (1956):I:257-298). The paramount chiefs of these polities received gold objects, emeralds and seashells from multiple communities that they managed or controlled (Simón [1626] 1981). Spaniards also mentioned some small polities acting in an independent way (Botiva 1989; Falchetti and Plazas 1973; Langebaek 1987:25). Archaeologists describe the occupation in this area as a sequence involving population growth, increasing political complexity and centralization of authority (Boada 2007; Henderson and Ostler 2005; Langebaek 1995, 2001). Archaeological information, however, does not show the powerful, oppressive and rich chiefs mentioned in Spanish accounts. Elaborate burials, sumptuous dwellings and large monuments are so far absent from the archaeological record.

1.1.1 The western valleys: The independent chiefdoms

The organization exhibited by the Muisca societies located in the Leiva valley and in the Fúquene and Susa valleys reflected some of those scenarios introduced above. Populations concentrated themselves during the Herrera period in two settlements of the Leiva valley (Suta and *El Infiernito*). During the prehispanic sequence these settlements were located in areas very suitable for agriculture and they continued to attract population until the Colonial period, but during the Late

Muisca period, new settlements of similar size were also established in other areas of this valley. The prehispanic settlement patterns did not suggest the existence of a central place that attracted relatively more population than others in any period (Langebaek 2001). A small mound with a dolmen tomb, 54 small to large menhirs carved in sandstone, (Silva Celis 1981, 1983, 1986) and evidence of feasting activities (Langebaek 2005, 2008; Salge 2007), however, indicated that *El Infiernito* may have been a central place where inter-community activities were performed with a moderate degree of intensity. These activities were conducted at least since the Early Muisca period and they were not always associated with the households which had higher indicators of wealth or prestige. Evidence of feasting activities is also found in Suta, but conspicuous differences between households in terms of wealth were not documented (Fajardo Bernal 2011; Henderson and Ostler 2005; J. Rodríguez 2009). In the valleys of Fúquene and Susa, populations occupied fertile soils located near rivers during the Herrera period. During the Early Muisca period, instead of a strong heightened nucleation around these early settlements, the settlement pattern was better described as a dispersed configuration. Then, during the Late Muisca period, two very large settlements emerged in areas with good agricultural productivity that were easily defendable (Langebaek 1995). The regional distribution of foreign ceramics and forms associated with fermented beverages indicated that exchange and feasting activities might have occurred without elite control (Langebaek 1995; 2008:75-87).

1.1.2 The largest regional polities in the Muisca area

Archaeological research on the largest regional polities in the Eastern Highlands during the prehispanic period has been focused in the Bogotá Savannah where the Bogotá chiefdom was located (e.g. Boada 2000, 2006, 2013a, 2013b; Broadbent 1987; Enciso 1989, 1990, 1993a, 1993b, 1995a, 1995b, 1996; Kruschek 2003; Leguizamón 2012; Ramírez 2009; Reichel Dolmatoff

1943; Romano 2002, 2003). The Bogotá Savannah between 400 B.C. and 200 A.D. sheltered small sedentary settlements where cultivation and exploitation of natural salt springs were conducted. Ceramic technology use seemed already widespread. This part of the prehispanic social sequence is commonly referred to as the Herrera period. In this period, settlements were small, slightly separated and located near rivers in areas with fertile soils close to piedmont zones (Boada 2006, 2013a, 2013b; Broadbent 1970; Kruschek 2003). After 800 A.D., during the Early Muisca Period, these settlements underwent a demographic explosion that occurred along with the development of political centralization and the emergence of social inequalities (Boada 2013a:44-64; Kruschek 2003). At the regional scale, population growth was concentrated around areas with good conditions for agriculture and easy access to other resources that were occupied since the first phase of sedentary life in the Savannah (Boada 2006, 2013b). During the Late Muisca period population estimates were similar to those of the Early Muisca period, and occupation was still concentrated around the earliest settlements in the region (Boada 2006). In the Bogotá area, however, great wealth differences between Late Muisca elites and commoners have not been archaeologically documented (Aristizabal 2016; Kruschek 2003). The settlement pattern studies conducted in the Bogotá Savannah suggested that after 200 A.D. there was an accumulation of factors that allowed the emergence of central places with centripetal forces strong enough to support hierarchical structures and inequalities. On one hand, hereditary lineages derived from direct relationships with ancestral founders supported the establishment of social status among early sedentary communities (Boada 2013a:66). On the other hand, the strategic location of the first settlements where neolithic adaptations began and the possibility that landscape modifications were made to increase crop productivity since very early in the social sequence, add up to an ideal scenario for the development and use of the notion of belonging and ownership between households (Boada 2006).These factors enabled early settlers to build dependency relationships with the new populations gravitating around them (Boada 2013a:62-68).

The polity centered in the place where the modern city of Tunja is now located probably had the same scale as the one in place in the Bogotá Savannah. The archaeological research in Tunja has documented a long occupation under the modern city (Castillo 1984; Pradilla, et al. 1992; Pradilla, et al. 1991). Villate (2001:171) argued that this settlement covered around 5 km^2. Inside this area, Hernández de Alba (1937) found ritual structures similar to those found in the Leiva valley. Burials, residential structures, and remains of everyday activities were also found mixed in the archaeological record under this modern city (Pradilla, et al. 1992). The numerous horizontal excavations conducted in Tunja provided detailed information about funerary practices, ceramic chronology and everyday activities of an occupation spanning over two thousand years, however, most of what we know about the political organization in this area is based on historic accounts. The Spaniards mentioned that just before the Conquest the chiefdoms of Bogotá and Tunja started expansionist campaigns against neighboring communities that escalated into a conflict between these two polities (Gamboa 2013:38). This process probably created a complex network of relationships between Tunja and its surroundings. For example, communities located several kilometers away from Tunja paid tribute to the elites nucleated in the prehispanic settlement of Tunja (Villate 2001:11-125). Prehispanic Tunja was also described as an important economic and religious center where several communities gathered to exchange products and perform ritual activities (Villate 2001:140-163). Archaeological excavations and Spanish accounts suggested that the area where the Universidad Pedagógica y Tecnológica de Colombia is located served as an interaction core that attracted the population of this polity based on economic, political, religious and social activities (Pradilla, et al. 1992; Villate 2001).

According to early written records the chiefdom located in the Duitama valley was also one of the largest and more complex societies that the Spaniards found in the Eastern Highlands. In the year 1543 the Duitama chief claimed that before the Spaniards arrived, his uncle, who was the former

chief of the area, had at least 42 local chiefs and by extension their communities, under his control (Gamboa 2013:182). These claims should be interpreted as product of a Colonial context, where the poor institutional integration that characterized the establishment of the Spanish bureaucracy was exploited by indigenous elites and conquerors to gain personal benefits. Nevertheless, this claim also indicated that before the sixteenth century the size and degree of influence of the polity located in Duitama had a magnitude that could be compared with other large regional polities identified in the Eastern Highlands (Gamboa 2013:183). Demographic estimates based on ethnohistorical records suggested that the population of Duitama could have reached tens of thousands of people (Gamboa 2013:180-185). These records suggested an intense interaction network between elites from Duitama and those that had the Chief´s office in the near Sogamoso valley. Piedrahita argued that if for any reason there was some dispute with regard to the new designated Sogamoso chief, the chief of Duitama had to select who should be the next chief (de Piedrahita 1688:Parte I Libro II capitulo VII:53). Although this is not an indication of the intensity of everyday interaction between populations in the two valleys, it does point out that Muisca elites in Duitama valley were involved in complex political networks, especially with the Sogamoso polity.

1.1.2.1 The Sogamoso valley

The Sogamoso valley was the location of one of the richest and most powerful Muisca chiefdoms described by the Spaniards. Despite the ethnohistorical information about the Sogamoso area and the fact that some archaeological studies have been carried out there (M. C. Cuéllar 2010; Escallón 2005; Flórez 1998; Flórez and Langebaek 1998; Silva Celis 1945a, 1945b, 1945c, 1945d), most of what was known about this polity was based on ethnohistorical records which emphasize the prestige and wealth of the Sogamoso chiefdom (Simón [1626] 1981:I:293-298).

Before the sixteenth century, 36 communities were most likely directly or indirectly attached to the Sogamoso chief (Gamboa 2013:185). Just before the Conquest, this chief apparently controlled a large territory that included lands in the northeastern foothills of the Andes (Langebaek 1991). In contrast with the Bogotá area, in the Sogamoso valley evidence of intensive agricultural production on raised fields is not reported. Nevertheless, the Spaniards described elites of the Sogamoso valley successfully participating in the diverse economic activities, including continuous exchange with non-Muisca communities from the lowlands (Langebaek 1991:327).

Some characteristics suggested ideological or religious basis for this polity. This chiefdom was well-known among the Spaniards because of its religious importance at the supra-local level, which probably extended beyond the Sogamoso valley to much of the Muisca area. The Temple of the Sun, a major religious pilgrimage center, was located in the Sogamoso valley (Correa Rubio 2004:76-77; Silva Celis 1945d; Simón [1626] 1981:I:293-298). The Sogamoso chief was the high priest of this temple and he received gifts from people located in the highlands and even from some in the eastern foothills of the Andes (Langebaek 1991:333; Sotomayor 2004:34-35). Upon their arrival, the Spaniards indicated that accession to the paramount chief's office in the valley was achieved by means of an election process rather than based on direct inheritance principles. The chiefs of four small polities subjected to the Sogamoso polity (Gameza, Busbanzá, Pesca and Toca) chose a candidate from two different communities: Firavitoba and Tobasía (de Piedrahita 1688:Part I book II. Chap VII:53). This could be consistent with accumulation of wealth and power by elites and strong inequalities between them and commoners, but it did not suggest power based on economic activities.

The intensive horizontal excavations conducted in Sogamoso in the 1940´s (Silva Celis 1945a, 1945b, 1945c, 1945d) uncovered an archaeological context that is nowadays associated with the location of the temple mentioned in the Spaniards' accounts. There are no chronological references as to exactly what period these findings may have corresponded, however, Silva repeatedly mentioned that the remains were similar to the archaeological material associated with Muisca populations (Silva Celis 1945a:110-113). Because the Herrera period was only defined in the 1960´s, and the archaeological remains excavated by Silva were not systematically stored, it is still unclear whether or not these materials were in fact earlier than he interpreted. An archaeological museum and in-situ reconstructions of prehispanic structures exist today in this place.

The excavations conducted by Silva revealed an intense prehispanic occupation in an area of less than 3 ha. The archaeological evidence included, among other things, post holes, large amounts of pottery, charcoal, animal bones and stone and bone tools. Large amounts of coal partially or completely burned were also found mixed with these cultural materials (Silva Celis 1945a:95; 1945d:40). The latter was interpreted as evidence that the prehispanic population in the Sogamoso valley might have engaged in mining activities (Silva Celis 1945a:95,105; 1945d:40). During the survey it was common to find coal mixed with archaeological remains, but unfortunately it was not systematically collected.

Silva identified 15 ovoid structures and based on the distribution and diameter of the post holes, they occupied areas of around 10 m^2. Most of these structures were probably used as dwellings (Silva Celis 1945a:95). The smaller ovoid structures enclosed areas large enough only to fit a small number of people with limited space to perform indoor activities. Because the areas that

they covered were very small, these structures might have served as dwellings in which a household could spend the night and most of the household activities were probably conducted outside. On the other hand, two additional larger, structures were also documented. The first one was an ovoid structure with an area around 30 m^2 enclosed by post holes with a mean diameter of 84.6 cm. This structure was surrounded by 31 post holes with diameters between 35 and 76 cm distributed in a rectangular shape. Four additional post holes with a mean diameter of 70 cm were located between the rectangular and the ovoid structures (Silva Celis 1945d:40). The area inside the rectangular shape encircled a total area of about 187 m^2. This area is significantly larger than those of other structures identified in the Muisca area (Boada 2007; Cifuentes and Moreno 1987; Enciso 1989, 1990, 1995b; Romano 2003). Silva interpreted these features as the remains of one of the residential complexes occupied by the Muisca elite that were mentioned in the Spaniards' accounts (Silva Celis 1945d:40; Simón [1626] 1981).The second structure was similar to the first but it was not enclosed. Excluding a post hole of 25 cm in diameter, the mean post hole diameter of the second structure was 72 cm. Inner post holes formed a large elliptical structure with an area of 16.5 m^2. Six additional post holes with diameters larger than 64 cm surrounded the main elliptical structure (Silva Celis 1945b:471). The diameters of the post holes and the areas that might have been roofed indicated that the nature of the activities conducted in the two larger structures could have included more than one residential unit. The activities performed within these structures, especially the one with the rectangular enclosing structure, could easily have been indoor activities that involved more than five individuals.

Besides the evidence associated with everyday activities, the burials identified within the museum´s area showed that this place not only served for residential purposes but it was also intensively used for funerary practices. 692 burials were excavated and several more were reported as looted by local peasants and landowners. There are only general reports about what

was found in the burials, but these descriptions indicate that a mere 10% of the burials had grave goods. These objects included lavish cups, globular pots, spindle whorls, at least two gold pectorals, one necklace with 36 gold beads, one gold nariguera, thousands of seashell beads, a couple of small pieces of a gold-copper alloy and one small emerald (Silva Celis 1945a:98; 1945b:481; 1945c:294-295).

1.1.3 The Sogamoso valley in the prehispanic context of the Eastern Highlands

It seems that the forces that fostered social interaction in prehispanic times in the Eastern Highlands were more variable than thought some decades ago. This variability makes the nature of early complex societies in the Eastern Highlands useful for understanding different forms of social organization based on hierarchical principles. How different were the social outcomes created when economic reasons seem the main reason behind intense daily interaction? Were the degree of centralization, the magnitude of the populations and the degrees of inequality produced by economic interaction different than those produced by social and/or religious reasons? To what extent was the development of local and supra-local communities similar or different when different reasons were influencing daily face-to-face interaction? All these questions were approached in this research using the archaeological data available for the Eastern Highlands and the results of the study conducted in the Sogamoso valley.

Considering these questions required a comparative perspective. In this case, the comparison has been made between the patterns documented in the Sogamoso valley and the settlement pattern data available in the Muisca region (Boada 2006, 2013a, 2013b; Langebaek 1995, 2001). Although Argüello García (2015) and Jaramillo (2015) conducted two more regional surveys in

the Eastern Highlands, their reports were only available by the end of this research and therefore they were not included in the analysis. Further comparison at the macro-regional level in the Eastern Highlands will require these datasets to be included. Almost all the recent studies about social organization at the regional scale in the Eastern Highlands have conducted comparisons of the available archaeological data (Argüello García 2015; Boada 2013a; Henderson in press; Langebaek 2001). The comparison conducted here was focused on suggesting general trends of social outcomes in the Eastern Highlands. Somewhat more attention was given to the prehispanic changes in the Bogotá Savannah and the Sogamoso valley. A focus on the social trajectories in these two areas was preferred for three reasons. First, they represented two of the four largest regional polities found during the Conquest. Second, these two polities seemed to have a different main centralizing force for interaction between individuals and households. Finally, the social trajectory in the Bogotá Savannah has been documented recently with a settlement pattern study (Boada 2006, 2013a, 2013b), allowing comparisons with the data collected in the Sogamoso valley.

The first task approached was characterizing the nature of the community organization in the Sogamoso valley during prehispanic and Colonial times. This characterization was based on the distribution of human occupation across the landscape and the density of the waste accumulated in these places. The study also analyzed the degree to which interaction in the Sogamoso valley was centralized. Demographic estimates were calculated for each archaeological period following the procedures originally developed for the valley of Mexico (Sanders, et al. 1979), but were improved to consider sherd densities more systematically (Berrey 2014; Drennan, et al. 2003). Documenting the nature of the community in the Sogamoso valley allowed a comparative perspective with other areas of the Eastern Highlands.

Similarities and dissimilarities of the community organization in the Sogamoso valley and other social trajectories were compared. First, the emergence and characteristics of local and supra-local communities across the Eastern Highlands were contrasted with the results obtained in order to assess whether these phenomena differed in important ways or whether they had a similar nature among the polities that emerged in the Muisca territory during prehispanic times. Second, the degree of centralization and the magnitude of social formations were compared with the aim of evaluating the attraction power of the integrative forces that acted during prehispanic times. This comparison provided the opportunity to discuss not only the nature of early complex societies in the Eastern Highlands but also to propose possible outcomes for scenarios when economic and religious forces are causing early community interaction.

2 ENVIRONMENT AND METHODS

2.1 ENVIRONMENT

2.1.1 Natural environment

The regional survey of the Sogamoso valley was conducted across an area of 123 contiguous km^2 located between 2500 and 2800 masl (Figure 2.1). The eastern limit is roughly defined by the contour line at 2800 masl behind modern Sogamoso. The western limit is a set of mountains located between the valleys of Sogamoso and Duitama. The surveyed area included Tibasosa, a small town part of the Corregimiento of Sogamoso during the seventeenth and eighteenth centuries, and apparently controlled by the Sogamoso chiefdom in prehispanic times (AGI ca. 1658 Contaduría 1346A, número 5; Gamboa 2013:185). The survey area went northward as far as a group of mountain ranges dividing the Sogamoso valley and the Busbanzá valley. In the south, it reached the limits of a survey of 12 km^2 carried out in the area of the Tota River (M. C. Cuéllar 2010). The survey boundaries included part of Firavitoba, a small town that probably corresponded to the *encomienda* with a similar name administered by Martin de Rojas y Fonçeca in the second half of the seventeenth century (AGI ca. 1658 Contaduría 1346A, número 5). According to the Spanish conquerors, before their arrival, the people within the Firavitoba area were ruled by the Sogamoso polity (de Piedrahita 1688:Part I Book II Chap VII:53).

The area surveyed is part of the Alto Chicamocha drainage basin. Its geology was molded during the Cretaceous Period by marine transgressions and later by significant displacements as a result of rock mass movement across the area known today as the Eastern Highlands. Geological

formations are composed of different types of clay, sandstone, quartz and limestone (IGAC-UPTC 1980:9-11). The Quaternary deposits located in the floodplain are comprised of different sized pebbles and sandy alluvium. During the prehispanic period it is likely that a lacustrine environment was present in the flat area of the valley (Gómez, et al. 2007; IGAC-UPTC 1980:11). The natural environment today is characterized by a bimodal rainfall pattern occurring from March to May and from October to November. The annual mean temperature oscillates between 15 and 16 ºC (IGAC-UPTC 1980:20-23). Weather stations in Sogamoso and Nobsa between 1985 and 2008 measured an average annual rainfall of around 750 mm (Rojas, et al. 2010).

The geomorphological characteristics inside the survey limits bear strong resemblance to the landscape across the Eastern Highlands (Figure 2.2). The local variability can be divided into three geographic zones: the floodplain, the gentle slopes and the mountain spurs. The survey covers part of the floodplain shaped by the confluence of three rivers of the Alto Chicamocha drainage basin. The Chicamocha River enters the survey area in the north western limit and flows eastwards in the northern zone. Before leaving the survey limits, it receives two right-bank tributaries that are flowing northwards: the Chiquito River and the Moniquirá River. The floodplain of these three rivers is located around 2500 masl and it represents 51% (63.6 km^2) of the survey area. This confluence is heavily transformed nowadays by several irrigation and water control canals constructed in order to cope with the tendency to inundate the floodplain that these three rivers have. The gentle slopes characterize around 39% (47.6 km^2) of the survey area. 26.7 km^2 of these slopes have 0-20% gradients while 20.9 km^2 show 21-35% gradients. These slopes are mostly located to the eastern and western flanks of the survey area. Finally, the mountain spurs count for around 10% (12.3 km^2) of the total area surveyed and they are usually above 2700 masl, with gradients higher than 35%. These spurs are typically aligned southwest-northeast toward the eastern part of the survey. They are relatively narrow (between 50 and 150 m wide) and

sometimes they are up to 2 km long. Regardless of the geographic zone, archaeological occupation was frequently located in areas with 0-20% gradient. 324 ha (74%) of the 438 ha with prehispanic or Colonial archaeological material occurred in areas with 0-20% gradient. 92 ha (21%) occurred in areas with 21-35% gradient and only 22 ha (5%) were documented in slopes with a more than 35% gradient.

2.1.2 Modern land use

The Sogamoso valley is situated in the modern province of Sugamuxí, a second tier geographical and administrative division of the department of Boyacá. The survey zone covered a percentage of the area of the municipalities of Tibasosa (34%), Firavitoba (27%), Sogamoso (26%), Iza (12%) and Nobsa (6%). The floodplain of the Sogamoso valley is now used for dairy cattle husbandry, and for crops such as maize, potatoes, onions, beans, peas and tomatoes. The slopes of the valley are also devoted to agriculture, but mining and traditional brick manufacture are common as well (IGAC-UPTC 2005:152). Agriculture is not industrialized and most of the landowners possess small parcels of land of less than 3 ha. Mining is present in the valley in the form of the two most common excavation types. Industrialized surface mining exploits deposits of limestone and iron for the local steel mill located in the north of the valley, outside the survey area. Industrialized and traditional subsurface mining exploits coal inside the survey area. The municipalities partly surveyed in this study probably have a large portion of the estimated 1720 million tons of coal reserves located under the landscape of the Department of Boyacá (Mojica and Mariño 2013). The coalbeds in the Sogamoso valley are associated with the Guaduas Formation which crosses the survey area beneath the eastern slopes of the valley. Some of these coalbeds can be found relatively close to the surface as different geological processes eroded most of the overlying formations (Mojica and Mariño 2013).

Although the town centers of Sogamoso, Tibasosa and Firavitoba are within the survey area, only the city center of Sogamoso—with an urban population around 100.000 inhabitants and an urbanized area of approximate 4 km^2—prevented the surveying activities. Other zones not covered due to rubble from construction and owners' unwillingness to provide permits, encompassed around 2 km^2 more. A total of 6.13 km^2 or 5% of the total area inside the survey limits could simply not be covered (Figure 2.3). Although the possibility of having unsurveyed areas was foreseen during the design process, it was paramount to include these urbanized zones in the study in order to answer the research questions laid down in the first chapter by means of surveying the area around the excavations made by Eliecer Silva Celis during the 1940s in what is now the Archaeological Museum of Sogamoso (Silva Celis 1945a, 1945b, 1945c, 1945d). The museum is located on the outskirts of Sogamoso and it represents the most likely location for the former center of the Sogamoso chiefdom. The characteristics of land tenure in the Sogamoso valley had implications for the way in which field activities were conducted and their effects are discussed in the next pages.

2.2 FIELD METHODS

2.2.1 Survey methodology

The research in the Sogamoso valley consisted of a systematic, full-coverage survey combined with small-scale stratigraphic testing. The survey adapted methods previously developed in the valley of Mexico (Sanders, et al. 1979), the valley of Oaxaca (Blanton, et al. 1982; Kowalewski, et al. 1989), the Alto Magdalena (Drennan 2006) and the Chifeng region in China (Chifeng 2003, 2011). Similar procedures were successfully applied with the aim of studying organization above

household level in Ecuador (A. M. Cuéllar 2009; Martín 2010), Panamá (Berrey 2014; Haller 2008) and the Eastern Highlands of Colombia (Argüello García 2015; Boada 2006, 2013a, 2013b; Jaramillo 2015; Langebaek 1995, 2001). Studies in the Intermediate Area documented settlements sometimes so small and evenly distributed over the landscape that their very nature challenges the concept of an archaeological site as a single, discernable human community or activity area (Berrey 2014:25). Moreover, archaeological literature increasingly suggests that the concept of site should be discarded as an analytical unit for collecting spatial data (Drennan, et al. 2003; Dunnell and Dancey 1983). Therefore, instead of using the concept of site, this study aimed at recording any type of prehispanic or Colonial occupation, regardless of its size, density or distribution on the landscape, using collection lots as basic units of data collection and analysis.

The maximum size of the collection units was determined by the methodology used to collect the settlement data. While in the field, two different methods were employed. On one hand, the Sogamoso valley has areas dedicated to dairy cattle husbandry that are usually located on pastures, which made clear during the design phase that subsurface testing was going to be an important method of data collection in many parts of the region. Previous experiences in similar environments showed that the excavation of small shovel probes was an efficient methodology for testing those areas covered by dense vegetation (Boada 2006, 2013a, 2013b; A. M. Cuéllar 2009; Drennan 2006; Langebaek 1995). On the other hand, in the survey area the non-industrialized agriculture in the valley exposes a large part of the surface and its soils. The continuous use of the landscape by prehistoric and modern population, the relatively shallow depth of soil and cultural layers and the post-depositional processes that occur in the Eastern Highlands constantly move part of the archaeological record to the surface—in most cases—displacing its horizontal position by only a few meters. Undoubtedly there are occasions when the post-depositional processes were intense enough to cause biases in the location of the

archaeological record. The most common example encountered in the field was erosion in small, hilly areas, but it was extremely mild and evident that it did not severely change the horizontal position of the archaeological record. These characteristics allowed the location, extent and density of the archaeological to be recorded by means of systematic walks over the landscape in those areas without dense vegetation. Thus, two complementary systematic methods of data collection were applied in the field: shovel tests in those areas with dense vegetation and systematic walks across areas where soils were exposed.

The excavation of each shovel probe usually consumes more time per area than systematic walks over the landscape. Some regional surveys in areas with dense vegetation distributed the shovel tests each 100 m (Argüello García 2015; A. M. Cuéllar 2009; Langebaek 1995, 2001). These studies successfully covered areas of around 100 km^2. Boada (2006, 2013a, 2013b) in the Bogotá Savannah and Berrey (2014) in the Tonosí region used smaller intervals between the shovel tests in order to reduce the possibility of missing small areas with archaeological evidence and to increase the resolution of the study. Although these studies provided meaningful data in order to discuss settlement pattern dynamics in their regions, they covered less than a 100 km^2 each. These experiences suggested that for regional surveys in areas with dense vegetation, the distance between shovel tests considerably reduces the extent of area that could be covered. Given that the settlement patterns and the structure of supra-local communities are a regional-scale phenomenon that require a study area large enough to comprehend its dynamics (Drennan, et al. 2003:126), and that one of the most recent attempts to compare the variability of such dynamics uses data from areas of several hundred to a thousand km^2 (Drennan and Peterson 2004, 2008; Drennan, et al. 2010; Peterson and Drennan 2005), Intervals of 100 m between each shovel test were therefore preferred. For every 100 m of poor visibility a single shovel probe of 40 cm by 40 cm was excavated to determine the presence of archaeological evidence and when this

was true, to collect a sample of it (Drennan 1985, 2006). All shovel tests were around 40 cm deep because the cultural layer of the sedentary occupation usually begins right after the vegetation coverage (Silva Celis 1945a, 1945b, 1945c, 1945d). Even the earliest archaeological period of this sedentary occupation has been found just below the vegetation layer in the Sogamoso valley and surrounding areas (Garavito 2007; Rodríguez Ramírez 1999). Although these choices reduced the resolution of the study, they made covering a large area enough to approach the regional-scale phenomena in the Sogamoso valley more likely.

The maximum area of each collection unit was 1 ha. This allowed the spatial continuity in those places with occupation over areas larger than 1 ha to be documented at 1 ha resolution. This maximum area was used for both zones, those with dense vegetation and those with good surface visibility. Collection lots with smaller areas within dense vegetation zones were not a feasible option given the resolution chosen for the shovel tests. The reason for this was simply because they could create small “unoccupied” areas between collection units that were not produced by prehispanic or Colonial activities but rather created as a result of the way in which data was collected in the field. Collection lots with larger areas were also an impractical alternative because they could reduce the resolution of the settlement data in those zones with dense vegetation even more. Additionally, while in the field, collection lots no larger than 1 ha each were also a useful concept because the local population uses it as the minimal unit to divide their properties in the countryside. This allowed survey teams to use landscape features such as roads, fences, tree lines, streams and rivers as boundaries without difficulty in order to divide those areas with artifact scatters that were larger than 1 ha into separate lots. One separate collection was gathered in each lot.

Shovel probes were excavated by team members working in pairs. Team members systematically examined excavated soil by hand or with trowels over plastic tarps, collecting all artifacts that they encountered in the process. After finishing the screening process each shovel test was refilled with the soils extracted. A total of 2599 shovel tests were excavated across the survey area, 208 of which recorded evidence of prehispanic or Colonial occupation (Figure 2.4). Collection lots made by means of shovel probes represented 22% of the 909 collection lots recorded inside the survey area.

The collection lots documented by means of systematic walks were done by survey teams of 3-4 people walking systematically across the exposed surface at 50 m spacing, recording both the location and spatial extent of any evidence of prehistoric and Colonial human occupation. Unlike in areas with dense vegetation, whenever the spreading of archaeological material was less than 1 ha, survey teams were able to record this area instead of drawing a collection of 1 ha. The sherd density was subjectively assessed to decide whether a systematic collection was feasible or not. Whenever a lot seemed to have a large density of sherds, a systematic collection circle with a radius of 1.8 m (i.e. 10 m^2 approximately) was drawn on the ground surface and all artifacts that were found within were collected. If this initial collection circle yielded fewer than 40 sherds, then a second systematic circle collection was made (more or less adjacent to the first) so as to obtain the desired number. A third, but final collection was made if necessary. In the case that a lot did not reflect a large sherd density on the surface, a general collection of the entire 1 ha lot was undertaken. A total of 701 surface collections were made, accounting for 77% of all the collection lots. From this, 693 were general collections while only eight were systematic collections.

The spatial limits of each collection lot were drawn directly on satellite images at a 1:7600 scale. These images were the base tool of the survey. Each image covered slightly more than 2 km^2 and it was divided by a grid of 1 km^2 cells. Each image included a 1 ha scale, the name of the assigned quadrat and WGS 1984 UTM coordinates over the grid lines. Daily activities of survey teams were focused on one of the two 1 km^2 squares in each image. Although hand-held GPS units were used to record UTM coordinates for the approximate center of each lot and for each shovel test excavated, this hardware was only used as a secondary navigation tool. Each collection that was made in the field, be it by shovel probe or surface collection, was assigned a unique lot number and a paper form was filled in that contained all its associated data, including its spatial information. Raised fields were not found inside the survey area. Other types of heavy or non-portable archaeological evidence like ground-stone items and petroglyphs inside or outside collection lots were recorded but not collected. Between collection units and shovel probes, a total of 909 collections were made during the course of the regional survey, documenting some 438 ha of occupation. The overall mean area of collection units was 0.5 ha which indicated that very small occupation areas were also recorded. In these collection units a sample of 5645 sherds from the prehispanic and Colonial periods were collected.

2.2.2 Stratigraphic test

The chronological framework for this survey was designed using preceding research on this topic in the Eastern Highlands. Nevertheless, a small-scale stratigraphic testing was conducted, not with the intention of making a new chronological or typological framework, but with the purpose of assessing how the chronological changes in the use of the different pottery types could affect the demographic and spatial data inside the survey area. Stratigraphic test pits of 2x1 m were excavated inside collection units that already had their ceramic assemblages classified according

to the ceramic typologies established for the Eastern Highlands. The locations of test pits were chosen based on a simple index made with dummy variables that distinguished presence or absence of ware typologies identified within the survey area. This index gave less points to those collection units where artifacts from the Colonial, Republican and Modern periods were found. Conversely, collection units with prehispanic sherds that could not be classified and sherds from any ceramic type related to prehispanic occupation received more points. At the end, this index highlighted those collection units without documented occupation after the prehispanic period and with a high degree of ceramic type variability. Collection units with higher index scores were considered for the excavation of the test pits. The initial plan was to excavate five test pits inside the area of the five collection units with the highest index scores, however, budget and logistic restrictions only allowed the excavation of three test pits in the two collection units with the highest index scores. From these, only two test pits were included in the analysis. The test pit excavated in the collection lot 13G3 was discarded because when it was compared with the other test pits, it yielded few ceramic sherds (n = 128) and it was heavily distorted by a modern garbage dump produced by the landowners of the lot.

Test pits were excavated during the last field season (June-July, 2014), when most of the study area was already surveyed and assemblages from almost all collection units were classified and digitalized. Stratigraphic test pits were oriented north-south. Before beginning with the excavation of each stratigraphic test, a systematic collection circle with a radius of 1.8 m was drawn on the surface where the test was located and all artifacts that were found within it were collected. This systematic collection circle was neither part of the test pit analysis nor the collection lot assemblage. When vegetation covered the location of the test, this was removed with shovels and the soil attached to it was inspected. The excavation of each test was made by natural strata subdivided into arbitrary layers of 10 cm whenever they were thicker. For each level of each

stratigraphic test a form was filled out with all the details of the excavation. Any features or soil changes were documented in sketches and drawings in additional graph paper. Several samples for radiocarbon dating were collected for future research. Each test pit received a unique code composed by the name of the collection lot, the letter C that stands for *corte* and a number that recorded the number of test pits made inside the same collection unit. For example the first test pit made in the collection lot 11F2 was registered as 11F2C1. The test pits provided ceramic, lithic and soils samples but only ceramic material was completely analyzed.

2.3 ANALYSIS METHODS

2.3.1 Chronology

The chronological framework used the same ceramic and lithic typologies delineated in previous studies in the Eastern Highlands. More specifically, lithic classification followed the categories created by Correal and Van der Hammen (1977) and the ceramic typology and chronology were based on the comprehensive efforts of Langebaek and Boada on this topic (Boada 2007:228-240; Langebaek 1995:163-186). Specific ceramic characterizations made by Broadbent (1970) and Cardale de Schrimpff (1981a) for the Bogotá Savannah also guided the classification process. The descriptions and local variants identified by Castillo (1984), Falchetti (1975) and Pradilla, et al. (1991) for the northern region of the Eastern Highlands were also used. Local variants of the Sogamoso valley were taken into account as well. Archila (1986a, 1986b) described and dated the local ceramic production for an area bordering the Sogamoso valley. Most of the archaeological materials found in the Sogamoso valley matched the typologies defined in Archila´s study, therefore, these local types were also used in the classification process.

Whenever local variants differed only in the location where they were found and in some few stylistic characteristics, in these cases, similar variants were collapsed in a single category. For example, Tunja Burnished Orange from Pradilla, et al. (1991) and Suta Burnished Orange from Falchetti (1975) were collapsed in a single type named Orange Burnished. Finally, the detailed definitions made by Therrien, et al. (2002) allowed to identify ceramic materials from the Colonial and Republican periods. The chronological framework and the pottery types associated with each period in the survey area are summarized in Table 2.1.

The archaeological sequence is comprised of five archaeological periods: the Preceramic, Herrera, Early Muisca, Late Muisca and Colonial periods. These periods followed the chronological framework proposed by Langebaek (1995). The beginning of the sedentary occupation in this structure was slightly adapted by the same author in the northern territories (Langebaek 2001) and this modification was taken into account here. Similarly, the end of the last period analyzed (the Colonial period) corresponded with the first documented contact of Spanish conquerors and the population of the Sogamoso valley. Although there are several other chronological frameworks (Argüello García 2015; Boada 2006, 2013a, 2013b; Kruschek 2003; Peña 2013; Romano 2003), they were not used because all of them are suggested for the south of the Eastern Highlands and their chronological differences with the northern territories probably reflect the expected variability associated with the prehispanic demographic scale and the number of archaeological studies conducted near or within the Bogotá Savannah more.

The Abriense and Tequendemaniense technologies characterize the earliest human occupation (Correal 1990a, 1990b; Correal and Van der Hammen 1977). Although the criteria used to distinguish these lithic technologies have been strongly criticized (Nieuwenhuis 2002; Pearson

2004), there is a general consensus on the time span in which these technologies were achieved. The first dates ranged in age between 10.000 and 8.000 BC (Aceituno and Rojas 2012; Correal 1990b; Correal and Van der Hammen 1977; Pearson 2004). It seems likely that the same lithic technologies produced during preceramic times were still in use until the Conquest (Boada 2013b; Langebaek 1995). Thus, the rule of thumb to identify preceramic contexts has been distinguishing areas with high densities of lithic materials but with complete absence (Boada 2006, 2013b; Langebaek 1995) or very low percentages of pottery in the upper soil layers (Correal 1990a; Correal and Van der Hammen 1977; Groot 1992). The arbitrariness behind this mechanism of differentiation could appear problematic but the evidence of preceramic contexts excavated in the Highlands so far has supported its reliability. In those preceramic sites where pottery was also excavated, very few sherds associated with the sedentary occupation were found (Correal 1990a:264).

The Herrera period represents the earliest sedentary occupation in the Eastern Highlands. The beginning of this period is still undetermined but a conservative approach in the northern territories could set it back to 400 BC. Its upper limit probably extended until 800 AD (Langebaek 1995, 2001). Because it spans for almost 1200 years, there have been several attempts to subdivide this period into at least two different stages (Boada 2013a; Langebaek 2001; Romano 2003). Although the differences in ceramic types and radiocarbon dates in the Bogotá Savannah give empirical support for subdivisions, the material culture of the Herrera period has been proven scarce and very homogeneous not only in this study but in the other regional survey conducted in the northern territories (Langebaek 2001). For this reason there were no attempts to subdivide the Herrera period in this research. The archaeological record in the Sogamoso valley did suggest that the Herrera period probably represented a long phase of technological homogeneity and low

demographic densities. The ceramic types found during the survey related with this period were Calcite Temper ware, Crushed Rock ware and Red on Cream ware.

The Early Muisca period probably characterized the northern territories of the Eastern Highlands between 800 and 1200AD. For this period, Archila (1986b) reports a radiocarbon date of 840±60 AD for local type Coarse Caramel ware in the Busbanzá valley. This valley borders with the Sogamoso valley in its northern edge. A similar relative chronology (700-800AD) was assigned to the moment when Sandy ware in the city of Tunja began to be used (Castillo 1984). In other studies the Sandy type is also strongly associated with the Early Muisca period (Kruschek 2003; Langebaek 1995, 2001). Therefore, Coarse Caramel and Sandy types represented the Early Muisca period in the survey area. Despite the fact that other ceramic types associated with this period were excavated in the Bogotá Savannah (Argüello García 2015:36), from these, only three sherds of Tunjuelo Laminar ware were found while surveying.

The Late Muisca period covered the last centuries before the Conquest. The lower limit probably started around 1200 AD in the Sogamoso valley and its upper limit reached the year 1537 AD, when the first Spaniards arrived to the valley (Anonymous n.d.). The chronology and materials associated with this period are perhaps the less disputed in the whole prehispanic sequence (Argüello García 2015:36; Boada 2006). In the survey area this period was characterized by the following ceramic types: Valle de Tenza Grey ware, Sherd Temper ware, Coarse Red ware, Burnished Orange ware, Grey Temper ware and White Temper ware.

Finally, the Colonial period characterizes the time under the control of the Spanish crown. It begun in the year 1537 AD and ended around the first decade of the nineteenth century. Documenting

the spatial distribution of the archaeological evidence associated with this period was important for the objective of this research. The Sogamoso valley, for the period before and after the Conquest, has an enormous amount of Colonial documents and publications with detailed descriptions on demographics and economics (AGI ca. 1658 Contaduría 1346A, número 5; ca. 1671-1749 Contaduría 1553.; Colmenares 1997), religious orders (Sotomayor 2004), political organization and legal disputes (Correa Rubio 2004; Gamboa 2013). The Eastern Highlands also have a fairly detailed ceramic classification for the Colonial period that allow separating Colonial ceramics from those produced during the Republican period (Therrien, et al. 2002). For these reasons, the Sogamoso valley was considered an ideal case study to contrast demographic population estimates made with ethnohistorical records and those reached by means of archaeological data. From the several Colonial types that have been documented in the Eastern Highlands, only Colonial Glaze ware and Dragged Temper ware were found by survey teams.

2.3.1.1 Test Pits

Two test pits were excavated in the collection unit 11F2. This collection unit had an area of 1.2 ha and it was part of the prehispanic nucleation documented around the local museum of archaeology in Sogamoso (Figure 2.5). The area is flat, on the left-bank of the Monquirá River and very close to its stream. The vegetation in the collection lot was removed in order to build affordable housing. The construction project had not yet begun by the time the test pits were excavated, allowing excavation teams to identify high density areas by means of systematic surface collections across the parcel. These systematic collections were circles of 1.8 m of radius (± 10 m^2) at 5 m intervals in parallel lines oriented north-south. Two separate high density areas were identified. The test pits were located in those areas with high densities inside the collection

lot. Although only one test pit was projected in the collection unit, ultimately, two test pits were excavated, one for each high density area.

TEST PIT 11F2C1: This test pit was excavated in the southeastern corner of the collection unit 11F2. This was a relatively deep and dense deposit. It yielded a total of 2237 sherds, of which 2209 were prehispanic sherds, 5 sherds were Glazed Colonial ware, 12 sherds were classified as Dragged Temper ware and 11 sherds could not be identified either because they were too small or too deteriorated or they did not correspond with any recognizable ceramic type. Seven arbitrary levels of 10 cm each were excavated. This test pit included three features that appeared below 30 cm depth. The features corresponded to soils that have been removed and they were interpreted as traces of potential burials. When the excavation reached 70 cm of depth, the feature located in the southern part of the test pit did in fact match with part of a burial. In this feature, the skull of an individual was identified, however, the soil composition severely deteriorated the human remains of this individual, only making possible to recover two dental pieces. The other two features continued after 70 cm depth, but the excavation of the test pit stopped at this level because the complete digging of the three features required time and resources not available to the project. Nevertheless, the location and distribution of the features were completely documented and they are available for future studies.

The prehispanic ceramic assemblage in this test pit presented great variability. All the prehispanic sherds identified during the survey were divided into twelve different types (Table 2.1), but only nine of these types were found in this test pit. Sherds classified as Calcite Temper, White Temper and Valle de Tenza ware were not found. However, 55 sherds of the Fine Incised type reported by Castillo (1984) in Tunja and associated with the Herrera period (Boada 2007:236) were

excavated in the first four upper levels of this unit. This test pit yielded mostly Coarse Caramel ware, while other types were also represented, their vertical distribution was rather random (Figure 2.6). The disturbances created by the burials located in the test pit probably caused the lack of stratigraphic order in those ceramic types different from the Coarse Caramel ware. On the contrary, the large percentage of Coarse Caramel sherds found in this pit, which added up to around half of all sherds collected (52%), probably protected the stratigraphic distribution of this type from being severely modified by the burials.

The stratigraphic pattern of Coarse Caramel decoration showed some differences. Coarse Caramel sherds with Incised-Combed decoration appeared in the whole sequence but they were concentrated in the three lowest levels (below 30cm deep). Coarse Caramel sherds with or without painted decoration became more common in the upper levels, above 30 cm depth. This pattern suggested that Incised-Combed decoration was gradually disappearing on Coarse Caramel ware. Unfortunately because of the scanty presence in collection lots of Coarse Caramel sherds with decoration and the way in which decoration was classified, the spatial distribution at the regional level of decoration in this ware could not be directly differentiated. The proportion of Coarse Caramel Sherds with any type of decoration found in collection lots was low. Only 108 of 2303 Coarse Caramel Sherds (4.6%) showed decoration. Coarse Caramel decorated sherds found in collection lots included incised-combed and red painted decoration, but during the classification process no differentiation was made between these styles.

TEST PIT 11F2C2: This test pit was excavated in the northwestern corner of the collection unit 11F2. This was a shallow but dense deposit. It yielded a total of 2002 sherds, of which 1959 were prehispanic sherds, 25 sherds were Glazed Colonial ware, 12 sherds were classified as Dragged

Temper ware and 18 sherds could not be identified either because they were too small or too deteriorated or they did not corresponded with any recognizable ceramic type. Five arbitrary levels of 10 cm each were excavated. The excavation reached bedrock at 50 cm deep.

Only ten of the twelve different ceramic types collected by means of collection lots were found in this test pit. Sherds classified as Calcite Temper and White Temper were not found. 17 sherds of the Fine Incised type did appear evenly distributed in the first four upper levels. This test pit also yielded mostly Coarse Caramel ware, representing 48% of the total of prehispanic sherds excavated. Ceramic types associated with Herrera occupation (Crushed Rock, Red on Cream and Fine Incised ware) were found in low proportions in all levels except in the 30-40 cm level. Red on Cream ware was found in a larger proportion in the deepest excavation level (40-50 cm). Sherds associated with the Early Muisca period (Sandy ware, Laminate ware and Coarse Caramel ware) were found almost always in the four uppermost levels. Coarse Caramel sherds without Incised-Comb decoration and Laminate sherds were not found in the deepest level. Coarse Caramel sherds with Incised-Comb decoration were the most common type in the deepest level. Sherds associated with the Late Muisca period (Coarse Red, Sherd Temper, Grey Temper, Burnished Orange, Tenza ware) were located consistently above 40 cm deep, in the four upper levels. Again, there was a clear stratigraphic differentiation between the Coarse Caramel sherds with or without different decoration and those sherds with Incised-Comb decoration. Sherds with Incised-Comb decoration were common in the lowest level and they were gradually replaced by Coarse-Caramel sherds with painted decoration or without it (Figure 2.7).

2.3.1.2 Discussion

The stratigraphic distribution of ceramic types highlighted some aspects about the diachronic use of local pottery relevant for this study. Coarse Caramel ware was invariably the most common sherd type and it appeared consistently through the stratigraphic sequence. The stratigraphic distribution of decoration in Coarse Caramel sherds suggested some chronological dissimilarities. The relative abundance of Coarse Caramel sherds through the different levels excavated could affected the population estimates, especially those related with the Early Muisca and Late Muisca period.

Coarse Caramel sherds with Incise-Comb decoration appeared deeper than Coarse Caramel sherds with other decoration styles or without it. The only radiocarbon date for the Coarse Caramel type (840±60 A.D.) was associated with red painted decoration (Archila 1986b:36). Considering this date and the distribution of decoration styles in the test pits excavated, Coarse Caramel ware with Incise-Comb decoration could have been produced earlier than 840±60 A.D. and therefore, was probably associated with the Herrera period. In the excavation conducted by Archila in Busbanzá only one sherd presented incised decoration (Archila 1986a:84). Although more stratigraphic excavations will be required to evaluate the significance of these patterns, these two pieces of evidence required an assessment on the implications for the settlement data collected. Unfortunately, the classification process of ceramic material in the collection lots of the regional survey did not clearly differentiate decoration styles applied to Coarse Caramel sherds. Nevertheless, one variant of the Coarse Caramel type that could bring light to this issue was documented. The Red on Orange variant, which is characterized by its red painted decoration (Archila 1986a) could be subtracted from the variable Coarse Caramel Decorated Sherds with the aim of obtaining a rough approximation of the number of possible Coarse Caramel Sherds

with Incised-Comb decoration found in collection lots. This approach could also provide a potential spatial distribution of Coarse Caramel Sherds with Incised-Comb decoration. This analysis identified a total of 81 possible Coarse Caramel sherds with Incised-comb decoration, which came from 45 different collection units (Figure 2.8).This means that a possible proportion of Coarse Caramel Sherds with Incised-Comb decoration found in collection lots could have been only 3.5%. Considering the small scale of the test pits excavated, the low proportion of potential Coarse Caramel Sherds with Incised-Comb decoration found in collection lots, that radiocarbon dates for Coarse Caramel Sherds with Incised-Comb decoration are not available and that other differences between Coarse Caramel sherds besides decoration are negligible, for these reasons, it was preferred to maintain these sherds associated with the Early Muisca period. Future research with a strong focus on dating methodologies should identify whether the changes in Coarse Caramel decoration could reshape the chronological framework of the Sogamoso valley.

Late Muisca sherds were found in low proportions in the upper stratigraphic levels of the test pits. These upper levels also contained large proportions of sherds classified as Coarse Caramel ware which partially characterizes the Early Muisca occupation. This evidence suggested that Coarse Caramel ware was probably still used in the Sogamoso valley during the Late Muisca period. Because Coarse Caramel ware had the largest proportions of sherds in all stratigraphic levels, it could be argued that Coarse Caramel ware was a common ceramic type not only in the Early Muisca period but also during the Late Muisca period. If that was the case, then population estimates and occupied area for the Early Muisca period could have been overestimated and those for the Late Muisca period could have been underestimated. This could occur because one part of the prehispanic populations used the same kind of pottery over a long period of time and they did not intensively interact with other areas of the Eastern Highlands. Because other prehispanic wares different from the Coarse Caramel type have fair chronological associations,

one could approximate the distortion caused by the long-term use of Coarse Caramel ware to the Early Muisca and Late Muisca estimates analyzing those collection units only with Coarse Caramel sherds.

183 collection units reported Coarse Caramel sherds without other ceramic types associated with the Early Muisca or Late Muisca period. These collection units covered a total of 81 ha. They were dispersed over the landscape without any apparent aggregation (Figure 2.9). Three different scenarios could have occurred with these collection units: 1) all were occupied only during the Early Muisca period; 2) all were occupied only during the Late Muisca period or 3) all were occupied in both periods. In the first scenario, and given that the total Early Muisca occupation was approximated of 225 ha, collection units only with Coarse Caramel sherds represented 36% of the Early Muisca occupation. In the second scenario, and because the total Late Muisca occupation covered 186 ha, the Early Muisca and Late Muisca occupation could have been overestimated by 36% and underestimated by 43% respectively. The latter value could be used as an upper level for a possible underestimation in the occupation during the Late Muisca period. In the third scenario, because a longer length of occupation in the same place should produce more waste, one could expect that only collection units with a large number of Coarse Caramel sherds were occupied in both periods. The distribution of Coarse Caramel sherds among those collection units that only yielded that ceramic type could be used to identify collection units with large numbers of sherds. The mean number of sherds for those collection units only with Coarse Caramel sherds was 2 sherds per collection unit (n=183; sum = 384; standard deviation = 2.2). From these, only collection units with counts of sherds above one standard deviation were used to generate a rough estimation for the third scenario. This procedure selected a total of 15 collection units with a mean of 8.4 Coarse Caramel sherds per collection unit (n=15; sum = 126; standard deviation = 2.7). The total area of these collection units covered 7.5 ha. If these 7.5 ha

were occupied in both periods, then the Late Muisca occupation could have been underestimated by 4%. Therefore, 4% could be used as a lower level for a possible underestimation in the Late Muisca occupation. This analysis suggested that because the way in which Coarse Caramel ware was used thorough the prehispanic sequence, Late Muisca occupation could have been underestimated between 4 and 43%. Considering the nature and scale of the survey procedures and the test pits, the factors that affect occupation and preservation of archaeological contexts and that additional and very expensive research based on dating methods for non-organic material will be required to assess this issue more precisely, this very rough range is a useful approximation to consider how population estimates could be affected by the nature of the archaeological data in the Sogamoso valley.

2.3.2 Demographic reconstruction

Demographic scale is one of the variables shaping the organization of human communities and the way in which human population changed through time is a common topic in the study of prehistoric societies. Archaeologists use the size and number of residential structures in order to calculate demographic estimates, however, this is a not feasible option at the regional scale in the Eastern Highlands of Colombia. In this region, features associated with prehispanic structures are usually undersurface and they can only be identified through large horizontal excavations. Residential structures in the Muisca area have been recognized by circular distributions of post holes which are easily affected by post-depositional processes and usually very hard to link to only one of the archaeological periods. Even if somehow the entire survey area is excavated, the nature of the archaeological record in this region weakens even more, at the regional scale, the effectiveness of using large horizontal excavations for demographic reconstructions. Therefore, approaching demographic reconstruction required a different line of evidence.

One useful assumption to create demographic reconstructions for the Eastern Highlands using archaeological materials is that—all else being equal—more people living in a place will leave more garbage of various kinds on the landscape. Ceramic sherds are the most common and best preserved archaeological material found in this region. They can be easily associated with archaeological periods on the basis of stylistic and production variables. Because of this, ceramic sherds are the most useful archaeological objects to quantify the intensity and extent of human occupation during each period. In the Eastern Highlands, at the regional scale, these archaeological materials have been used to estimate the size of the prehispanic occupation (Argüello García 2015; Boada 2006, 2013a, 2013b; Langebaek 1995, 2001).

Two separate and measurable variables of the distribution of ceramic sherds across the landscape were used together to estimate the total number of inhabitants for each archaeological period: the area covered by sherds of each period and the sherd density at which an area is covered. On one hand, the area covered by sherds in each lot was assumed to be equivalent to the area people lived on during an archaeological period at a density given by the corresponding sherd density. On the other hand, it was assumed that the sherd density calculated for each archaeological period—that is, the amount of sherds per square meter—represented the human density for each period in each lot, entirely irrespective of the actual lot area. Based on these two assumptions, the total number of inhabitants in each lot was calculated by multiplying human density (determined by sherd density) by area covered by sherds lot by lot.

Because collection lots were drawn on georeferenced satellite imagery at a known scale, the procedure followed to calculate the area of each collection lot was simple. The polygons drawn

on each one of the satellite images used in the field were digitized and their areas were calculated using the scale at which imagery was printed. The spatial distribution of ceramic types associated with different archaeological phases in these collection lots was used to identify which areas were occupied during the different phases. The combined area of all the collection lots that contained sherds associated with a particular archaeological period produced the total area occupied for that given period.

Each positive shovel test represents a sample of archaeological materials in a collection lot where vegetation prevented carrying out a surface collection. Sherd densities of collection units made by means of individual shovel tests were calculated using the amounts of sherds found in the shovel tests. Because shovel test usually provided sherds associated with different archaeological periods, the procedure described below was conducted for each ceramic assemblage of each archaeological period. First, the total number of sherds associated with a period was divided by the approximate area excavated in a probe (around 0.16 m^2). Next, with the aim of dealing with the possibility that longer periods of occupation created greater accumulations of garbage, sherd densities for each archaeological period were divided by the number of centuries that each period covered. This provided an index roughly representing something like sherds per square meter per century for each one of the four archaeological periods of sedentary occupation identified in the Sogamoso valley.

Sherd density values of each collection lot made by means of a shovel test were translated then into human densities per hectare. To do this, four density categories established on the basis of the correlation between the residential densities and sub-surface sherd densities of four local-scale surveys conducted in four separate prehispanic communities were used (Berrey

2014:32,44). Two of these local-scale surveys were conducted in the Eastern Highlands (Boada 2007; Fajardo Bernal 2011; Henderson and Ostler 2005). These characteristics suggested that the methodology developed by Berrey was the most effective approach for establishing the relationship between sherds and human densities using the archaeological data collected. The first density category included density-index values (sherds/m^2/century) of 0-14 and this represented 5-10 people per hectare. The next category included density-index values of 15-34 and it represented 10-15 people per hectare. Density-index values between 35 and 55 designated human densities of 15-20 people per hectare. Finally density-index values larger than 55 were related with densities of 20-30 people per hectare.

The methodology developed by Berrey was established for conditions similar to those in which the regional survey in the Sogamoso valley was conducted. Moreover, in both areas, two complementary field methodologies were required to conduct the survey. As discussed above, the land use present in the survey area made employing shovel testing and surface collections as two complementary methods of data collection necessary. For this reason, the procedure used to calculate the ceramic densities of each lot required establishing equivalency between the data collected by the two methods. Shovel testing was used as the basic scale of the density index. This was because of variability in the characteristics of some of the lots documented by general collections. Some of the general collections came from areas with crops in the tillering stage or with patchy grass where surface visibility was somewhat reduced. These conditions probably produced some general collections in which sherd frequency provided a less reliable indication of ceramic density. Although large differences in the number of sherds between general collections still reflected meaningful dissimilarities in ceramic densities, the reduction of surface visibility in some of the general collections made these collections less reliable as measures of ceramic densities. Because each probe was excavated roughly with the same horizontal and vertical

dimensions and they were also distributed across the whole survey area, shovel testing provided a slightly more consistent measure of ceramic densities within the survey limits. Therefore, shovel tests were used to create the basic scale on which ceramic densities were evaluated. The ceramic counts from of each surface collection were then transformed in order to be measured on the same scale as the density of shovel tests.

Shovel tests and surface collections had similar distributions across the valley and they were conducted in all the different geographical zones found inside the survey area, suggesting that at least in spatial terms they should be comparable. When the batch of surface collections was transformed using the $\sqrt{x}$, the batches of density values resulting from surface collections and shovel tests aligned in a steam-and-leaf plot showed roughly similar distributions and similar medians (Figure 2.10). The batch of sherds from shovel tests is skewed upwards with higher outliers, but the main batch of cases covers roughly the same area and peak as the batch of sherds from surface collections transformed. The minimum and maximum values are also very similar between the two batches.

After calculating sherd densities for individual shovel tests, the numbers of sherds resulting from surface collections corresponding to each archaeological phase were transformed to be measured in the same scale as those numbers of sherds found in each shovel test corresponding with the same archaeological phase. The transformation was done by aligning the medians. For instance, the batch of numbers of sherds associated with the Herrera period found in surface collections was transformed to have roughly the same minimum, maximum and median values as the batch of number of sherds associated with the Herrera period that came from shovel tests. This was accomplished by multiplying the batch of sherds from surface collections by the median

of the batch of sherds from shovel tests. This procedure was conducted for each archaeological period for all surface collections and it allowed surface collections to be incorporated into the method of demographic reconstruction that was developed using shovel probes. Because survey teams were able to identify the actual horizontal dispersion of the ceramic sherds in surface collections, the transformed numbers of sherds that resulted from surface collections associated with each archaeological period were divided by the area of each surface collection. Then in the same way as with shovel tests, these densities for each archaeological period were divided by the number of centuries that each period covered. This provided a density-index value for surface collections measured in the same scale as the ones for collection lots made by means of shovel tests, making it possible to use the same four categories developed by Berrey (2014) to calculate human densities based on the ceramic densities collected.

The last step for creating the demographic reconstruction of the archaeological sequence in the Sogamoso valley was to calculate the absolute population estimates for each archaeological phase. The minimum, maximum and mean absolute numbers of inhabitants were assigned to each collection unit by multiplying the area of each lot by the corresponding density category value of each archaeological period. The totaled absolute values of all the collection lots that contained sherds associated with a particular archaeological period produced the minimum, maximum and mean absolute numbers of inhabitants for each phase. This same procedure was used for each phase of the archaeological record analyzed, including those materials associated with the Colonial period.

The complete procedure for the demographic reconstruction is not different from what Sanders, et al. (1979) did in the Basin of Mexico more than 50 years ago, except that instead of estimating

the density subjectively, this study used the number of sherds in shovel probes or in surface collections to try to reach more accurate sherd density estimates. Moreover, in the case of the Colonial period, an additional demographic estimate, stimulated by a comparison made by Sanders et al. (1979), was made using historical accounts of the communities inside the survey area. This demographic reconstruction is fully explained in section 3.4.1.

2.3.3 Human communities

Human communities in the Sogamoso valley were defined using distance-interaction principles. Local communities were indicated by nucleated clusters of habitation debris (primarily sherds) that are small enough to facilitate daily face-to-face interaction and were separated from other clusters by clearly discernible areas with little or no occupation. The approach was systematic and it used distances between collection units, unoccupied areas and demographic densities to cluster collection units in local groups that are likely to intense daily face-to-face interaction (Peterson and Drennan 2005). A more inclusive type of community was identified. The aggregations in this next level seemed to connect to human interaction on a different scale, with less potential for strong human interaction. These communities are better described as clouds of dispersed farmsteads that could have gravitated around a local community, but usually lacked it, and although landforms were not used to define them, their limits loosely corresponded with small variations in the landscape. These clouds of farmsteads fall in a range between strongly nucleated communities on one side and a complete dispersed settlement pattern on the other. Following the same approach, supra-local communities were defined as regional-scale concentrations of occupation. The scale of these communities exceeded the limits of daily interaction in a way that some members of these communities did not interact intensively during their everyday lives. In the Sogamoso valley during prehispanic times these large-scale communities organized some local communities and clouds of dispersed farmsteads. The density of human settlements is

illustrated by means of tridimensional graphs in which the geographic location determines the x and y axes while z-values correspond to human densities calculated by means of the area covered and the density of archaeological materials for a given archaeological period. In these graphs, human nucleation is represented by sharp peaks while dispersed settlements appear as low, hilly areas at different intervals across the landscape.

Local communities, the largest clouds of farmsteads and supra-local communities were coded with the aim of facilitating comparisons. The code used to identify local communities and clouds of farmsteads used an alphanumeric combination that roughly indicate their spatial location. The prefixes SOG, TIB, FIR designated local communities and clouds of farmsteads inside the territory of the modern towns of Sogamoso, Tibasosa and Firavitoba, respectively; and a letter was used to identify different local communities in each of these categories. The same approach was used to identify the largest clouds of farmsteads but a number was used instead of a letter. For example, the local community of Sogamoso did not exist in the Herrera period but a small cluster of farmsteads named SOG-1 was located in the same place where, during the Early Muisca period, the local community SOG-A emerged. This local community since the Early Muisca period was part of a cloud of farmsteads labeled as SOG-1. The supra-local communities were indicated by the name of the modern town closer to the place where they were identified.

2.3.4 Landscape use

The landscape in the Eastern Highlands constrained the local resources available for sedentary communities. Although horizontal excavations documented some exotic resources during preceramic times, these were probably obtained by constant movements made by human groups between the highlands and the lowlands. The most common wild resources found in preceramic

excavations have been local species such as deer (*Odocoileus* sp.), guinea pig (*Cavia Porcellus*), and in lower proportion, rabbit (*Sylvilagus* sp.) and armadillo (*Dasypus* sp.) (Correal 1990a; Correal and Van der Hammen 1977). These species along with riverine resources were probably exploited in this period and also during the sedentary occupation (Langebaek 1987). Salt was exploited at least since the beginning of the sedentary occupation (Cardale de Schrimpff 1981a), and it was a very important resource for participation in the exchange networks within the Eastern Highlands and with lowland communities where important raw materials such as cotton could be obtained (Langebaek 1987). Guinea pig could have been domesticated and maintained in Muisca settlements. Despite the importance of such resources, the subsistence of sedentary populations living during prehispanic times in the Sogamoso valley probably relied on agriculture. Evaluating the distribution of people against the agricultural resources was required to understand how agricultural activities could have shaped human communities and the landscape of the Sogamoso valley.

The most important agricultural resources inside the survey area are the soils with different levels of agricultural productivity. A soil classification based on a study conducted in the 1980s in the Sogamoso valley was used to identify the distribution of differences in agricultural productivity (IGAC-UPTC 1980, 2005). This classification followed the land-capability classification proposed by the Soil Conservation Service of U.S. (Department of Agriculture 1961). Six different soil zones were identified inside the survey area. Their characteristics could be summarize as follows (Figure 2.11).

Class III soils: These soils usually occur in the floodplain. These are deep soils consisting of clay, with moderate to low productivity. This category includes soils that are usually well drained but

can sometimes be imperfectly drained. They are usually on slopes with a gradient between 3% and 25%. These soils required a rotation system for permanent crops.

Class IV soils: These soils occur in the gentle slopes. These are deep to superficial soils, with moderate to low productivity and they require careful handling or crop restriction. This category includes soils that are usually well drained but erosion varies from light to moderate. They are located in slopes with less than 50% gradient but they usually have between 12% and 25% gradient.

Class V soils: These soils occur in the floodplain. They usually do not suffer erosion but they are poorly drained. They are acidic to very acidic, with light to moderate fertility. They have high contents of organic material but require large labor investments to be used for agricultural production. They are located in flat areas.

Class VI Soils: These soils occur in the floodplain. They are usually inadequate for cultivation. They show high contents of organic material but they are located in poorly drained areas.

Class VII Soils: These soils occur in the slopes with more than 25% gradient. They are not usually deep, and they are affected by erosion from a moderate to very severe degree.

Class VIII Soils: these soils occur in the slopes and mountain spurs. They usually show slopes with more than 50% gradient and erosion processes from light to very severe. These soils have strong limitations for agricultural practices.

The spatial patterns of the prehispanic and Colonial occupation in these soil categories were analyzed. Obviously, this soil classification corresponds to the present conditions in the survey area, which could be different from the settings present in prehispanic and Colonial times. For example, the quantity of minerals and nutrients available in some soil classes that cover the Sogamoso valley could have changed simply because prehispanic populations used those particular areas of the landscape more intensively. Two reasons support using these modern soil categories as analogous to the conditions occurred in the past. On one hand, the soil classification is not only based on the chemical characteristics of soils but also on variables that are very unlikely to have varied in the last ten thousand years. Such variables include the slope, drainage, bedrock type and basic soil composition, which indeed could change but at a different time scale and not as a result of human activities. On the other hand, pollen analyses show that environmental conditions in the Eastern Highlands have been very similar during the last 10000 years (Correal and Van der Hammen 1977; Gómez, et al. 2007). Nevertheless, these same analyses suggested that human intervention in the landscape has probably been intense since 3800 BP (Gómez, et al. 2007). This evidence indicated that prehispanic communities could have modified the soil conditions through their everyday activities. For these reasons, the analysis of the relationships between soil classes and the archaeological occupation anticipated the possibility that some of the present conditions were in part produced by human activities conducted in prehispanic times.

2.3.5 Additional forces driving human interaction

Human interaction is usually propelled by activities, places or ideas that attract or repel populations. During their life span, individuals and households take into consideration factors that drive interaction in order to obtain the best possible outcomes, given the decisions of other individuals and the constraints imposed by the cultural and environmental systems. Broadly speaking, the factors driving social interaction have been divided in two groups. On one hand, economic forces have been seen as a powerful way to attract sizeable populations and build social inequalities. On the other hand, social, political, ideological or religious reasons can also favor social interaction in ways that could produce impressive social outcomes. Among prehispanic societies in the Eastern Highlands economic factors have been seen as the strongest force pulling human interaction (Boada 2006, 2007, 2013a, 2013b). Other studies have documented enough evidence to suggest that ideological and social forces were also driving social interaction (Henderson and Ostler 2005; Langebaek 1995, 2001). The method followed in both cases to suggest these possibilities was analyzing the spatial distribution of the archaeological record that could suggest the presence of economic forces driving social interaction, and the same approach was taken here. The spatial distributions of lithics, non-local ceramics and decorated sherds were examined against the human densities and community organization of three prehispanic periods of the sedentary occupation in order to identify whether economic forces were the most plausible force creating human interaction. As usual, the realities of the social sequence were more complex and could not be explained only by the presence or absence of one particular interaction force.

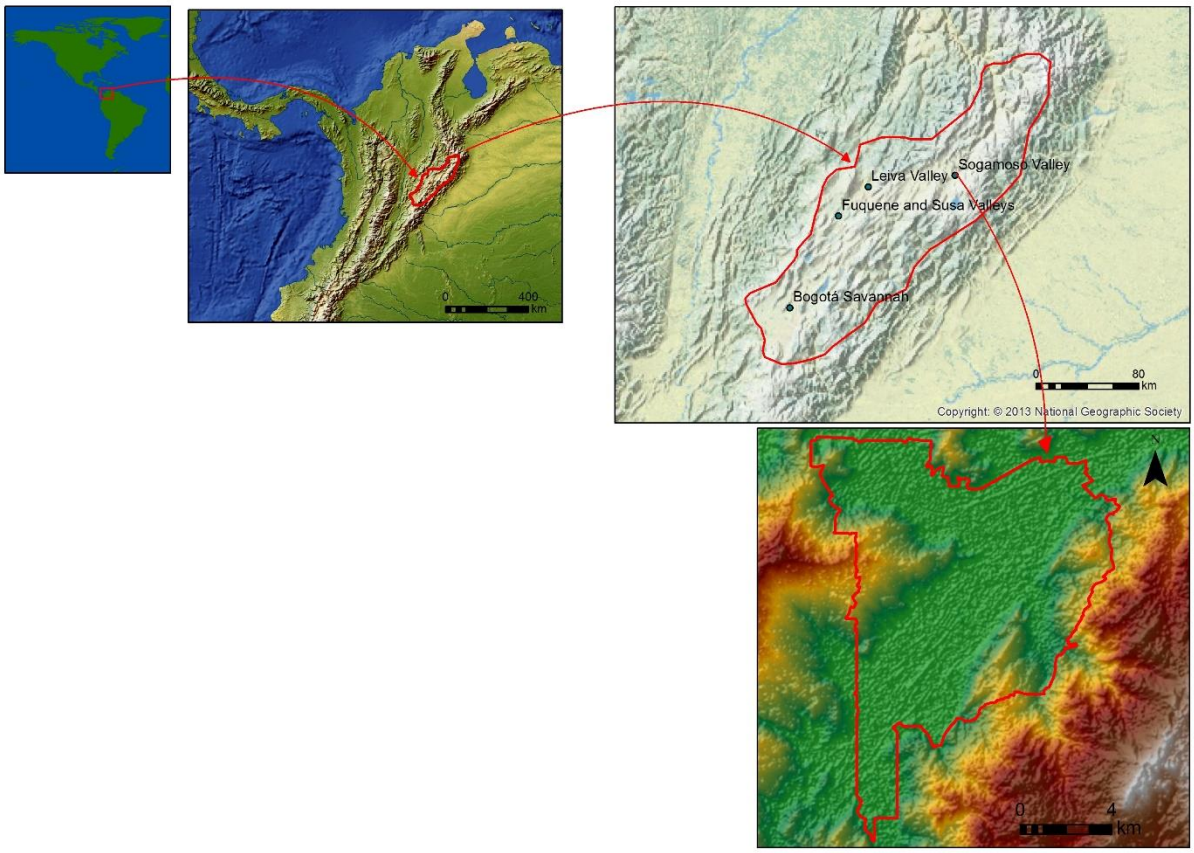

Figure 2.1 General location of the survey zone in the Sogamoso valley

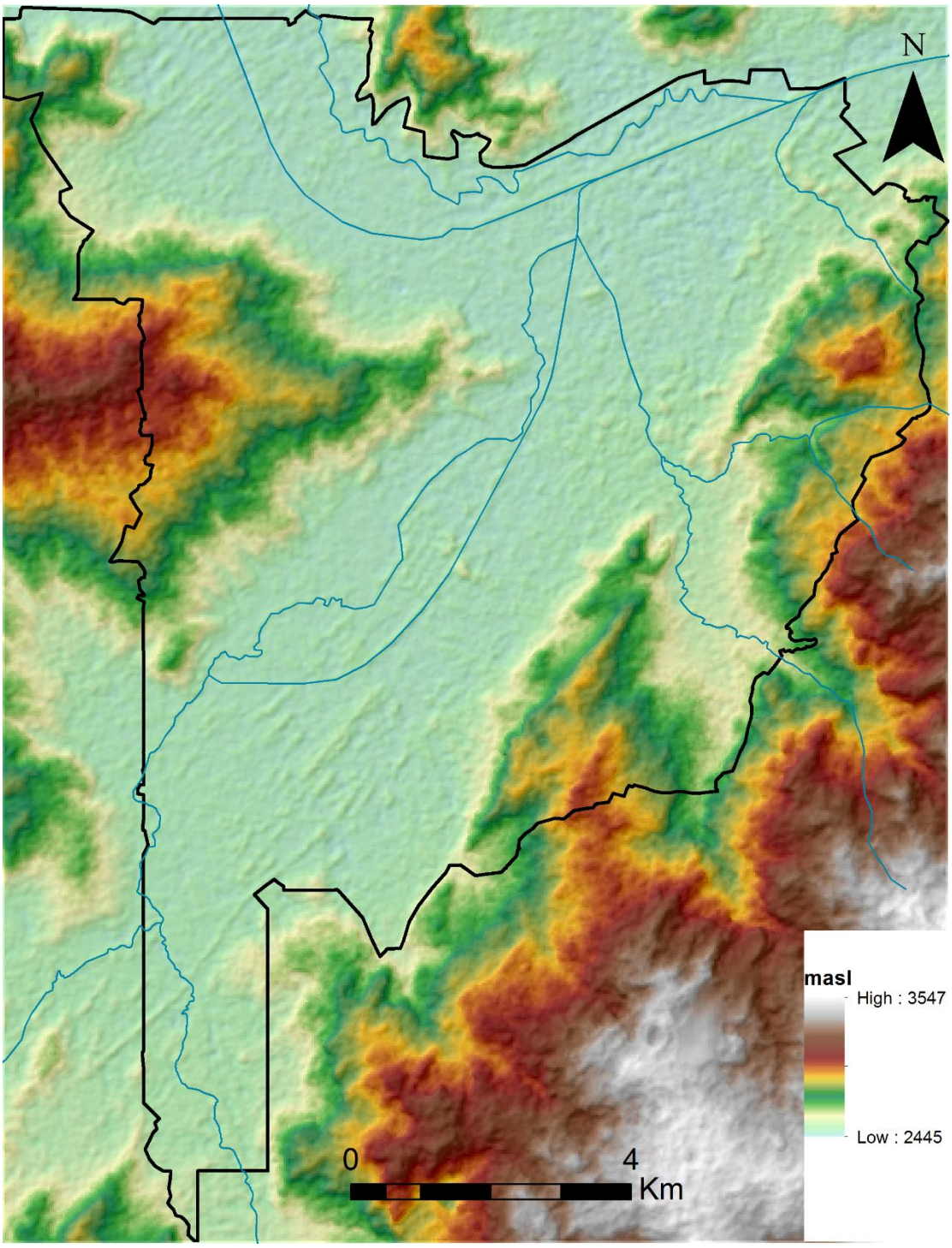

Figure 2.2 DEM model and principal rivers and canals in the survey area

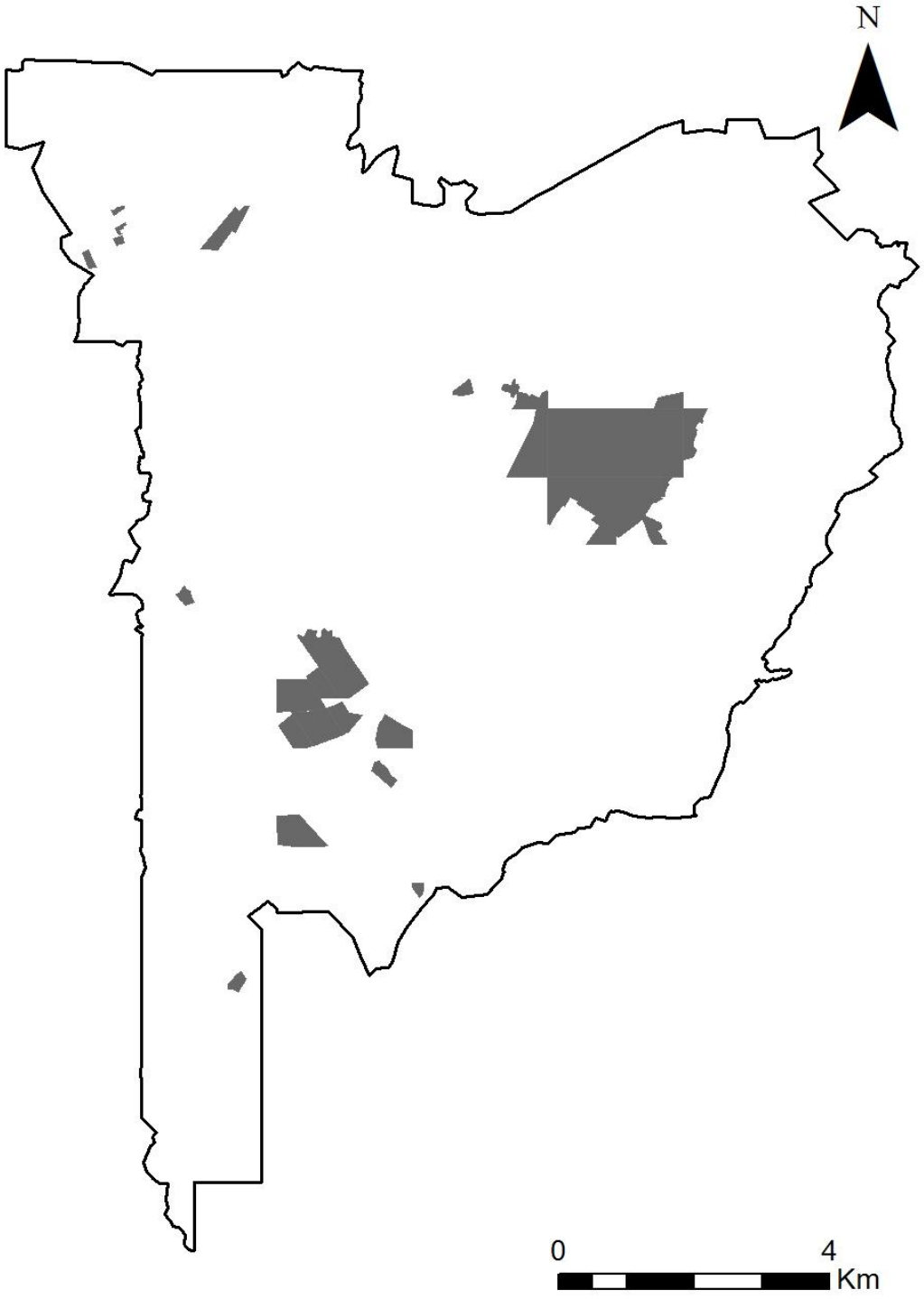

Figure 2.3 Unsurvey areas due to landlord unwillingness, presence of modern buildings or rubble from modern construction

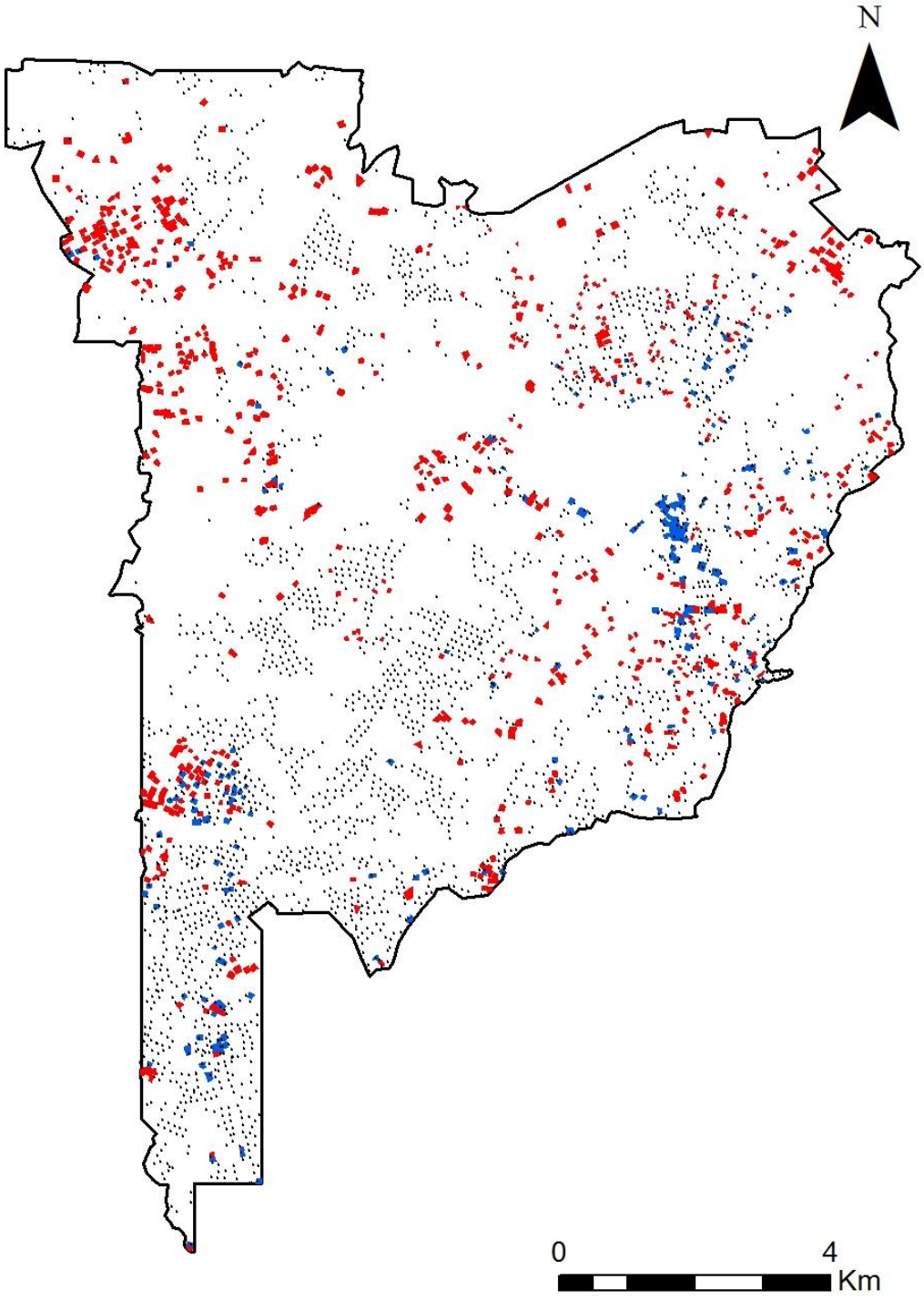

Figure 2.4 Collection lots made using surface collections (red) and shovel test (blue). Negative shovel tests are shown as grey dots.

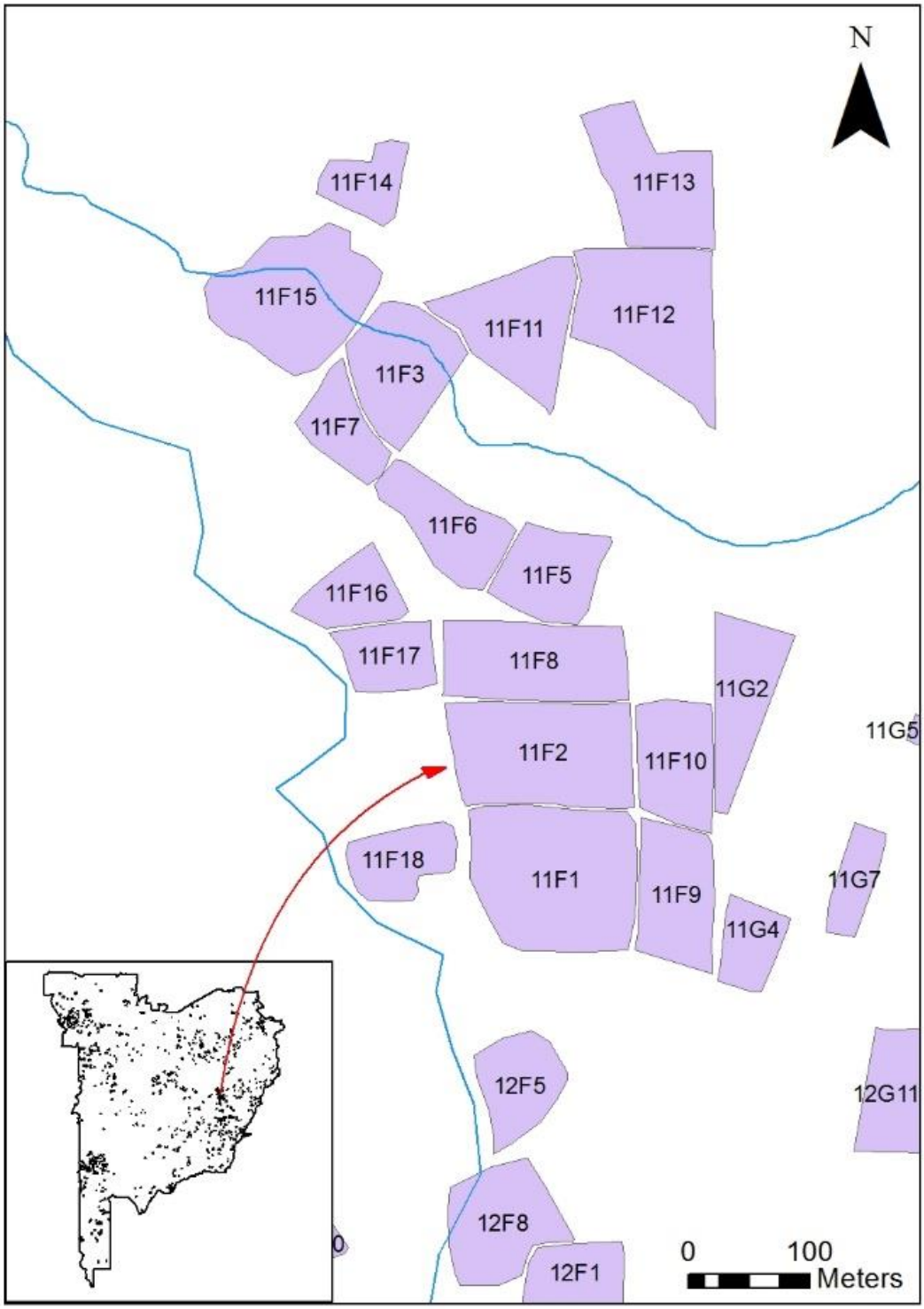

Figure 2.5 Location collection unit 11F2

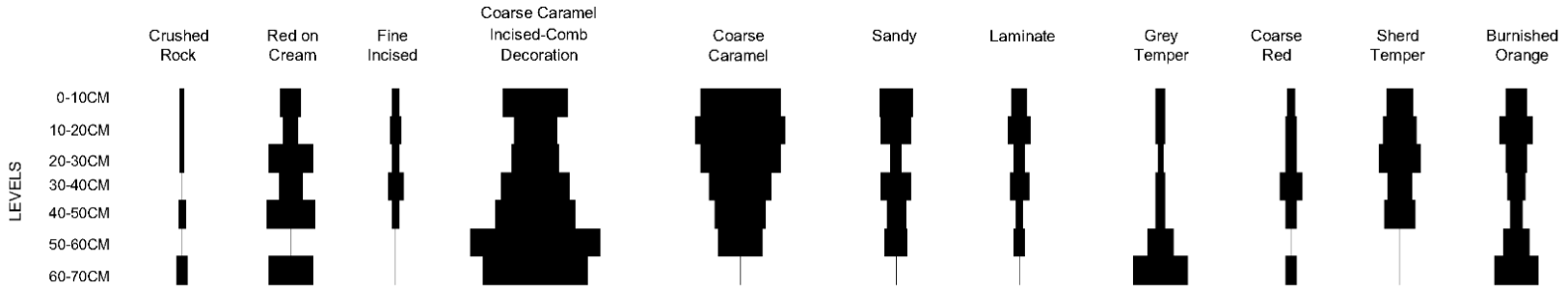

Figure 2.6 Battleship graph showing stratigraphic distribution ceramic types in test pit 11F2C1

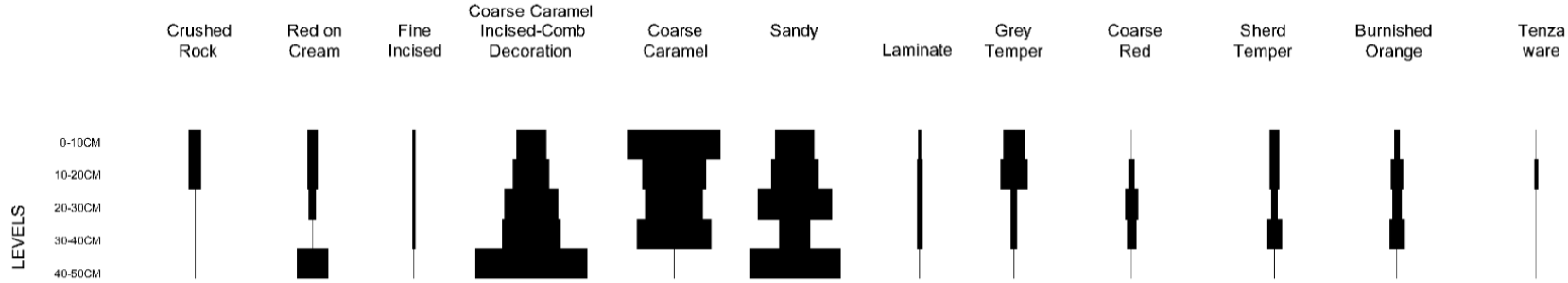

Figure 2.7 Battleship graph showing stratigraphic distribution ceramic types in test pit 11F2C2

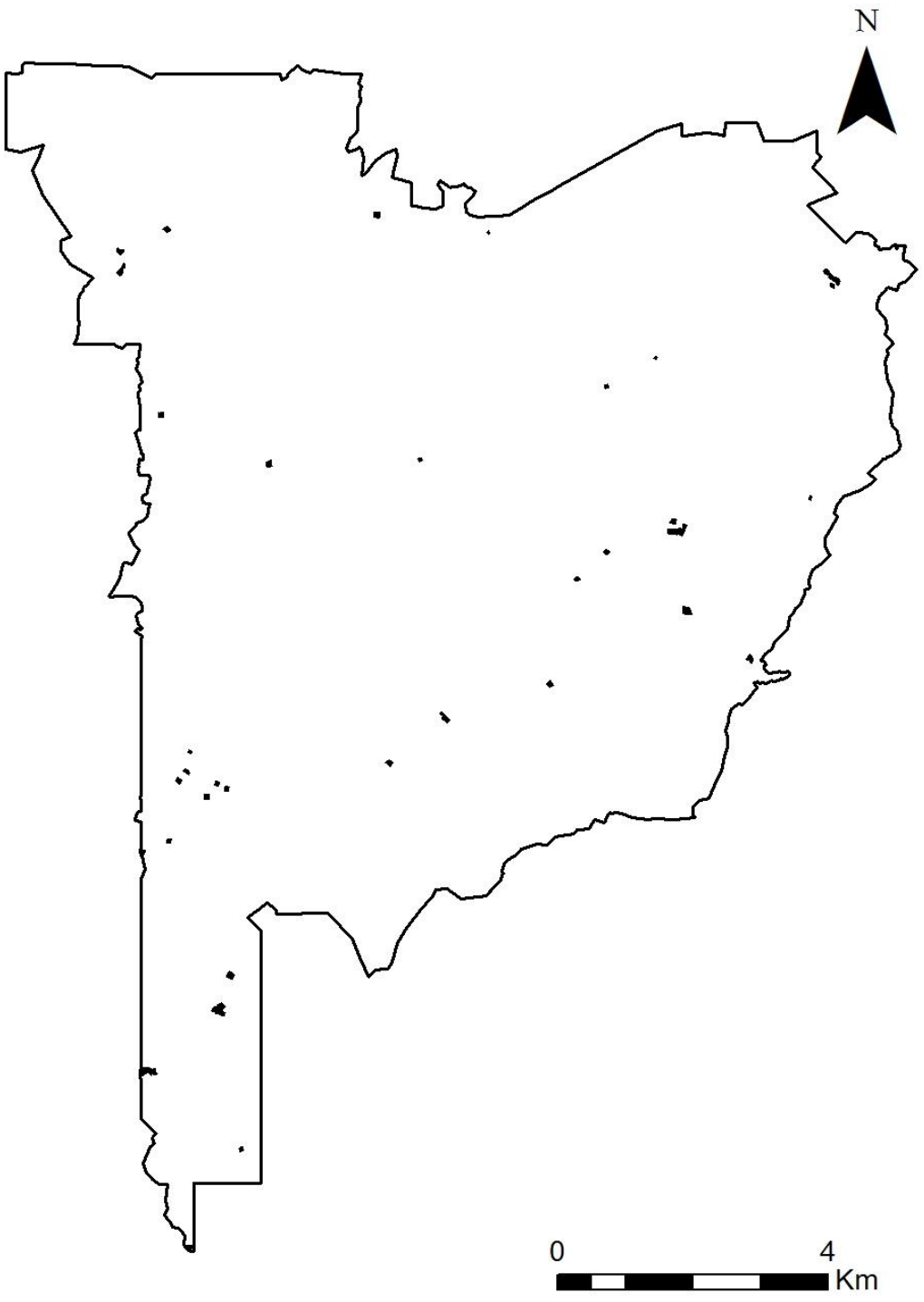

Figure 2.8 Collection units showing possible locations of Coarse Caramel sherds with Incised-Combed decoration

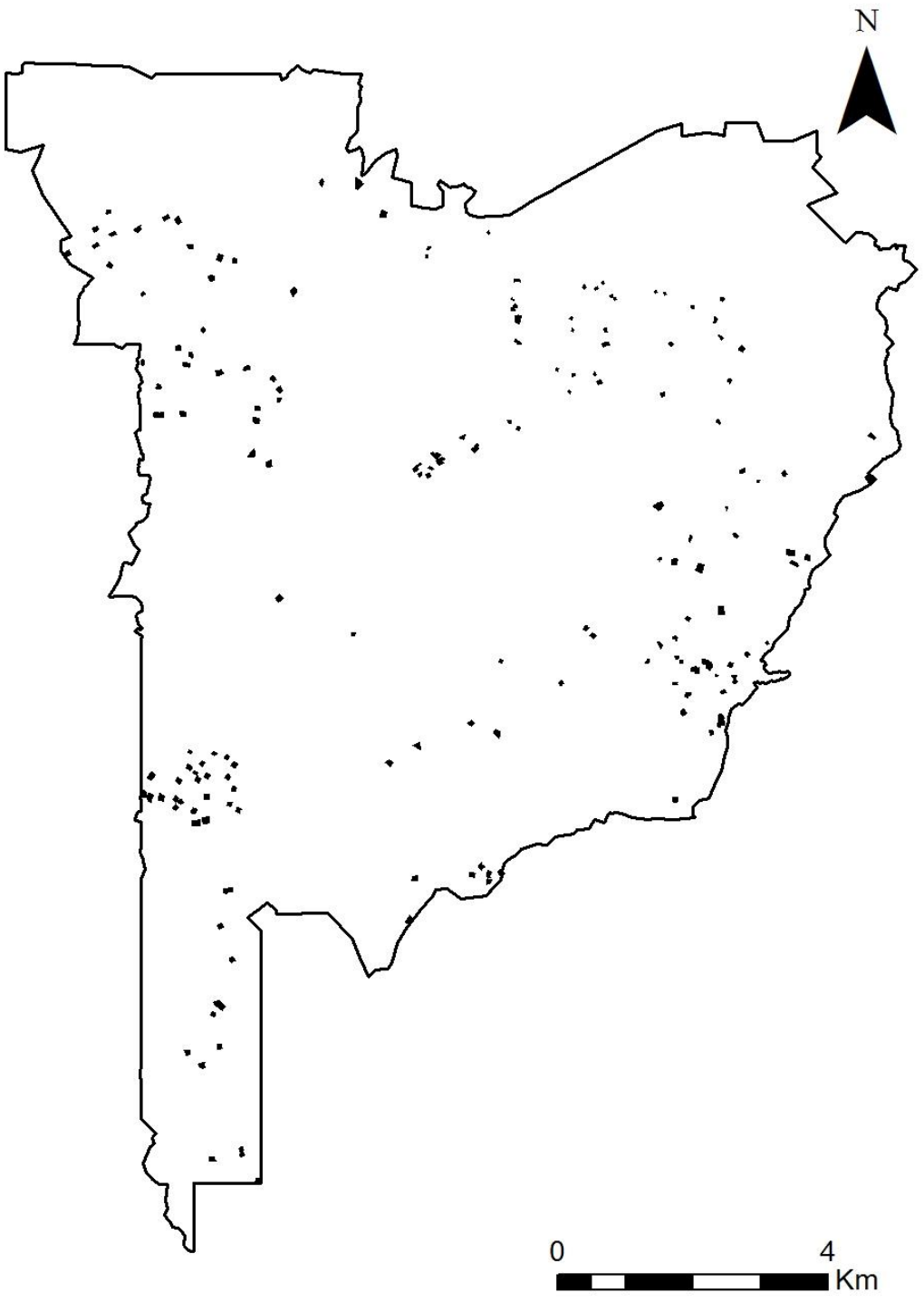

Figure 2.9 Collection units with Coarse Caramel sherds and without other ceramic types related to the Early Muisca or Late Muisca periods.

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	5	5666788889
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	6	015667788
0000	7	3345899
0	8	123467
0	9	0004
0	10	0
0	11	46
0	12	
00	13	
0	14	
0	15	
00	16	2
00	18	
00	19	
0	20	
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0	26	
0	27	
0	33	
0	42	
0	55	
0	59	
0	62	
0	100	
0	121	

Figure 2.10 Back to back steam-and-leaf plot comparing batch of sherds from surface collections transformed by $\sqrt{x}$ (right) and untransformed batch of sherds from shovel tests (left)

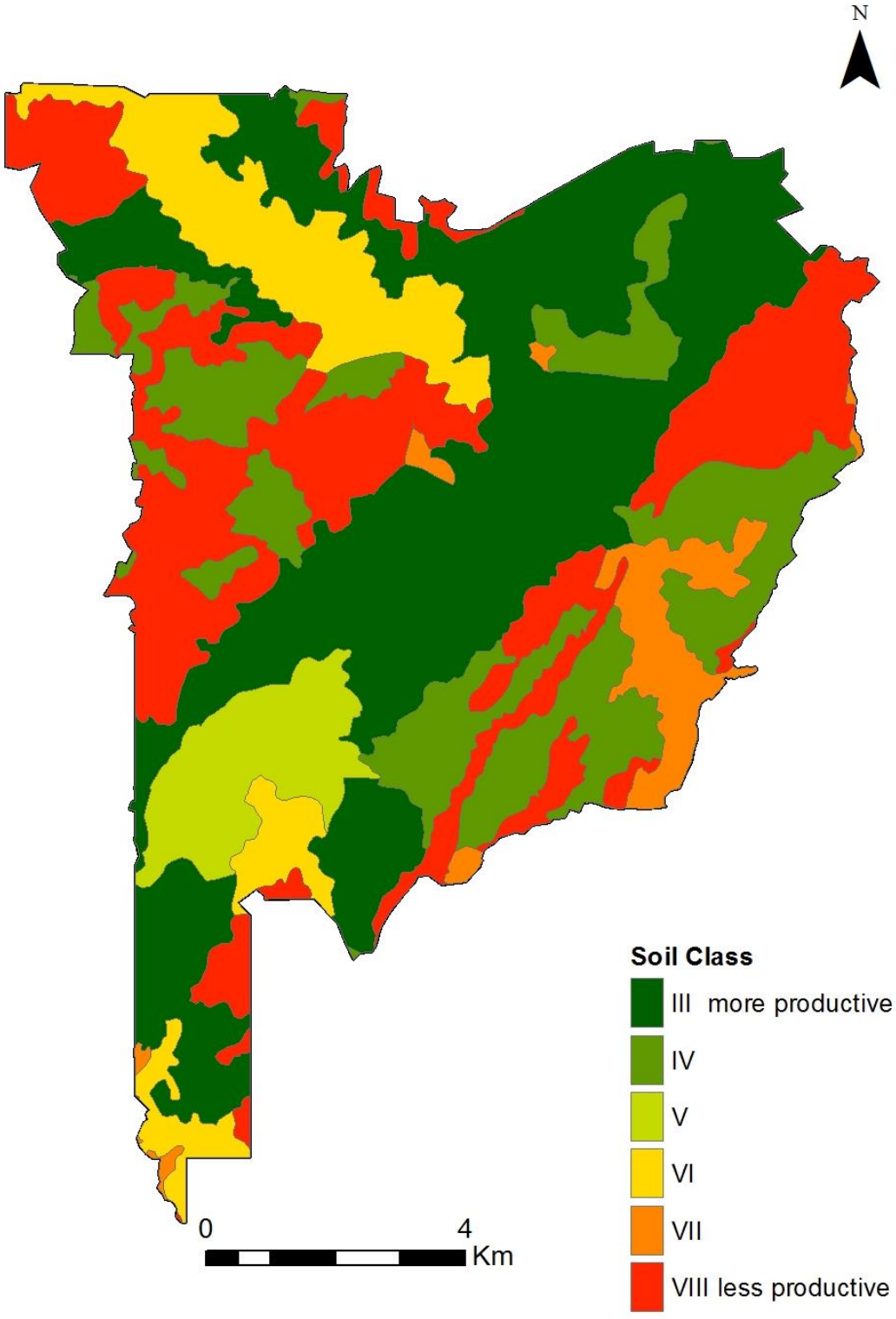

Figure 2.11 Soil classes available within the survey area

Table 2.1 Archaeological periods of sedentary occupation and ceramic types found in collection lots in the survey area

Ceramic Type	Archaeological Period
Calcite Temper ware	Herrera period (400 BC - 800 AD)
Crushed Rock ware	
Red on Cream ware	
Coarse Caramel ware	Early Muisca period (800-1200 AD)
Tunjuelo Laminate ware	
Sandy ware	
Coarse Red Ware	Late Muisca period (1200-1537 AD)
Burnished Orange ware	
Sherd Temper ware	
Grey Temper ware	
Valle de Tenza Grey ware	
White Temper ware	
Colonial Glazed ware	Colonial period (1537-1810 AD)
Dragged Temper ware	

3 EARLY SEDENTARY COMMUNITIES IN THE SOGAMOSO VALLEY

Human occupation in the Sogamoso valley started with small mobile groups that used lithic technologies during the early Holocene. Bone remains found north of the Sogamoso valley included fragments of a dolichocephalic skull with a calibrated radiocarbon date of 8990-8630 B.P. The isotopes analysis from these remains showed carbon and nitrogen isotopic compositions related to a diet with high proportions of edible tubers and animal protein/fat (J. V. Rodríguez 2011:48). Although some lithic tools and skeletal remains found northwest of the Sogamoso valley have been dated between 22910 ± 320 BP and 19760 ± 220 BP (Becerra 1994, 1995, 1998), the most accepted start for the early occupation in the northern highland region is around 10000 BC. Rodríguez (2007) suggested that the valley of the Chicamocha River was the probable route through which northern early population came from the Magdalena valley, however, a northern path was probably not unique. early Holocene mobile groups might have ascended from the Middle Magdalena valley via at least two routes: one up in the north, and the other in the south (J. V. Rodríguez 2007). Two different footpaths could explain to some extent the morphological differences found among later Herrera populations (J. V. Rodríguez 2007). This hypothesis has been challenged by a population discontinuity model where those dissimilarities were explained by different human migratory waves (Delgado Burbano 2012). The model itself is not new and it has been used as an interpretation for the morphological, technological and social changes that took place during the Herrera period (Correal 1990a). Delgado Burbano argued that during some point between 3000 and 1500 BP, Herrera populations arrived with: 1) a distinct morphology 2) a new technology (pottery) and 3) a subsistence system without regional precedents (agriculture) (Delgado Burbano 2012:10). The anatomic and morphological analyses in this study only included preceramic individuals, thus, the morphological affinities of those individuals with latter sedentary

populations were not evaluated, reducing its power to explain the morphological and social changes occurred in the region. In any case, early occupation seems larger and older in the Bogotá Savannah (Correal 1990a, 1990b; Correal and Van der Hammen 1977; Groot 1992), suggesting that it is likely that early human incursions in the north of the highlands were sporadic and carried out by small groups.

Regardless of whether the morphological and social changes documented in the region were related or not to different migration waves, mid-Holocene populations were intensely modifying the natural conditions of the Sogamoso valley. The pollen record indicated a reduction in the swamp forest in conjunction with lowering of water tables, rise of the charcoal presence and increasing disturbance, probably by erosion, all over the basin, approximately 4810-3800 BP (Gómez, et al. 2007:154). This evidence lays down a scenario where human intervention on the landscape without crop cultivation could have started very early in the human occupation. The first indication of crop growing (*Zea mays*) appeared in the pollen record around 3800-2470 BP. Simultaneously, there were also some signs of increased degradation and erosion not only in marshy environments but over the montane forest on the slopes around the high plain. Higher amounts of charcoal, increased grassy vegetation (including Chenopodiaceae–Amaranthaceae) and the presence of *Zea mays* could reflect the beginning of agricultural activities (Gómez, et al. 2007:154).

Evidence of preceramic occupation was scarce and probably nonexistent in the survey area. Lithic materials were usually found in low proportions mixed with ware from the prehispanic sequence. A total of 151 lithics between tools and debitage were collected in 60 collection units dispersed all over the survey area. From these collections units nine had lithics and no pottery debris from

the prehispanic occupation. These nine collection units composed only of lithics were dispersed over the eastern part of the survey area and they showed very few lithics (min = 1; max = 4; mean = 1.5; sum =14). Although these collection units did not exhibit prehispanic pottery in their assemblages, they were contiguous to other collection units with prehispanic occupation. The scantiness of lithic materials, the dispersed distribution of these collection units and the presence of contiguous collection units with evidence of prehispanic occupation suggested that these collection units probably did not represent preceramic occupation.

3.1 THE HERRERA PERIOD

The Herrera period embodies the earliest sedentary occupation. During this phase, human populations in the north of the high plain were already using pottery and small-scale agriculture as widespread technological innovations (Boada 2007; Escallón 2005; Flórez 1998; Flórez and Langebaek 1998; Langebaek 1995, 2001; Rodríguez Ramírez 1999). A diachronic analysis of the variability in craniofacial morphology suggested that Herrera populations probably emerged from early and mid-Holocene mobile groups (J. V. Rodríguez 2007).

3.1.1 Population estimates and nature of settlement pattern

Herrera settlements in the Sogamoso valley occupied only 19.5 ha and most of their locations were toward the east of the survey area (Figure 3.1). Their regional population probably reached a few hundred people, indicating that human density all through the period was very low, even when the maximum average population estimate is considered (Table 3.1). The data indicated

that initial sedentary occupation consisted of a few small hamlets with less than fifty inhabitants and a small number of dispersed farmsteads, probably representing the residences of one or two families. Around half of the Herrera population was living in small hamlets while the other half resided in dispersed farmsteads. These small hamlets were identified by areas of contiguous collection units that included Herrera sherds in their assemblages. The collection units of a period do not necessarily represent areas of contemporaneous occupation. The population estimates for these units represent an average population in that place through that period of time. Herrera households living in those areas classified as hamlets were probably and more frequently choosing a way of life that implied a close daily interaction with other households. The possibility that these collection units are in fact representing a single household moving its residential structure over an area larger than 1 ha is plausible, however, studies at the household level recognized more than one residential structure within 1 ha during prehispanic times (Boada 2007; Fajardo Bernal 2011; Romano 2003). This suggested that the prehispanic population could have preferred to build their new residential structures within the same hectare where they located their first dwellings, making it less likely that contiguous collection units of more than 1 ha simply represented the rebuilding process of residential structures.

The overall demographic estimates for the Sogamoso valley and the distribution of settlements during the Herrera period did not indicate a large population. Previous population estimates calculated in the north of the Muisca area for the Herrera period showed similar population sizes to the one documented in the Sogamoso valley (Boada 2007:83; Langebaek 2001:22). When population estimates for the south of the Eastern Highlands were considered, the Herrera population appeared significantly lower in the north of the Highlands. Settlement pattern studies conducted in the south produced population estimates at least two times larger than those calculated for the Sogamoso valley and the Leiva valley (Boada 2006:71; 2013a:51-54; 2013b:21;

Langebaek 1995:77). Estimates for the south were interpreted as relatively low when they were compared to the population estimates for some areas of Mesoamerica (e.g. Sanders, et al. 1979), but for the Eastern Highlands of Colombia, the Bogotá Savannah and adjacent areas seemed to have the largest early sedentary population. Herrera local communities also occupied larger areas in the south. For example, the two largest Herrera villages in the Fúquene and Susa valleys occupied areas of 5.79 and 5.21 ha respectively (Langebaek 1995:75). Moreover, the central place of the Bogotá chiefdom encompassed a household cluster larger than 11 ha during the early Herrera and late Herrera periods (Boada 2013a:51-55). The size of the population and the degree of nucleation were different between the south and the north during the establishment of agricultural practices and sedentary life. In the south, local communities were small villages and the overall population was larger than in the north. On the other hand, local communities in the north were very small hamlets inhabited by few families. Human interaction probably had different implications in each of these two social settings. It is likely that daily interaction among northern communities implied less complex and intensive relationships than in the south because, as a general rule, chances to exchange, cooperate, fight and punish increase whenever distance between individuals and social groups diminish (Feinman and Nicholas 2012; Peterson and Drennan 2005). Summarizing, the process of sedentism and the experimentation with new technologies (e.g. agriculture and pottery production) that occurred across the highlands during the Herrera period happened in the Sogamoso valley without a large population nor the presence of centripetal forces that were nucleating individuals into large local communities.

3.1.2 Local and supra-local communities

Hamlets and farmsteads in the Herrera period established at least three different levels of intensity in human interaction (Figure 3.2). From high to low intensity face-to-face interaction, Herrera settlements could be described as follows. In the first level there were three local communities

best described as very small hamlets (FIR-A, FIR-B and SOG-B). FIR-A was situated in the south and population was estimated around 17-33 people. This hamlet created a type of interaction strong enough to attract a dispersed population that included a Herrera site registered in a cultural resource management report (Flórez 1998; Flórez and Langebaek 1998). Including FIR-A and its associated dispersed population (FIR-1), this community covered around 6 ha and it could have had between 30 and 59 people. This community was the only one that reached more than a 100 m across. FIR-B and SOG-B with population estimates between 15 and 35 people, one in the south and the other in the northeast, were also part of this group. These very small hamlets did not show dispersed population gravitating around them but they represented 31% of the total Herrera population.

The second level is characterized by two clusters of dispersed farmsteads (SOG-1 and SOG-2) located on the relatively flat slopes in the eastern part of the survey. These clusters had population estimates ranging between 11 and 35 inhabitants and they represented around 28% of the overall population estimated for the period. Each cluster covered about 3 ha of non-contiguous occupation. Although they showed similar demographic densities and areas of occupation as the hamlets, the collection units forming each cluster of farmsteads were close but not continuous. The areas in-between these collection units were completely surveyed by means of general collections or shovel tests and no other collection units with Herrera sherds were reported.

Finally the lowest intensity level of face-to-face interaction was represented by three isolated farmsteads, each probably formed by no more than two households. One of these isolated farmsteads was located in the northeastern part of the survey area, very far from any other documented settlements. The other two were located in the northeast and the east of the valley.

The one in the northeast also seemed rather far from other settlements, while the one in the east was close to a small cluster of dispersed farmsteads. These isolated settlements represented about 9% of the total population estimated for the Herrera period.

The Herrera population in the Sogamoso valley probably lacked any regional-scale authority (Figure 3.3). The average population estimates for the very small hamlets, the clusters of farmsteads and the isolated farmsteads were used with the aim of conducting a rank size analysis (Drennan and Peterson 2004) (Figure 3.4). The analysis showed a slightly convex upward curve but a value for *A* very close to a log normal distribution (*A*= 0.161, n=8). These contradictory results were produced by both tails of the distribution. The upper tail is shaped by the very small hamlets and the clusters of farmsteads. The population estimate values of the isolated farmsteads "cancel" to some extent the population estimate values shown by the very small hamlets and the clusters of farmsteads, which in turn produced a value for *A* very close to the log normal distribution. This indicates that the *A* value is actually produced by the presence of two different patterns of settlements rather than a single type of settlement pattern integrated by a scaling factor. FIR-A attracted dispersed population toward it, and its associated dispersed farmsteads, in the south of the survey area, showed the largest population estimate. Nevertheless, the marginal differences in occupied area and human density, in addition to the total number of Herrera communities and the unoccupied spaces between them suggested a weakly integrated system at the regional level. Settlement aggregation occurred in the southern part of the survey area but there were no meaningful differences in terms of settlement size or monumentality between small hamlets and dispersed farmsteads. Moreover, research on the stylistic variability of pottery during the Herrera period suggested that pottery styles had a high degree of variability not only at the macro-regional level but also within each site. The author interpreted the latter as evidence of the absence of regional scale polities during this period (Escallón 2005:85). This study

included ceramic assemblages from a Herrera site that was excavated as part of a salvage archaeology project and that was also recorded during the survey (Flórez 1998; Flórez and Langebaek 1998). This site was probably part of the dispersed population attracted by FIR-A in the south. The population estimated (between 30 and 59 inhabitants) and probable area of this community did not suggest that this place was nucleating people or creating political integration at the regional level. The settlement pattern documented in the survey area suggested that local interaction was more important than regional integration during the Herrera period. The large unsettled area in between the settlements in the extreme south and those in the east and northeast suggested that there was no a single integrated polity under one central place in the Herrera period.

3.1.3 Forces driving human interaction

3.1.3.1 Landscape use

Most of the Herrera population inhabited areas toward the eastern part of the survey at around 2550 masl, in the ecotone between the montane forest and the high plain (Figure 3.5). The question of whether the Herrera population preferred locating their dwellings in zones more suitable for agriculture was assessed by means of comparing the observed population with the expected population in each soil class. The expected population was the overall population estimate of the survey area proportionally distributed depending on the areas covered by each soil class. For example, if within a survey area there are only two soil classes (A and B) and soil class A covers 25 km^2 and soil class B covers 75 km^2, then a random distribution of population will have 25% of population in A and 75% in B. A random distribution of population can be taken as an indication that the type of soil was not an important variable in deciding where settlements should be located.

The expected and observed Herrera population in each soil class given the distribution of soil types in the survey area are presented in Table 3.2. The best available areas for crop cultivation are soil classes III and IV (IGAC-UPTC 1980, 2005). Together, they cover around 68 km^2, representing slightly more than half of the total area surveyed. 41% of the population calculated for the Herrera period established their dwellings on soil classes III and IV (Figure 3.6).The observed populations in these two soil classes were slightly lower than the expected populations. The expected and observed population in Class VIII soil were also similar. Although the observed population was larger than the expected population, both had relatively comparable values. Soil classes V and VI are less common in the survey area (5% and 11%, respectively) and their expected populations were very low, which is consistent with the observation that Herrera occupation was not documented there. The only observed population by soil class that clearly deviated from the expected population was the one documented in Class VII. 26% of the overall observed population was located in this soil class while only 4% was expected. This class is especially abundant in the eastern zone around the Ombachita Stream and the Monquirá River. The Herrera settlements near these two water bodies were dispersed farmsteads aggregated in two small clusters (SOG-1 and SOG-2). The Class VII soil is also present in the southern part of the survey area where one of the small Herrera hamlets was located. Soil productivity and population density in each soil class showed a weak and not very significant negative rank-order correlation (r_s = - .3, p ≥ .62). These analyses reasonably satisfy the argument of a random distribution of Herrera settlements according to soil classes.

3.1.3.2 Exchange

Langebaek (1991) argued that exchange activities with societies of the eastern foothills might have been important to consolidate the political authority and the economic power of the

Sogamoso chiefdom in the early 16th century. This possibility is reasonable because the modern city of Sogamoso is still acting as an important node that connects the foothills, most of the Eastern Llanos and the rest of Colombia. Human interaction with the communities of the foothills and the Eastern Lowlands might have played an important role in the consolidation of the prehispanic communities in the Sogamoso valley. For example, when Herrera populations established their residences, they could have considered the traveling distance from their new home to the lowlands as an important variable. Although Herrera settlements tended to occupy the eastern flank of the Sogamoso valley, additional archaeological evidence supporting intense and continuous interaction between communities of the Sogamoso valley and the lowlands was absent from the data collected during the survey and it is not reported in other studies. This probably indicates that reducing time travelled between the lowlands and the Sogamoso valley could not have been a very important variable for the settlement configuration process.

3.1.3.3 Decorated sherds distribution

The spatial distribution of decorated sherds in communities without division of labor can be used to identify differences between places or types of settlements with regard to daily time invested in particular activities. Decorated sherds have been used as an indicator of differential access to goods because decoration implies more labor invested in the production of a particular object (Feinman, et al. 1981). It has also been documented that decorated ware can be displayed during social interaction with the aim of acquiring prestige or social status (Clark and Blake 1994; Dietler and Hayden 2010; Hayden 2001).

Elite groups could control large amounts of wealth or prestige, depending on the sources of power available and usually these groups use some kind of fancy objects in feasts and other types of analogous activities. The archaeological record in the Eastern Highlands of Colombia shows that decorated sherds are the most abundant and best preserved evidence associated with prehispanic elaborate objects. Regardless of whether households invested more time acquiring decorated objects or more labor in decorating their own production, high proportions of decorated sherds could be used as an indicator of the kind of activities associated with elites. In fact, high proportions of decorated pottery have been found in Muisca and Herrera communities associated with elite activities. Moreover, in the Muisca area, high proportions of decorated bowls and jars have been associated with intensification in feasting activities (Boada 2007; Fajardo Bernal 2011; Kruschek 2003; Langebaek 1995, 2001; J. Rodríguez 2009; Salge 2007).

Feasting might have played an important role in the materialization of ideas and in the human interaction required to produce or share different kinds of knowledge. This new knowledge was not necessarily restricted to material or economic domains but could also include new belief systems or ways to organize social interaction. In the past, this context could enable some households to gain prestige or control surplus, which in turn may create a new set of unequal relationships. Spaces for feasting can be created in everyday settings (e.g. firepits, hearts, longhouses), but the areas where feasts were more or less intense are likely to be spatially and diachronically differentiated. In other words, they could be located in different types of settlement configurations and the intensity of interaction might vary over time. If one assumes that decoration is one of those different lines of evidence associated with feasting activities, and that elites conducted feasting activities more intensively, then one can explore the spatial and temporal dimensions of those activities simply by looking at the distribution of decorated ware. Furthermore, when decorated sherds are roughly distributed between all the different types of settlements in

an area during several periods, then one can explore the spatial and temporal intensity of activities associated with the presence of elites, by means of comparing the proportions of decorated sherds and their statistical significance.

After careful consideration of the sample bias, decorated and non-decorated Herrera sherds found in collection units were considered as a random sample of the spatial distribution of all Herrera sherds in the Sogamoso valley. With the aim of exploring other dimensions of human nature, collection units can be aggregated in groups that indicate different types of human communities. In this case, they were grouped in two categories: hamlets and farmsteads. These two categories are used in this study to differentiate two different behaviors. The collection units pertaining to Herrera hamlets were taken to represent a tendency to live more aggregated in space. Conversely, the category of farmsteads embodied the remains left by people that preferred to live in a dispersed settlement pattern. These two different types of settlement patterns generally imply different types of daily interactions (Peterson and Drennan 2005) and it has been argued that dispersed and nucleated settlements present dissimilar forms of social and political ties (Feinman and Nicholas 2012). In this study the differences in proportions of decorated sherds between dispersed farmsteads and hamlets were compared to identify which settlement configuration was more prone to include elite activities.

Herrera sherds from collection units associated with hamlets were taken as a random sample of all the sherds coming from middens produced by people that preferred to live in aggregated form during the Herrera period. The same procedure was done for the Herrera farmsteads with the aim of characterizing the proportion of decorated sherds among populations living in dispersed settlements. 48.1 % of all Herrera sherds from hamlets were decorated while collection units from

farmsteads had 32.4% of Herrera sherds with decoration. The expected values versus the observed values of decorated and non-decorated sherds in hamlets and farmsteads were compared by means of a chi square test to assess the significance of these results (Table 3.3). The differences between hamlets and farmsteads with respect to proportions of decorated and non-decorated sherds from the Herrera period were fairly significant (X^2 = 2.901, .10 > p > .05, V = 0.13). It seems fairly likely that the differences in the proportions of decorated sherds in the Herrera period between collection units of dispersed and nucleated settlements represented more than just the vagaries of sampling. Cramer´s V value showed a positive association between hamlets and higher percentages of decorated sherds. This could mean that nucleation in local communities during the Herrera period allowed people to conduct—to some extent—more activities associated with decorated sherds than people living in dispersed farmsteads. Elite activities were more strongly represented in nucleated settlements than in dispersed farmsteads. Feasting activities could have been part of those activities and they probably fostered human interaction during the establishment of sedentary occupation in the Sogamoso valley. The presence of higher proportions of decorated ware in the collection units associated with small hamlets, instead of inside collection units related to farmsteads, could be taken as an indication that settlement nucleation was propelled by intensification of activities associated with elites.

3.1.3.4 Lithics

Lithics found inside the survey area were usually mixed with sherds from the prehispanic occupation. In the same way as with the ceramic material, stone objects collected were found on the surface or in the first 40 cm below it. As previously stated, collection units composed only by lithic materials were very few (n= 9) and it is very unlikely that they were associated with preceramic occupation. Therefore, it is plausible that these lithic materials were produced during

the sedentary phase of the prehispanic occupation. Unfortunately in the Eastern Highlands lithic materials cannot be chronologically differentiated in the same way as pottery. It seems that the same lithic technologies locally produced during preceramic times were still in use until the Conquest (Boada 2013b; Correal and Van der Hammen 1977; Langebaek 1995). In this challenging scenario any attempt to specifically correlate lithic materials with the three sedentary periods of the prehispanic occupation will be unreliable. Thus, one could prefer to analyze the patterns of lithics coming from collection units where only one period of the sedentary occupation was represented, which is analyzing lithics coming from collection units only with sherds from the Herrera period. An attempt to identify these collection units was conducted for each of the three prehispanic periods associated with sedentary occupation (Herrera, Early Muisca and Late Muisca), but there were no such collections. This could be explained by the fact that the number of collection units with lithics is relatively small and because in the Sogamoso valley archaeological materials from the different periods of the prehispanic and Colonial occupation were often registered together in the same places. In this scenario, one option could have been simply to renounce the analysis of lithic materials, without exploring ways of dealing with the complex characteristics and random noise inherent to the archaeological record. Instead of avoiding this issue, the analysis was done with a different set of collection units. This approach introduced more random noise into the dataset but it was preferred in order to assess the ways in which the spatial distribution of lithic materials could be related with the prehispanic sedentary occupation. The collection units with lithics where sherds from the Herrera period represented at least 60% of the total of prehispanic sherds were selected to consider the possible relationships between lithic materials and Herrera occupation. The 60% limit was arbitrary and it was used to identify those collection units with lithic materials and with a majority of sherds from the Herrera period. The same procedure was conducted for the Early Muisca and Late Muisca periods. This implied that some lithics were grouped and analyzed more than once, as if they were part of the lithic sample of each one of the prehispanic periods of the sedentary occupation. For the Herrera

period, only one collection unit fulfilled the parameters introduced above. One chert flake without signs of use was found in this collection unit. It seems that lithics were not usually found in collection units where the majority of prehispanic sherds was associated with Herrera occupation. Nevertheless, Herrera sherds and lithic artifacts were small samples in the survey area and they were considerably less abundant than other sherds, which makes it less likely that both samples could be identified together in the same collection units.

3.2 THE EARLY MUISCA PERIOD

3.2.1 Population estimates and nature of settlement pattern

The Early Muisca period witnessed a dramatic increase in regional population in the Sogamoso valley. For the very first time in this social trajectory, the population reached at least more than one thousand inhabitants (Table 3.4). A similar demographic growth has been documented in other settlement pattern studies conducted in the south (Boada 2006, 2013a; Langebaek 1995) and the north of the highlands (Langebaek 2001). In the same fashion as during the Herrera period, dispersed farmsteads and small nucleated settlements characterized the occupation. The settlement configuration of these two periods, however, differed considerably in their magnitudes. A total of 225 ha occupied during Early Muisca times indicated that occupation increased more than ten times compared with the Herrera period (Figure 3.7 and Table 3.4). Most of the Early Muisca occupation was characterized by a dispersed population distributed across the survey area. This type of settlement averaged around eight people per hectare and occupied approximately 190 ha. Around 950-1900 people could have been living in this pattern, which means that roughly 70% of the regional population were living in farmsteads scattered across the Sogamoso valley. Nevertheless, some degree of nucleation was documented. 34 ha showed

human density values between 13 and 25 people per hectare. These density values were similar to those calculated within Mayan settlements of the late Classic and late Formative period where clear residential clustering was documented (Drennan 1988:275). Some of the collection units showing these high densities were dispersed over the landscape without a clear pattern, and the rest were on top of the Herrera hamlets and in the new population clusters of Firavitoba (in the southwest), Tibasosa (in the northwest) and Sogamoso (in the east). Probably between 450 and 650 inhabitants lived in this high human density pattern during the Early Muisca period.

Considering other settlement studies with similar areas in the Eastern Highlands, the Sogamoso valley had the highest occupation increment from the Herrera period to the Early Muisca period (Boada 2006, 2013a, 2013b; Langebaek 1995, 2001). The total population in the Sogamoso valley during the Early Muisca period occupied around 225 ha and it was estimated between 1400 and 2550 inhabitants. Sharp population growth documented in other parts of the Highlands during the Early Muisca period also occurred, but the magnitude of the demographic change seemed rather different. In the Leiva valley and in the Fúquene and Susa valleys the occupied area increased from the Herrera period to the Early Muisca period by 60.2% and 93.3%, respectively. The same demographic growth in the Sogamoso valley accounted for an increment of 1051%. This growth was only similar to what has been proposed for the Bogotá Savannah in the Suba and Cota zones where the occupied area changed from 20 ha in the Herrera period to 348 ha during the Early Muisca period, representing a 1642% increment (Boada 2006:63,72). When the other two sections of the Bogotá survey were included in the estimate (Boada 2013a, 2013b), the total occupied area in Bogotá Savannah during the Early Muisca period increased around 547%. Boada (2013a) redefined the Early Muisca period from previous publications (Boada 2006, 2013b), as late Herrera period, however, the nature and chronology of these two periods are very similar. For these reasons, the late Herrera period from Boada (2013a) was treated here as the

Early Muisca period. Although population estimates and regional density for the Bogotá Savannah are the highest for the Eastern Highlands, the magnitude of the demographic growth witnessed during the Early Muisca period in the Sogamoso valley was stronger than in other parts of the Muisca area (Table 3.5 and Table 3.6). It seems unlikely that this growth rate could be a product only of the initial and very small Herrera occupation identified within the survey area. This could indicate that the forces attracting population inside the Sogamoso valley were strong enough to pull populations from outside of the survey area. This does not imply that the overall population nearby suddenly decided to move inside the survey area. Early Muisca people inside and near the Sogamoso valley could have preferred social interaction and probably established their dwellings within the communities inside the survey area.

3.2.2 Local and supra-local communities

The descriptions of local Muisca groups included in ethnohistoric documents are varied. (Boada 2013a:45-47). Archaeologists and historians have long debated around the ambiguous definitions used by Spaniards to describe how local Muisca communities were integrated and how they interacted in prehispanic times. Recognizing this, Gamboa (2013:55-84) proposed a flexible model of local organization that accounts for a fluid interaction between local groups. In his model, local groups differed in terms of their sizes and capacity for horizontal social mobility. Although this model represented an effort to avoid the inherent imprecisions of the historical documents, it is still mainly based on those same records. Instead of classifying prehispanic local groups of the Sogamoso valley in one of the several definitions given by Spanish conquerors, this study explored the ways in which those communities could had existed at the local level using the settlement data collected in the field (Peterson and Drennan 2005). The settlement patterns

identified in the Sogamoso survey area showed that local groups during the Early Muisca period did not differ only in terms of their size but also in the way they were spatially organized.

It seemed that human interaction in the Sogamoso valley was bound on at least three different levels. Again from high to low intensity in face-to-face interaction, these levels could be organized as follows. The first category is defined by the small, dense and nucleated settlements best characterized as local communities (Peterson and Drennan 2005). In these places, human interaction could have created the strongest bonds between households and individuals. A more inclusive type of community constitutes the next level. The aggregations in this next level seemed to connect human interaction on a different scale, with less potential for strong human interaction. These communities are best described as clouds of dispersed farmsteads that could have gravitated around a local community, but usually lacked it, and although landforms were not used to define them, their limits loosely corresponded with small variations in the landscape. These clouds of farmsteads fall a range between strongly nucleated communities on one side and a complete dispersed settlement pattern on the other. They were especially useful as units of analysis because the prehispanic settlement patterns in the Sogamoso valley combined dispersed and nucleated settlements. The last level where human interaction could have existed in the Sogamoso valley during the Early Muisca period is better defined at the supra-local interaction scale (Peterson and Drennan 2005). Here settlements covering several km^2 and loosely drawn to local communities were divided by clear unoccupied areas.

A total of six local communities were probably established in the Sogamoso valley during the Early Muisca period (Figure 3.8). Most these local communities (SOG-A, SOG-B, FIR-A and FIR-B) emerged in the same places where hamlets or clusters of farmsteads were documented during

the Herrera period. Four very small hamlets (FIR-A, FIR-B, FIR-C and SOG-C) in the south of the survey area could be included in this category. These local groups covered areas around 2 to 4 ha and their population estimates ranged between 20 and 50 inhabitants. These communities were probably very similar to the Herrera hamlets documented for the previous period and three of them in fact overlapped with Herrera occupation. A reuse of ancient settlements during the Early Muisca period seems a plausible explanation for the nucleation observed in these places and it has been documented in other settlement pattern studies within the Muisca area. Two of the three southernmost local communities (FIR-A and FIR-B) were part of one of the largest cloud of dispersed settlements near Firavitoba. The other two of these communities did not seem to attract a dispersed population. FIR-B and SOG-C seemed stand-alone settlements. An additional isolated local community (SOG-B) was established in the northeast of the survey area. SOG-B had around 5.5 ha and showed population estimates between 50 and 80 people. The settlement patterns did not suggest that this local group was attracting population toward it during the Early Muisca period. Finally, the local community of Sogamoso (SOG-A) was the densest and largest of the local communities identified (Figure 3.9). Although it is difficult to estimate its population and area because much of it is obscured by modern construction, during the Early Muisca period, SOG-A was covering approximately an area of 12.5 ha, from which 42% have densities between 12 and 25 people per hectare. Population estimates for this local community ranged between 100 and 200 inhabitants representing around 8% of the overall population identified in the survey area. The collection units that defined this settlement have a C-shaped form surrounding the local museum of archaeology. The site of the museum was probably part of this place as well. This local community had at least around 24.5 ha of dispersed settlements gravitating very close around it. This local community and the closest dispersed population gravitating around it could approximately have had 250 to 450 people covering some 37 ha.

The survey found no indications of prehispanic occupation within the museum, probably due to the intensive horizontal excavations conducted in the 1940´s (Figure 3.9) (Silva Celis 1945a, 1945b, 1945c, 1945d) and the extended earth moving to build the museum and the in situ reconstruction of prehispanic structures. The evidence collected during the regional survey showed that the Herrera occupation near the local museum probably encompassed, at best, a very small cluster of dispersed farmsteads. It was not until Early Muisca times that evidence of intense occupation emerged. Based on these findings and given the extent of the archaeological contexts documented by Silva (see chapter 1), one could argue that most of the prehispanic activities documented within the museum area were conducted after the Herrera period. The human occupation around the local museum after the Herrera period indicated that the Early Muisca period was the most likely beginning for the intense occupation in the area.

The next level in which human interaction could have been structured in the Early Muisca period is characterized by clouds of dispersed settlements with less potential than local communities for strong human interaction. 15 of these clouds of settlements embodied local interaction between small groups of dispersed farmsteads. These communities encompassed 400-700 people and the average populations for each of these groups showed values between 20 and 70 inhabitants. The spatial dimension of these clouds of dispersed farmsteads showed that all of them were several hundred meters wide and some could have been 1 or 2 km across. Additionally, there were five large clouds of settlements (SOG-1, FIR-1, FIR-2, TIB-1 and TIB-2) with a different nature. Together these five entities probably enclosed a total population between 800 and 1450 inhabitants and each had average population estimates between 110 and 360 people. Two of these large clouds of settlements are located near Tibasosa (TIB-1 and TIB-2), in the northwest of the survey area. Two more were located in the south, near Firavitoba (FIR-1 and FIR-2). The largest one existed in the eastern part of the survey area, behind the modern town of Sogamoso

(SOG-1). These communities were at least 2 km wide and this distance probably represented a feasible maximum limit for local interaction during the Early Muisca period. These communities consisted of collection units representing mostly dispersed farmsteads with population estimates around four inhabitants, however, a few collection units with population estimates above 14 inhabitants were also part of them. In the case of the largest cloud (SOG-1), these collection units with high densities were nucleated toward the limit between the flat zone and the slopes of the highlands, in the local community (SOG-A) identified around the modern museum of archaeology. As it showed in the smoothed surface, this local community probably represented the very first central place in the Sogamoso valley (Figure 3.10). The occupation clusters near Firavitoba and Tibasosa also showed some degree of nucleation but in any case smaller and less concentrated than the local community of Sogamoso.

Some of the settlements in the Sogamoso valley during the Early Muisca period were so dispersed and with such low human densities that they could not be grouped in any of the two levels of human interaction introduced above. This group included probably 200 to 400 people and each settlement had on average of no more than 7 inhabitants dispersed less than a few 100 m wide. The collection units representing these settlements were close to or consisted of between occupation clusters but far enough away to not be included in them. These isolated and small occupation areas could represent temporary residential structures. Langebaek indicated that Muisca households kept temporary residences in places away from their permanent residential structures where they had cultivation plots (1987:40-41). Regardless of whether they were temporary residences or not, these areas probably represented daily activities carried out in isolation by farmsteads of one or two families that created small settlements in between larger household clusters.

SOG-A could have been at the center of a settlement system integrating the populations inside the survey limits. With the aim of evaluating this possibility, the degree of integration of this system was assessed using a coefficient of shape based on a rank size graph with its associated statistical confidence level (Drennan and Peterson 2004). The analysis was based on two of the three different levels of human interaction in the Sogamoso valley. On one hand, the average population estimates of the clouds of farmsteads were used. Whenever these clouds included a local community, the population estimates of the nucleated settlements and its dispersed settlements associated were counted as one meaningful community. On the other hand, the dispersed settlements that could not be included in these clouds also were used for the analysis. Since the dispersed settlements that could not be clustered also were part of the settlement pattern in the Sogamoso valley, it was necessary to include them in the rank size analysis in order to understand how they can affect the possible structure of a hypothetical settlement system. For these reasons, these groups were used to create the rank size graph. The average population estimate for each cloud of settlements was used with the aim of conducting the rank size analysis (Drennan and Peterson 2004) (Figure 3.11).

The settlement patterns of the Sogamoso valley suggested that more than one supra-local community was formed inside the survey area. In the same way as with the settlement data from the Herrera period the value for A suggested a function close to the log normal distribution (A= .053, n=67) because the two tails of the settlement system were not showing two different magnitudes of the same settlement type (e.g. large and small villages) but rather two different types of settlement systems. This value is produced because the first part of the function starts out convex upwards due to the largest clouds of farmsteads. Then the tail drops below the log-normal line, thanks to the presence of a large number of dispersed farmsteads that could not be aggregated within any cloud of settlements. These two tails caused the positive values from the

upper part to cancel out the negative values from the lower part. Most of this pattern is due to the nature of the settlement configuration during the Early Muisca period. Neither the local communities, nor the clouds of settlements nor even the dispersed farmsteads in between the clouds of settlements are ever very clearly delineated. This suggests that even though local communities existed and some of them had dispersed farmsteads gravitating around them, human interaction between households was more fluid and probably centered at the supra-local level in some specific places in the valley. The smoothed surface from Figure 3.10 shows three separate clusters at the regional scale, each with its central place. One of these clusters gravitated in the east, around the local community of Sogamoso. The other, situated in the floodplain, toward the south end of the survey area, drew settlements to its less nucleated core formed by a cloud of farmsteads near Firavitoba. Finally, the last cluster was located in the northwest and it gravitated around two paired clouds of farmsteads. The forces that were driving nucleation towards these three cores lacked the attracting power to completely integrate the regional population into one large supra-local community.

3.2.3 Forces driving human interaction

3.2.3.1 Landscape use

Early Muisca communities dispersed their dwellings across the landscape of the Sogamoso valley. 72% of the overall population lived in a dispersed fashion and only around 28% located themselves in settlements with densities between 13 and 25 people per hectare. Approximately 37% of the population (around 520-970 people) lived in the floodplain, while around 63% (around 880-1600 people) inhabited the gentle slopes around the Sogamoso valley. This pattern differed from the earlier period because the Herrera population inhabited only the limits between the

floodplain and the slopes of the valley, usually close to rivers that have perennial streams. On the contrary, all the soil classes available in the survey area had Early Muisca occupation (Figure 3.12 and Figure 3.13). Soils IV, V and VIII were the only classes with observed populations slightly higher than the expected values. Zones classified as soils III, VI and VIII have lower observed population than their expected values. The zones classified as soil class VIII showed the highest difference between the observed and expected population. This class covers about 24% of the survey area but it had only 14% of the overall observed population. Soil class VI, which is less vast (13.2 km^2), was in some degree avoided by Early Muisca population. Despite the fact that 11% of the total Early Muisca population could be expected to be located in this soil class, only 2% of the overall observed population occupied these zones. Soil class VI had strong limitations for agricultural purposes due to poor drainage (IGAC-UPTC 1980, 2005) and this could be a reason why it presented less observed population than expected. Conversely, soil class IV had around 8% more observed population than could be expected. This particular type of soil is the second most suitable for cultivation and it is generally located on the slopes of the valley. Soil productivity and population density in each soil class showed a moderate and fairly significant positive rank-order correlation ($r_s = .6$, $p < .20$). These observations suggest that in the Sogamoso valley during the Early Muisca period proximity to zones with high productivity for agriculture was one but not the only factor that people took into account in order to decide where to locate their settlements.

The settlement pattern of the Sogamoso valley had a dual nature. It combined dispersed occupation gravitating around some nucleated habitational areas. There were three areas that more or less show a concentration of settlements in the valley: Tibasosa in the northwest, Firavitoba in the southwest and Sogamoso in the east (Figure 3.14). Whether these clusters were caused by some integrative force or simply the result of people deciding to locate their dwellings

in high productivity areas was another question explored. To this end the survey area was divided into 1 km^2 squares and the expected population versus actual observed populations of each square were compared. The expected population of each 1 km^2 was calculated on the basis of the amount of each soil class that is available within it and the total population density of each soil zone in the total survey area during the Early Muisca period. More specifically, the expected population density in each 1 km^2 was calculated by multiplying the regional human densities of each soil zone by the area of each soil type that is present in any given grid square and then adding these values for each grid square. The result of this analysis is a weak correlation between the expected and the observed populations among the 1 km^2 ($r = 0.372$, $p < 0.0005$, $Y = 0.954X +0.531$). The significance level is high because there is a very large sample of squares, which is not very meaningful because of spatial autocorrelation. This indicates that population clustering in the Sogamoso valley during the Early Muisca period was not merely due to people´s desire to occupy areas where high productivity agriculture could be conducted. Settlement nucleation responded to other sorts of integrative forces. Figure 3.15 shows which areas inside of the survey area have observed to expected population ratios above or below the standard deviation of the mean given the soil class availability in each square. The analysis suggested that most of the Early Muisca population avoided areas inside the floodplain. This area suffered until modern times from episodes that inundated the plains, which have been controlled by a system of modern canals constructed in the valley. This could be the reason why high productivity zones in the flat area were avoided during the Early Muisca period. People from this period also avoided areas classified as soil class VIII which presents the worst conditions for cultivation in the region. An additional look at the grid squares indicated that integrative forces were strongly attracting people to Tibasosa, Firavitoba and Sogamoso along the location of previous Herrera hamlets located in the northeast and in the south of the survey area. The Firavitoba clustering cannot be explained only by a preference to avoid flooding because it is located in the floodplain. It is possible that this clustering was strongly based on social reasons. The two clouds of settlements in the Early

Muisca period that compose the Firavitoba clustering (FIR-1 and FIR-2), especially the southernmost one, could have been established as a result of the ancestral occupation in the Herrera period. It is possible that part of the Early Muisca population was attracted to this area because the largest local community in the Herrera period was located near this zone. The existence of an ancestral settlement could have been taken as a sign of good conditions for locating dwellings in the valley. The reduced area of the hills where the small Herrera hamlets were located could have resulted in most of the new population in the area south of the survey area being forced to occupy the flat areas. This evidence is consistent with a scenario where forces different from people´s desire to occupy places with the best resources for agriculture were attracting most of the population in the Sogamoso valley during the Early Muisca period. Settling near or on the ancestral settlement, together with avoiding flooding episodes and the worst conditions for cultivation were also important variables in deciding which areas should be occupied. Nevertheless it seems likely that something else was attracting local population to the occupation clusters of Firavitoba, Tibasosa and Sogamoso.

3.2.3.2 Exchange

Archaeological objects associated with economic activities were not common inside the survey area during the Early Muisca period. Pottery or other artifacts associated with contemporaneous periods from the Eastern Lowlands or the Magdalena valley did not appear during the survey. From the three ceramic types found during the study related to the Early Muisca period, only the Hard Laminar type could be interpreted as foreign material because it is often found in archaeological contexts of the Bogotá Savannah (Enciso 1990, 1993b, 1995a, 1995b; Langebaek 1995:191). Sandy and Carmel Corse types were taken as local types because they were relatively abundant (14% and 85% of total Early Muisca Sherds, respectively) and they were found in

previous studies near the Sogamoso valley (Archila 1986a, 1986b; M. C. Cuéllar 2010). Only three Hard Laminar sherds were found in two separate collection units. One of these collection units (18C11) was part of FIR-A, a local community of around 4 ha in the south part of the survey area. 18C11 had a very high density per hectare for the Early Muisca period (18 people/ha). Several dispersed settlements gravitated around FIR-A and together they formed one of the largest clouds of farmsteads in the Early Muisca period, with a population estimate between 80 and 110 people. The other Hard Laminar sherd was found in the collection unit 9G3. This collection unit is part of one of a cloud of settlements with population estimates between 20 and 70 inhabitants. 9G3 had low human densities per hectare (8 people/ha) and it probably represented a dispersed farmstead. No additional data related with exchange activities was found, suggesting that these activities were probably moderate, not centralized, and they could not explain the settlement configuration or the emergence of the central places around which supra-local communities gravitated.

3.2.3.3 Decorated sherds distribution

It has already been argued that decorated ware can be taken as a rough indicator for elite activities where wealth can be displayed or prestige can be obtained. After careful consideration of the sampling process and the possible sources of bias, Early Muisca decorated and non-decorated sherds were considered as a random sample of the sherd to be found in the occupied areas during the Early Muisca period. The spatial indicator of intensive or moderate daily interaction was the demographic density calculated for each collection unit. Households located in high density areas lived in close proximity to other households and probably had more intensive daily interaction than households located in low density areas. Proportions of decorated and non-decorated sherds of collection units with demographic densities lower than 13 people per hectare

were compared with the same proportions from collection units with demographic densities equal or larger than 13 people per hectare. The distribution of decorated sherds in the Early Muisca period suggested weak differences in elite activities between densely occupied areas and areas with less dense occupation. The overall proportion of decorated sherds decreased considerably between the Herrera period and the Early Muisca period. The Early Muisca decorated sherds were only 6% of the total sherds classified from that period (Table 3.7). Activities in which decorated ware was used or produced, seemed less frequent during the Early Muisca period than during the Herrera period. High human density areas exhibited 7% decorated sherds, while low human density areas showed only 4% decorated sherds. It is very likely that the differences observed between the proportions of decorated sherds in collection units with population densities equal or higher than 13 people/ha and collection units with population densities lower than 13 people/ha represented more than just the vagaries of sampling, however, these differences were weak (X^2 = 12.163, p < 0.0005, V = 0.07). This result suggested that the Early Muisca population probably conducted activities where wealth can be displayed or prestige can be obtained with similar intensity, regardless of whether they were occupying settlements with high or low human densities.

It is plausible to evaluate the spatial distribution of these activities in other ways. For example, The disconnected areas showing dispersed occupation in between the clouds of farmsteads had on average no more than 7 inhabitants, were less than a few hundred meters wide and they probably represented temporary residences dedicated to plot cultivation away from permanent residential structures (Langebaek 1987:40-41). If these areas did correspond to temporary residential structures dedicated mostly to agricultural activities, then substantially lower proportions of archaeological remains associated with feasting activities should be expected. On the other hand, if they were in fact the permanent dwellings of isolated households, then, because

of their isolation, they probably held fewer activities where wealth or prestige could be displayed or gained, because their interaction with other households was less frequent. In either case, people conducting activities in these areas probably were engaged in high labor requirements associated with cultivation. Therefore, one could expect that these dispersed areas with low population densities and apparently disconnected clouds of farmsteads show smaller proportions of decorated sherds than clouds of settlements with local communities such as Sogamoso, because the latter were denser and they might have allowed more intense, varied and interdependent daily interaction among individuals and households. With the aim of assessing these expectations, the collection units were divided into those from clouds of settlements and those from dispersed farmsteads in between them in order to compare the proportions of decorated sherds between them (Table 3.8). The most populous clouds of farmsteads, with average population estimates ranging between 110 and 360 people, had the highest proportion of decorated sherds (7%). Clouds of farmsteads with average estimated populations between 20 and 70 inhabitants showed around 5% decorated sherds. Finally the dispersed settlements disconnected from the clouds of farmsteads showed around 2% decorated sherds. Figure 3.16 indicates that it is unlikely that these different tiers had the same percentages of decorated sherds. This suggests that the clouds of settlements that formed the cores of the three supra-local communities conducted more activities where decorated wares were used or produced. This could indicate that local elites where probably settled in these cores. This weak differentiation could be an indication that access to expensive objects or activities where wealth could be displayed or prestige could be obtained were less frequent only in the dispersed settlements disconnected from the local communities and their associated clouds of settlements. Moreover these activities were not restricted to places that local elites occupied intensively. Although the clouds of farmsteads and the disconnected areas with documented occupation did not strongly differentiate in terms of their access to decorated sherds, three local communities identified during this period showed at least two times higher percentages of decorated sherds than any of the

clouds of farmsteads. These communities were the two located in the south (FIR-A and FIR-B), on top of the two former Herrera hamlets, and the local community of Sogamoso (SOG-A). The southernmost local community (FIR-B) had around 38% decorated Early Muisca sherds while the other one in the south (FIR-A) and SOG-A showed around 18% decorated sherds. This suggests that local communities in the Early Muisca period probably concentrated elite activities and these elites were probably strongly differentiated from the households living in dispersed fashion.

3.2.3.4 Lithics

The collection units with lithics where sherds from the Early Muisca period represented at least 60% of the total of prehispanic sherds were selected to consider the possible relationships between lithic materials and Early Muisca occupation. This procedure selected 27 collection units with a total of 81 lithics. The majority of the collection units were located toward the eastern part of the survey area, inside SOG-A and some of the very close dispersed settlements around it. They also were found in the isolated local community in the northeast (SOG-B). Most of these collection units showed population densities between 13 and 25 people per hectare. Some of these collection units were located inside the local communities in the south, near Firavitoba (FIR-A, FIR-B, FIR-C and SOG-C), and none of them were collected in the northwestern part of the survey area, in the Tibasosa sector. Most of these sets corresponded to some type of tool (n = 47), among which were flake tools and a couple of microliths. These collection units also included unused cores, flakes and debitage (n=34) but it seems that there were more tools than debitage.

The spatial distribution of lithic materials is better understood if we compare the distribution of all lithics found inside the survey area against the distribution of all sherds from the prehispanic

sequence. This association is illustrated by means of a smoothed surface showing the distribution of all lithics based on distance-interaction principles. Figure 3.17 was created using a ratio to show the relationship between counts of lithics and the sum of lithics and all the prehispanic sherds found in each collection unit. Collection units composed only of lithics were excluded from the analysis because they will show ratio values of one, creating unrealistic peaks in the surface. The smoothed surface shows a high and dense peak in the eastern part of the survey area. A small concentration is also documented in the southern end of the survey area. It did not overlap with the core of the cloud of settlements documented in that area during the Early Muisca period but rather it was in the same place as the three local communities registered there (FIR-A, FIR-B and FIR-C). The highest peak in the lithic distribution shown in Figure 3.17 roughly overlaps with SOG-A during the Early Muisca period. The population density peak of the central place inside this community seems to overlap with the highest peak created by the distribution of lithics, but other small areas dispersed nearby also showed the presence of lithics. The distribution of lithic artifacts, the small Herrera population documented in the eastern part of the survey area and the fair spatial correlation between the highest peaks showing the lithic distribution and the local communities could indicate that the population in the survey area carried out activities in the local communities, especially in SOG-A that required production and use of lithics more intensively than in other parts of the valley, perhaps more intensively since the Early Muisca period.

3.3 THE LATE MUISCA PERIOD

3.3.1 Population estimates and nature of settlement pattern

The Late Muisca period roughly encompassed the last four hundred years before European contact. When the settlement data from this period was compared with the Early Muisca occupation in other studies carried out in the Muisca area, a demographic growth has been suggested. Nevertheless, this population increment was not unvaryingly strong across the Highlands. In two of the three sections of the study conducted in the Bogotá Savannah, that rise seemed moderate (Boada 2006, 2013a). On the contrary in the third section, the population growth appeared rather strong (Boada 2013b). The demographic scale of the Late Muisca communities in the Fúquene and Susa valleys and in the Leiva valley also showed a strong population increase (Langebaek 1995, 2001). The population shift that occurred across the Highlands between the Herrera period and the Early Muisca period seemed more homogeneous than the changes that happened between the Early Muisca period and the Late Muisca period. While in the Early Muisca period strong demographic growth has been documented across the Highlands, during the Late Muisca period the demographic changes had a wider degree of variation.

Human occupation during the Late Muisca period in the Sogamoso valley apparently decreased with respect to the Early Muisca Period. A total of 185.8 ha showed Late Muisca occupation (Figure 3.18). This represented a decrease of 17% in relation to the Early Muisca occupation in the survey area (Table 3.9). Most of the Late Muisca occupation continued as a mixed settlement system that combined a few nucleated areas and, more frequently, dispersed population distributed across the landscape. Dispersed settlements covered around 166.6 ha and they were

characterized by collection units with densities of 8 people per hectare. Nucleated areas had human densities equal or above 13 people per hectare and they only encompassed 19.2 hectares. Around 90% of the Late Muisca population lived in farmsteads of one or two households scattered across the Sogamoso valley. Some of the collection units with high densities were dispersed over the landscape without a clear pattern. There were only two clear clusters of contiguous collection units and they represented the local communities of SOG-A and SOG-B. (Figure 3.19). For the Late Muisca period, an overall population between 1060 and 2010 inhabitants was estimated (Table 3.10), representing a decrease of around 23% compared to Early Muisca average population estimates. This demographic decline was not extremely strong and it could have been the product of both local and macro-regional forces that affected prehispanic population in the Eastern Highlands. Nevertheless, this decline also could be due to the use of Coarse Caramel sherds—which were associated with the Early Muisca period—again in the Late Muisca period (see 2.3.1).

The total population in the Sogamoso valley during the Late Muisca period occupied around 186 ha. While in other regions there was a tendency to show growing populations (Table 3.9), the regional population in the Sogamoso valley dropped slightly. The most impressive changes in occupied area during the Late Muisca period were documented in the Fúquene and Susa valleys (Langebaek 1995) and in the Leiva valley (Langebaek 2001). There, human occupation increased by a percentage of 218% and 784%, respectively. In the Cota, Suba and Chia section, the occupation of the survey only increased 161%. When the population estimates of each area were compared (Table 3.11), the Sogamoso valley showed the lowest population estimates for the Eastern Highlands. The occupied area in the Sogamoso valley showed a decrease and it represented the lowest occupation documented during the Late Muisca period among the settlement pattern studies that were compared.

Local dynamics could also have played an important role in the demographic shifts documented in the Sogamoso valley. Because the distribution of collection units identified in the landscape represents the most likely location of the prehispanic settlements of a given period, one can use those distributions to get insights into where the most conspicuous demographic changes inside a survey area were located. The most noticeable differences were located, in terms of occupation and population size, in the south of the survey area. The comparison of the smoothed surfaces (Figure 3.10 and Figure 3.19) showed that the population in the south of the survey area decreased during the Late Muisca period. The southern coarse peak formed during the Early Muisca period disappeared almost completely during the Late Muisca period. The overall average population estimate for the clouds of farmsteads on this side of the survey area was estimated between 350 and 630 inhabitants during the Early Muisca period, while during the Late Muisca period the same estimate only reached 170 to 330 inhabitants. The population in the southern part of the survey area could have been reduced by half during the Late Muisca period. One explanation for this change is related with the nature of the archaeological record in the Sogamoso valley. Figure 2.9 shows a concentration of collection units composed only of Coarse Caramel sherds in this area. Given that Coarse Caramel sherds could have also been used during the Late Muisca period, it could be possible that some of these collection units with only Coarse Caramel sherds were also occupied during the Late Muisca period. The other two aggregations of occupation near the modern towns of Tibasosa (in the northwest) and Sogamoso (in the east) did not reflect strong differences in the shape and area of their surfaces, indicating that their occupied area and relative demographic importance probably did not suffer a reduction in the transition between the Early Muisca and Late Muisca period. However, Sogamoso and Tibasosa were demographically almost equal, indicating that Sogamoso reduced its demographic weight. This evidence suggests that at least half of the population that was located in the south of the survey

during the Early Muisca period changed their location and during the Late Muisca period were probably living somewhere else. The local community of SOG-A during the Late Muisca period continued at the center of the largest peak in the smoothed surface but there was no indication that any force was attracting the southern population toward it. Moreover, the clouds of farmsteads around it got smaller in very similar fashion to the clouds in the Tibasosa sector. Furthermore, the differences with regard to the overall regional population estimates between the Early Muisca period and the Late Muisca period in the survey area were about two times larger than the difference in the same dimension in the south of the survey area between these two periods. This suggests that the decline in population occurred across the whole survey area but it was more intense in the southern communities. The ethnohistoric documents report that Muisca local communities were constantly reshaping their population during a life cycle due to the way residence of local groups changed over time with marriages and deaths of individuals (Correa Rubio 2004:201; Gamboa 2013:73). It seems unlikely that these movements of people could explain the depopulation in the south. Another plausible explanation involves the location of the largest cloud of farmsteads in the south of the survey area during the Early Muisca and Late Muisca Period. This community was located on the right bank of the Chiquito River and most of this area is classified as soil class V, which are poorly drained soils with high risk of flooding (IGAC-UPTC 1980:228; 2005). There was no evidence of prehispanic modifications of the landscape near the settlements located in this zone and the canal and ditches nearby were made in modern times. The characteristics of this area could have created a high risk scenario for the new populations that settled there during the Early Muisca period, which in turn could explain the depopulation of the floodplain in the south of the survey area during the Late Muisca period. Still this possibility does not fully explain the general population decline inside the survey area.

3.3.2 Local and supra-local communities

In the same fashion as with the Early Muisca settlements, communities were structured in three different levels from high to low face-to-face interaction (Figure 3.20). Only two clear local communities existed during the Late Muisca period. One local community (SOG-B) in the northeast part of the survey continued in the same place occupied during previous periods. It covered some 5 ha and sheltered on average around 40 to 70 inhabitants. Again this local group did not attract population toward itself, and it seemed rather isolated. The local community of SOG-A during the Late Muisca period represented the densest and the largest of the local communities identified. This community was a central place of some 12 ha, from which only 4.5 ha had population densities equal or larger than 13 people per hectare. The population estimated for this local group was around 100-160 people, representing 8% of the overall average population identified in the survey area. Around 16 ha of dispersed population gravitated very close to it.

Two different types of clouds of farmsteads were formed in the Late Muisca period. A group of eight clouds of dispersed settlements constituted the first type. An overall population between 370 and 680 individuals probably lived in them and the average population estimate for each cloud varied between 45 and 100 individuals with a mean of around 65 people. These clouds of farmsteads had a tendency to cover areas 1 or 2 km across and they had several small dispersed areas with densities between 8 and 13 people per hectare. Two of these clouds located south of the modern town of Tibasosa, including TIB-2, probably broke apart from one of the two paired clouds of settlements that constituted the core that attracted population in the northwestern part of the survey area during the Early Muisca period. Clouds of farmsteads with similar population estimates and occupied areas comparable to the ones described above were also found during that Early Muisca period. Given their similarities, one can compare them in order to characterize

changes in the interaction of groups of dispersed farmsteads. These clouds of farmsteads during the Late Muisca period had the same spatial location as those during the Early Muisca period, however, they differed in terms of their populations. During the Early Muisca period these dispersed communities had an average population estimate around 40 inhabitants (n = 15; min = 22; max = 67). The same sort of communities during the Late Muisca period had an average population estimate around 65 inhabitants but were less numerous (n = 8; min = 46; max = 96). Although the number of these clouds of settlements moderately decreased in the Late Muisca period, they seem to have encompassed larger populations. Furthermore, at least two of these clouds of dispersed farmsteads were part of larger clustering during the Early Muisca period. This probably indicates that a reuse of ancient settlements during the Late Muisca period was common but it did not entail continuity in the configuration and nature of dispersed settlements.

An additional type of farmstead cloud was established in this second level of human interaction. This type is indicated by three clouds of farmsteads that incorporated at least 100 inhabitants during the Late Muisca period. These communities were located in the northwest (SOG-1), in the southwest (FIR-2) and in the east (TIB-1). They occupied roughly the same places and they had similar occupied areas to the largest clouds of farmsteads established during the Early Muisca period. During the Late Muisca period SOG-1, FIR-2 and TIB-1 had average population estimates of 250, 220 and 135 inhabitants respectively and they included an overall population between 410 and 780 inhabitants. These communities were more than 2 km wide and included several dispersed farmsteads. TIB-1 has the second largest average population estimate but it only includes dispersed population with densities of 8 people per hectare. In the case of FIR-2, only 1.4 ha of occupied areas had population densities of 13 people per hectare while the remaining occupation of the 15.62 ha showed population densities of 8 people per hectare. SOG-1—the

cloud of farmsteads around the local community of SOG-A—represented the densest and the largest of this type during the Late Muisca period.

Small and dispersed areas showing occupation that could not be clearly clustered in any of the clouds of settlements were also found in the Late Muisca period. These areas probably included 280 to 540 people and the average population estimates for each ranged between 1 and 27 inhabitants. They had on average no more than 7 inhabitants and they were always less than a few hundred meters wide. This first group reflected the same characteristics of the disconnected areas with occupation identified for the Early Muisca period. These areas of the Early Muisca period were interpreted as representing daily activities carried out in isolation by farmsteads of one or two families that created small areas of activities in between farmstead clusters. The settlement data suggest that during Late Muisca times there was an increment of around 25% in the daily activities carried out in isolation by small groups of one or two families in between these large clusters.

A hierarchically integrated settlement system did not emerge during the Late Muisca period. The existence of a unique settlement system at the supra-local scale was evaluated with the smoothed surface representing human densities and a coefficient of shape based on a rank size graph and its associated statistical confidence level (Drennan and Peterson 2004). The units of analysis were again the clouds of farmsteads and the disconnected areas showing human occupation (Figure 3.21). Once again the upper tail of the distribution creates a convex upwards distribution and the lower tail goes below the log normal distribution. These two patterns produce a value for *A* close to the log normal distribution ($A = 0.095$; $n = 70$), that does not suggest an integrated settlement system but rather the presence of two settlement systems—one based on clouds of

dispersed farmsteads and the other one represented by dispersed farmsteads in isolation—that were almost evenly preferred by Late Muisca populations. This pattern did not significantly differ from the distribution documented for the two former periods. The *A* value for the Late Muisca rank size distribution falls inside the 80 % confidence zone for the *A* values of the Early Muisca and Herrera rank size distributions (Figure 3.22). This suggests that it is very likely that the differences in regard to *A* values for the Early Muisca and Late Muisca periods did not have much statistical significance. The smoothed surface (Figure 3.19) for the Late Muisca period contradicts the idea of a single integrated supra-local community. Sogamoso and Tibasosa appeared as two separate clusters of several km^2 across that could be better described as supra-local communities. These two supra-local communities had roughly the same shape and population density. The local community of Sogamoso is nucleated and for this reason its supra-local community shows the highest peak in the smoothed surface. The unsmoothed surface of Figure 3.19 indicates that life in local communities was less common during the Late Muisca period. Only the central place of Sogamoso and the small settlement of the northeast showed some degree of nucleation. Dispersed farmsteads across the slopes of the valley dominated the settlement pattern during this period.

3.3.3 Forces driving human interaction

3.3.3.1 Landscape use

Late Muisca communities intensified the dispersed settlement configuration of the previous period. 89% of the overall population lived in dispersed settlements with densities of around 8 per hectare while the remaining 11% located their dwellings in places with densities between 13 and 25 people per hectare. When these percentages were compared with the data from the Early Muisca period, there was an increment of around 17% in the dispersed settlements with low

human densities during the Late Muisca period. The percentage of population living on the floodplain and the gentle slopes around the valley barely changed with respect to the Early Muisca period. Approximately 35% of the population (525-960 people) lived in the floodplain, while around 65% (880-1600 people) occupied the gentle slopes around the Sogamoso valley. All the soil classes available in the survey presented Late Muisca occupation (Figure 3.23 and Figure 3.24). Soil classes III, VI and VIII had less observed population than the expected populations given their availability inside the survey area. Zones classified as IV, V and VII showed larger observed population than the expected values. Soil zone IV had the largest difference between observed and expected populations. In this zone observed populations were 14% larger than expected given the availability of the soil class. This type of soil is usually located in the gentle slopes. The zones classified as soil class VI presented 9% less observed population than expected. These soils are poorly drained and are located in the floodplain. Despite the fact that soil zones VII and VIII are located in areas with steep slopes and poor soils, which could have made agricultural activities challenging, the observed populations were very similar to their expected populations. Furthermore, soil class VII had 5% more observed population than its anticipated population. Soil productivity and population density in each soil class showed a weak and not very significant positive rank-order correlation (r_s = .4, p < .4). This indicated that Late Muisca population could have taken into account soil productivity when they decided to locate their settlements but it was probably not an important variable. Moreover, this relation is not very significant and might be a product of the vagaries of sampling.

In the same fashion as with the settlements of the Early Muisca period, the degree to which settlement clusters were caused by some integrative force or were simply the result of people deciding to locate their dwellings in high productivity areas was explored by comparing the expected population and the actual observed populations in a set of 1 km^2 squares that divided

the survey area. The result of this analysis is a very weak correlation between the expected and the observed populations among the 1 km^2 squares ($r = 0.331$, $p < 0.0005$, $Y = 0.836X + 1.482$). The high significance value is again due to the large but not very meaningful sample size. This indicates that population clustering in the Sogamoso valley during the Late Muisca period was not merely due to people´s desire to occupy areas where highly productive agriculture could be conducted. It looks like settlement nucleation responded to integrative forces that were attracting people to the same areas as in the Early Muisca period. Figure 3.25 shows which areas inside the survey area have observed to expected population ratio values larger or smaller with respect to the mean (n = 170; mean = 1.13). There was some spatial continuity with the settlement pattern of the Early Muisca period, nevertheless, the location of relatively high observed to expected ratio values suggests that more people were slowly attracted to the areas with high population densities of Sogamoso in the east and Tibasosa in the northwest. In these areas there was at least one 1 km^2 square with an observed to expected ratio 1.5 standard deviations above the mean. These grid squares showing high population densities were surrounded by other 1 km^2 squares with observed to expected ratio values 0.5 to 1.5 standard deviations above the mean. This pattern was especially notorious in the northwest where several areas had observed to expected ratios with values of 0.5 and 2.5 standard deviations above the mean. This is not surprising because that area is the only sector inside the survey area that has soil zones III on the gentle slopes around the valley. The population distribution across the landscape showed that this northern sector sheltered dispersed population and similar population densities to those found in the east. Sogamoso, in the east, continued as the largest clustering in the entire valley but its demographic weight was reduced and it was now similar to the clustering around Tibasosa in the northwest.

During the Late Muisca period the slopes of the valley with good conditions for agriculture attracted dispersed populations in the Sogamoso valley. Sogamoso and Tibasosa were pulling

more individuals toward their surroundings than could be expected based on the distribution of land for cultivation near them. Sogamoso continued attracting population in the valley but Tibasosa almost had the same demographic weight. The areas near Tibasosa also had slightly more population than could be expected but the degree of nucleation of the settlements in that area was very low. In other words, some Late Muisca people preferred to live in the northern sector near Tibasosa, but they lived in a dispersed fashion, in contrast to the nucleation that occurred in Sogamoso. In the same way as during the previous period, Late Muisca inhabitants used the floodplain but probably did not establish permanent residences. The population located in the south of the survey area during the Late Muisca period was about half of the estimate made for the Early Muisca period. The large cloud of farmsteads near Firavitoba (FIR-2) had a significant decrease in its population. Because this community was located in a poorly drained area and was at risk of suffering flooding by the Chiquito River, it is plausible that during some point of the Early Muisca or Late Muisca period flooding episodes caused about half of the inhabitants to move somewhere else or they just simply passed away. The overall population estimate for the survey area decreased during the Late Muisca period, indicating that if residents of the south moved to different locations, these new settings could have been located outside the survey area.

3.3.3.2 Exchange

Archaeological objects from other parts of the Eastern Highlands were more common during the Late Muisca period. Pottery or other artifacts from the Eastern Lowlands or the Magdalena valley did not appear in the study area. The Late Muisca period was characterized in this study by six ceramic types. The most common ceramic type was Coarse Red ware and it was probably the only one locally produced (Archila 1986a). It represented 76% of the total Late Muisca sherds collected (n=1032). The other five ceramic types were probably more intensively produced in the

outside of the Sogamoso valley. Orange Burnished ware, Grey Tempered ware, Sherd Tempered ware, White Tempered ware and Valle de Tenza Gray ware accounted for 24% (n= 246) of total Late Muisca sherds. The characteristics and geographical distribution of these ceramic types has been described elsewhere and there is no need to repeat these descriptions here (Langebaek 1995:169-179). In the Late Muisca period, clouds of settlements with average population estimates between 140 and 250 people had 28% non-local sherds in their assemblages; while those with average population estimates between 50 and 100 people showed 14.7% non-local sherds. Disconnected areas showing occupation exhibited 19% non-local sherds. Figure 3.26 shows these percentages of non-local sherds with their respective confidence levels. This graph indicates that it is very likely that clouds of settlements differed with regard to the percentages of non-local sherds during the Late Muisca period and that their differences were not a product of the vagaries of sampling. SOG-1, FIR-2 and TIB-1 showed almost 10% more non-local sherds than other types of clouds of farmsteads. Moreover, the collection units that delimited the local community of SOG-A showed a percentage of non-local sherds of 65%

The spatial distribution of these non-local sherds was also explored by means of a smoothed surface based on the percentage of foreign sherds of the total sample of Late Muisca sherds. Figure 3.27 represents the number of non-local sherds associated with the Late Muisca period in each collection unit divided by the total number of Late Muisca sherds in that collection. Collection units with only non-local sherds were excluded from the data to plot the smoothed surface. The largest peak is located in the same place as the nucleated area of the local community of SOG-A. The second tier peaks in the surface fairly corresponded with the location of other local communities in the northeast (SOG-B), and the occupation clusters near Firavitoba (FIR-1), but they are quite small compared with the concentration documented in Sogamoso. Finally some very small peaks appeared distributed toward the northwestern part of the survey area, in the

zone where the cloud of dispersed settlement of TIB-1 was located. This evidence suggested that the Late Muisca population in the Sogamoso valley probably interacted with other areas of the Eastern Highlands. Although this interaction was not exclusively conducted by people located in high density areas, most of the evidence associated with this type of behavior was centralized in the local community of SOG-A. This scenario indicated that exchange activities with other Muisca groups probably were important during the Late Muisca period in the Sogamoso valley. The most likely location for those activities was the local community of SOG-A which operated as a central place. It dominated the access to non-local sherds during the Late Muisca period, despite the fact that demographically speaking the supra-local community of Sogamoso seemed of roughly similar importance as the one in Tibasosa.

3.3.3.3 Decorated Sherds Distribution

After careful consideration of the sampling process and the possible sources of bias, the ceramic assemblages of the collection units were taken as a random sample of the sherds in the occupied areas of the Sogamoso valley during the Late Muisca period. Each collection unit with Late Muisca occupation was used as a single observation in order to identify differences in the distribution of decorated sherds between areas with high and low human densities. Proportions of decorated and non-decorated sherds of collection units with demographic densities lower than 13 people per hectare were compared with the same proportions from collection units with demographic densities equal or larger than 13 people per hectare with the aim of assessing whether high density occupation areas were more likely to have held activities associated with elites.

The overall proportion of decorated sherds during the Late Muisca period was low. From the total Late Muisca sherds found in the survey area only 6.6% were decorated (Table 3.12). Dispersed farmsteads with low human densities had 7% decorated sherds while settlements with high human densities showed 6% decorated sherds. The small differences observed between the proportion of decorated sherds in areas with high and low human densities, were probably just the vagaries of sampling, (X^2 = 0.568 , 0.50 < p < 0.20, V =0.02). These results suggested that regardless of whether they were occupying high or low density settlements, Late Muisca populations probably did not differentiate with regard to their access to decorated sherds. The same postulate was true when the differences in regard to proportions of decorated sherds between clouds of farmsteads and disconnected areas with occupation were compared (Table 3.13). The largest clouds of farmsteads exhibited 8%, the next tier 7% and the very small and dispersed areas with occupation had 5% decorated sherds. It is very likely that the very weak differences in proportions of decorated sherds between these different types of communities identified in the Sogamoso valley for the Late Muisca period represented just the vagaries of sampling (Figure 3.28). This suggests that during the Late Muisca period communities did not strongly differentiate in terms of their access to decorated sherds. The local community of SOG-A on its own showed a percentage of decorated sherds around 13%, higher than any other settlement in the valley.

3.3.3.4 Lithics

Only seven collection units showed at least 60% percent Late Muisca sherds and lithics. This lithic assemblage was comprised of one flake without use, two cores, three flakes showing use and three possible tools and one undetermined artifact. Six of these collection units exhibited low human densities (8 people per hectare) and just one probably had approximately 13 people per

hectare. The total area covered by these collection units reached around 4 ha dispersed across the eastern and south part of the survey area. The abundance of ceramic types associated with the Early Muisca period probably determined the relationship between lithics and archaeological periods. It is likely that part of the collection units with Coarse Caramel sherds were occupied not only during the Early Muisca period but also during Late Muisca times. Therefore, the spatial pattern showed by lithics and the collection units with majority of Late Muisca Sherds probably has nothing to do with the intensity of use or manufacture of lithic objects but simply because a specific type of ceramic was used constantly during the Muisca periods.

3.4 THE COLONIAL PERIOD

3.4.1 Population estimates and nature of settlement pattern

The sixteenth century marked the beginning of one of the most impressive social transformations to have occurred in what we now know as the American continent. In the Sogamoso valley, this process started with a group of about two hundred conquerors led by Gonzalo Jiménez de Quesada that arrived in the year 1537 (Anonymous n.d.; Gamboa 2013:216). After the Conquest, in the year 1539, the prehispanic communities within the Sogamoso valley and the areas surrounding it were integrated into the Colonial system by means of the new Tunja Province. This province was subdivided into several *corregimientos*. These subdivisions included several communities, and each of these communities was the result of the clash between the indigenous societies and the taxation, aggregation and reorganization policies implemented by the Spanish Crown. These communities were divided into *encomiendas*, *pueblos de indios*, *reducciones* or *agregaciones* (Colmenares 1997:54-65; Gamboa 2004; Herrera 1998; Villamarin 1972). The Colonial communities within the Sogamoso valley were part of the *Corregimiento* of Sogamoso.

The extent of this *Corregimiento* encompassed not only the Sogamoso valley but also other adjacent regions. In 1602 the *Corregimiento* of Sogamoso incorporated at least 17 communities denominated by some authors as *pueblos de indios* (Colmenares 1997:84-85), but at least until the end of the seventeenth century, they were also called *encomiendas* in historic documents (AGI ca. 1658 Contaduría 1346A, número 5.). Sogamoso, Firavitoba and Tibasosa were included among these communities (Table 3.14). The procedure followed to establish the location, extent and population of the *corregimientos*, *encomiendas* and *pueblos de indios* was influenced by geographical location, traditional indigenous community interaction and claims from conquerors, tax collectors, catholic missionaries and local population (Colmenares 1997:53-55). Although small prehispanic communities disappeared or were aggregated into larger communities, the spatial subdivisions created in the Colonial period probably resembled the spheres of regional interaction that existed during the last decades of the prehispanic period. This is suggested by the distribution of the names of the Colonial *corregimientos* and their *pueblos de indios* across modern towns and the descriptions in historical records about the political organization of Muisca communities before the Conquest (Aguado [1581] (1956)). For example, Duitama and Sogamoso were two of the corregimientos established during the seventeenth and eighteenth century (Colmenares 1997:xiii), and they were also included among the four largest chiefdoms that the conquerors found in the Eastern Highlands (Aguado [1581] (1956)). Nevertheless, it seemed that the largest political units were divided into more than one *corregimiento*, probably with the aim of preventing large indigenous uprisings. For instance Tunja, which was usually described as large as the Bogotá Chiefdom (Aguado [1581] (1956)), was divided into three different *corregimientos* (Colmenares 1997:xiii). The names of modern towns, the names of *pueblos de indios* and those of corregimientos are very similar and often identical, suggesting that modern towns and regions in the Eastern Highlands retained their prehispanic toponymy during the Colonial period. Using this pattern as indication, it is likely that the survey area did not completely cover the Colonial corregimiento of Sogamoso, because the location of *encomiendas* or *pueblos de indios* such as

Monguí, Cuitiva and Tota was probably outside of the Sogamoso valley. Following the same assumption, most of the occupation related to the Colonial communities of Sogamoso, Firavitoba and Tibasosa could have been inside of the survey area because the old Colonial centers of these three modern towns were covered by the survey. For this reason, the study of the historic records of the Colonial communities in the Sogamoso valley was focused only on the data available for Sogamoso, Firavitoba and Tibasosa. More specifically, the analysis tackled the demographic dimension of these Colonial communities in order to compare the population estimates reconstructed from historical records with the estimates calculated using archaeological data.

Several studies have explored the demographic dimension of the Colonial communities in the Tunja Province using historical records (e.g.Colmenares 1997; Francis 2005; Friede 1965; Gamboa 2013; Mingarro Arnandis 2004; Sotomayor 2004) . The story told by Colonial documents is one of population decline due to contagious diseases together with the severe punishments inflicted by Colonial administrators on the local population and the disruption of the indigenous social networks by means of relocation of population (Colmenares 1997; Francis 2005) (Figure 3.29). Friede suggested that the total population of the Tunja Province during the first decades of the Colonial period reached more than 500,000 individuals (Friede 1965:17), while Colmenares and Francis estimated a total population, at the most, between 100,000 and 200,000 individuals (Colmenares 1997; Francis 2005:120). By the mid seventeenth century population in the Tunja Province did not reach more than 50,000 inhabitants (Francis 2005:120). The indigenous population in the Eastern Highlands declined constantly over the Colonial period and never showed the recovery documented in Mexico and Perú (Francis 2005). Although these authors explicitly indicated that the number of individuals calculated in the Tunja Province for the Colonial period are estimates, one common mistake is handling these estimates as precise numbers. There are at least three reasons why demographic reconstructions based on historic documents

should be discussed as estimates. First, most of the demographic data collected by the Spanish Empire was gathered in order to assess the number of possible indigenous taxpayers from which Colonial institutions could extract tribute. This policy created accounts of indigenous population where women, children and the elderly population were underrepresented (Colmenares 1997:48). Second, demographic data was not gathered systematically. Sometimes Colonial officials only recorded the information provided by *encomenderos* without actually visiting their *encomiendas* or the *pueblos de indios* under their supervision. In other cases, local leaders from indigenous communities provided the data about commoners (Gamboa 2013:180). In both scenarios, personal interests or simply the inherent problems of gathering primary data from secondary sources made an inaccurate depiction of the demographic dimension of these communities. Finally, the indigenous population in the Tunja Province was constantly relocated by Colonial institutions. *Encomiendas* and *pueblos de indios* were constantly merged, divided, relocated or removed, in reality, and within the historic records. This process created imprecise historic records that affected the demographic estimates for the Colonial communities. In turn, these data gaps diminish the accuracy of demographic comparisons between different years and regions (Francis 2005). For these reasons, demographic data from historic documents is discussed below in approximate rather than highly precise terms in order to avoid a misreading of the population estimates derived from them.

Demographic data between the years 1560 and 1700 from the *pueblos de indios* of Sogamoso, Tibasosa and Firavitoba was used to estimate the population of the Colonial period within the survey area. These communities were inconsistently referred to as *pueblos de indios* or *encomiendas* at least until 1700. The data (Table 3.15) was extracted from the tables included in Tovar (1988:86-90), Francis (2005:126-145) and from two unpublished accounting documents of the *corregimiento* of Sogamoso (AGI ca. 1658:Sevilla, Contaduría, 1345 No. 1345; ca. 1671-

1749:AGI, Sevilla, Contaduría, 1553). Most of the data from Francis (2005) was originally published in a different format by Colmenares (1997). These sources included more data than only counts of taxpayers from those three *pueblos de indios*. On one hand, data from Tovar (1988) and Francis (2005) contains counts of taxpayers from visits conducted by Colonial officials to the *Pueblo de Indios* of the Tunja Province between 1560 and 1634. On the other hand, the two accounts done by the *corregidores* of the *Corregimiento* of Sogamoso between 1656 and 1700 included counts of taxpayers and the amount of tribute that each *encomendero* had to collect from each taxpayer in each *Pueblo de Indios*.

A population estimate based on historic data was made with the specific purpose of comparing it to the estimations reached using archaeological remains from the Colonial period. In this study, the archaeological population estimates came from the patterns of accumulation and distribution of garbage associated with a specific period. In this archaeological approach, a population estimate indicates an average population for the whole period without defining the intensity per year of the occupation. For example, it is possible that the estimated average population level was maintained throughout a period, but it could also be that twice the estimated population lived in the location for only half the period. Therefore, the ethnohistorical data was transformed to represent a range for varied scenarios of an average population for the Colonial period, in order to make a meaningful comparison with the archaeological estimates. Table 3.15 shows counts of taxpayers in Sogamoso, Tibasosa and Firavitoba for 13 different years between 1560 and 1700. The scarcity of demographic data for the first two decades of the Colonial period and the cumbersome task of extracting counts of taxpayers from historical records only allowed accessing data for the years mentioned in Table 3.15. Nevertheless, the demographic observations over this period cover about 80% of the Colonial period (1537-1810 A.D.), which could be considered as a close representation of the period whenever population estimates are handled as ranges.

The issues associated with demographic historic records mentioned above make it necessary to calculate and analyze the population estimates derived from them in terms of a range rather than as single precise. The Colonial demographic information from Sogamoso, Tibasosa and Firavitoba only reported counts of taxpayers, who were usually men of marriageable age and able to work, between 17 and 60 years old (Colmenares 1997:48). In some cases, these men represented a marriage with or without children. Accounts of the number of individuals associated with a marriage and to residential structures indicate that the size of Muisca households during the Colonial period in the Tunja Province probably varied. The residential structures were probably occupied by more than one family (Gamboa 2013:62) and the number of individuals in each family fluctuated between married couples without children, marriages with 1 to 9 children and single mothers with 1 to 4 children (Mingarro Arnandis 2004:98). Table 3.16 shows the data from Mingarro Arnandis (2004) in relation to the marriages and the number of children of the Pueblos de Indios of Suta and Bombasa. These two *Pueblos de Indios* were located in the Tunja Province and the latter was probably part of the *corregimiento* of Sogamoso between 1562 and 1636 (Colmenares 1997:81; Francis 2005:89). Marriages without children were the mode in Bombasa, while in Suta marriages with two children were the most frequent configuration. In both cases marriages with more than 4 children were rather unlikely. Based on this data, one could argue that a reasonable minimum limit for the population estimates derived from historic records for the *corregimiento* of Sogamoso could be 2 individuals per taxpayer. This scenario represents a population where the average configuration of marriages was married couples without children. Conversely, the maximum limit could be 5 individuals per taxpayer. In this case, the average configuration was married couples with 3 children. These two limits include within their range the ratios per taxpayer calculated by Colmenares (1997), Francis (2005) and Gamboa (2013) for the Tunja Province. These limits were the basis for transforming the taxpayer numbers recorded in

the historic documents into population estimates for the Colonial period. The calculation of the estimates was rather simple. The number of taxpayers from the *pueblos de indios* of Sogamoso Tibasosa and Firavitoba was multiplied by the minimum limit and the maximum limit. An average population estimate was calculated by multiplying the number of taxpayers by the mean value of the minimum and maximum limits of individuals per taxpayer. This procedure created three tables with the population estimates for Sogamoso, Tibasosa and Firavitoba in each one of the 13 years from which data was available. Then the results in each year were added in order to reach a general population estimate in the survey area for each one of the 13 years with demographic observations. Finally, a mean value for the 13 observations in each table was calculated with the aim of estimating the minimum, average and maximum regional population estimates in the survey area for the Colonial period (Table 3.17). Population estimates based on the archaeological materials from the Colonial period are presented in Table 3.18. One of the major challenges faced in estimating these numbers was that most of the Colonial town of Sogamoso was replaced by modern structures. About 386 ha covered with modern buildings could not be surveyed (Figure 2.3). In the worst case scenario, if the modern structures in the city of Sogamoso obscured a dense prehispanic and Colonial occupation, then the settlement patterns documented could completely change, and large and dense occupation peaks associated with any or all of the archaeological periods might appear. For example, if all the unsurveyed urban area had the highest residential density considered in this study (25 people per hectare) for each archaeological period, then the modern buildings of Sogamoso could possibly cover a population several times larger than that documented for each archaeological period within the survey area. However, incidental findings of archaeological materials in the urban area of Sogamoso are scarce and most of those findings were located in the area around the Local Museum (Garavito 2007; Silva Celis 1945a, 1945b, 1945c, 1945d). Moreover, the urban area near the local museum still has zones covered by grass and the residential structures usually have yards and courtyards. Thanks to this circumstance, the fieldwork teams completely surveyed this area. For these

reasons, it seems unlikely that the modern structures of Sogamoso are covering a dense archaeological record from the prehispanic period. Nevertheless, modern buildings did replace most of the Colonial structures. This change did not occur in Tibasosa and Firavitoba because most of the Colonial structures in these two towns are preserved. The Colonial population estimates based on material culture were affected by that change. Population densities of Tibasosa, Firavitoba and Sogamoso show similar values, despite the fact that Colonial records indicated that Sogamoso was the largest of the *Pueblos de Indios* located in the survey area. Because of this, the Colonial architecture that still remains in the old town of Sogamoso was delineated in the same fashion as with the collection lots, and the largest residential density per hectare (25 people per hectare) was assigned to each one of the polygons drawn with the aim of correcting the population estimates for the Colonial period. This Colonial architecture and their estimated population densities represented around 4.6 ha occupied by an estimated population between 90 and 140 people; they are included in the estimates for the Colonial period (Table 3.18) and in the following analyses.

The Colonial population estimates from historic records and those derived from the archaeological materials were similar. The archaeological record provided lower values than the estimations made with historic documents; the minimum value was 15% lower and the maximum value was 35% less than what could be estimated from historic records (Figure 3.30). These differences are similar to what has been found by Sanders when sixteenth century data and archaeological calculations from the Aztec period in the Basin of Mexico were compared. In that comparison, the minimal estimates from ethnohistoric data were around 20% higher than the maximum estimates from the archaeological data (Sanders, et al. 1979:38). In the Sogamoso valley, the range of population estimates from historical data is more spread out than the range from the archaeological data (Figure 3.30). A corrected estimation of the Colonial inhabitants within the

survey area was calculated using the population estimations from the ethnohistorical and archaeological data. This exercise provided a regional population estimate around 1200 to 3500 inhabitants during the Colonial period.

The demographic estimates based on ethnohistorical data provided useful information to compare against the archaeological data. Historic records showed the evolution of population during the Colonial period with a fine grain resolution. The population decline observed in the historic data and described by Francis (2005) could not be recognized using only the archaeological data from the Colonial period because the population estimates reached by means of analyzing archaeological data had a different scale of analysis. Ethnohistorical records can provide data to identify changes through decades or a few centuries, while archaeological data, at least in this case, is meant to be used as a sign of social changes having occurred during the course of several centuries. Historic records did provide a way of contrasting regional population estimates derived from archaeological data. The results indicated that the archaeological estimate roughly overlaps with the lower part of the population estimate range provided by ethnohistorical data. Considering the imprecise nature of the archaeological and ethnohistorical data, which include issues such as preservation, primary sources bias, limit problems of the study area, among others, there is a remarkable level of agreement. Moreover, it must be taken into account that the maximum limit of the regional population estimates based on historic records might be exaggerated. A figure of 5 individuals on average per taxpayer suggests at least a stable replacement fertility rate. Because the demographic trend in the Colonial period indicated a population decline (Figure 3.29), a Colonial period in the survey area with a stable replacement fertility rate seemed rather unlikely. Historic records also gave insights into the differences between communities inside the survey area. The *Pueblo de Indios* of Sogamoso in the year 1560 was probably 2.5 times larger than Tibasosa and 3.8 times larger than Firavitoba (Figure 3.29). Population differences between

these three *pueblos de indios* were strongly reduced after 1571, but Sogamoso was still the largest community in the valley.

Despite the fine grain resolution that can be achieved using ethnohistorical data, there are several lines of evidence where archaeological data can provide a better insight into the societies of the past. On one hand, a comparative perspective on the demographic changes that occurred since the prehispanic period, even though with less resolution, can be better achieved using archaeological data from the prehispanic and Colonial periods. On the other hand, the location of the human activity areas inside the survey limits is better understood by means of an archaeological approach because archaeologists can create detailed maps with the distribution of remains associated with the Colonial period and compare them to the patterns documented for the prehispanic periods. For these reasons, the following pages will explore the archaeological data for the Colonial period documented in the survey area.

The Colonial occupation slightly increased compared with the previous prehispanic period (Figure 3.31). A total of 211 ha had archaeological remains from the Colonial period. The Colonial remains occupied 13.4% more area than the Late Muisca occupation. Colonial settlements in the Sogamoso valley combined nucleated areas and dispersed settlements in similar fashion as occurred during the prehispanic periods. Colonial inhabitants lived in settlements with low human densities. 93% of the occupied areas (196 ha) had human densities equal to or lower than 8 people per hectare. The only area (4.6 ha) with high human density values occurred in the eastern part of the survey area but these high density areas were estimated using the preserved Colonial architecture in Sogamoso. Estimates based on archaeological remains suggested a regional

population between 1200 and 2280 people during the Colonial period. Population estimates indicated a small increment (14%) in population between the Late Muisca and the Colonial period.

The comparison with other settlement patterns studies conducted in the highlands was limited to the occupied area (Table 3.19). The changes between the Late Muisca period and the Colonial period with regard to areas with human occupation indicated that the transition to the new Colonial order was different across the Highlands. The Sogamoso valley showed a slight increment in the occupied area while in the Leiva, Fúquene and Susa valleys the occupation increased considerably. The only section that reported data for the Colonial occupation in the settlement pattern studies conducted in the Bogotá Savannah suggested a reduction in total occupied area during the Colonial period.

3.4.2 Local and supra-local communities

The archaeological record collected through the settlement pattern study did not show clear local communities during the Colonial period (Figure 3.32). Tightly nucleated areas that could suggest intense local interaction were not identified. The Colonial towns of Sogamoso, Tibasosa and Firavitoba were probably local communities but they did not look like that in the settlement data collected. The small local community in the northeast (SOG-B), that maintained a roughly similar occupied area during the prehispanic sequence, appeared almost completely disarticulated during the Colonial period. One explanation simply could be that modern towns obliterated most of the archaeological material left by these local communities. This explanation is plausible in the case of Sogamoso, where a great deal of the Colonial town was replaced by modern structures, but it does not clarify what occurred in Firavitoba and Tibasosa where most of the town centers

are still configured by Colonial structures. On the other side, it could be possible that Colonial towns were not as nucleated and densely inhabited as has been thought. Historians suggested that Colonial towns in Viceroyalty of New Granada were used by local populations as temporary residences and religious and economic centers rather than places where they established permanent dwellings. The reluctance to permanently occupy these settlements during the Colonial period was a resistance strategy used by indigenous populations to avoid Colonial control (Herrera 1998). The settlement data collected indeed showed that Sogamoso (SOG-1), Tibasosa (TIB-1) and Firavitoba (FIR-2) appeared rather like clouds of dispersed settlements which is consistent with the role that some historians have proposed for the Colonial towns. Then Sogamoso and Tibasosa during the Colonial period are better understood as clouds of farmsteads rather than local communities. They showed average population estimates around three hundred inhabitants. Both communities had very similar population estimates but they differ in the way that occupied areas were distributed over the landscape. Tibasosa, in the northwest, was slightly less clustered. Sogamoso showed more nucleation. The remains of Colonial architecture and the historic records from Sogamoso suggested that nucleation could have been more intense in this community than in Tibasosa, nevertheless, the patterns observed only supported mild differences in regard to demographic weight between these two communities.

Six additional clouds of settlements were formed in the Sogamoso valley. They had areas of 2 km wide and average population estimates between several tens and a few hundreds. They included a total population between 400 and 800 people and the average population estimates for each of these local communities were between 80 and 160 inhabitants. These communities did not show nucleation and they seemed to be evenly distributed in the survey area without a preference for a specific landscape setting. Most of these communities (n = 5), appeared to be attracted to the two largest communities inside the survey area. Only one of these communities

(FIR-2), which is also the largest one in this tier, appeared to be an unconnected community in the southwest of the survey area.

Dispersed areas with occupation that could not be grouped clearly in any of the clouds of farmsteads contained an overall estimated population between 350 and 700 people and they showed average population estimates that ranged between 1 and 50 inhabitants. They were also always less than a few hundred meters wide. Again these areas probably represented daily activities of isolated farmsteads of one or two families that created small settlements in between household clusters. Considering the number of these areas identified in the previous period, there were 15% fewer during the Colonial period (n = 50) than during the Late Muisca period (n =59).

The analysis of the smoothed surfaces based on interaction-distance principles revealed some similarities with the settlement configuration inside the survey area during the Colonial period (Figure 3.33). The suggested limits for human interaction between the largest clouds of farmsteads during the Colonial period were more diffuse than during the prehispanic sequence. During the Colonial period, dispersed settlements gravitated toward Sogamoso and Tibasosa as a general rule for the occupation. This tendency created a continuum of occupation with two very similar density peaks located in the east (Sogamoso) and northwest (Tibasosa) of the survey area, indicating that the east flank of the survey area was no longer the zone with most of the occupation. A third density peak (Firavitoba), unconnected and smaller than the other two peaks, was located in the south of the survey area. The occupation clusters of Sogamoso and Tibasosa had very similar population estimates but they differed slightly in the shape of the settlement distribution. Tibasosa seemed more dispersed than nucleated while the occupation of Sogamoso showed a stronger tendency to nucleation. The smoothed surface suggested that these two

clusters formed two supra-local communities, however their similarities in terms of size and estimated population indicated that neither controlled the area and that probably a larger political center existed outside the survey area. The latter hypothesis is supported by the historic records which describe that during the Colonial period the Corregimiento of Sogamoso was a subdivision of a province centered in the city of Tunja (Colmenares 1997). This is supported by the analysis of the rank size graph and its associated statistical confidence level (Drennan and Peterson 2004). The units of analysis were again the clouds of farmsteads and the disconnected areas showing human occupation (Figure 3.34). The A value suggested that local communities during the Colonial period were very well integrated at the regional level (A = 0.084; n = 58) but this value was produced by the combination of a convex pattern at the beginning that then turns below the log-norm distribution, cancelling the first part of the curve. This suggested again that the results of the rank size graph did not reflect the degree of integration of settlements in the Sogamoso valley. The mixed nature of the settlement patterns—that show a combination of slightly clustered dispersed settlements and few nucleated areas—in the Early Muisca, Late Muisca and Colonial period carries over into the rank-size graphs. The value for A did not significantly differ from the distributions documented for prehispanic sequence, although settlements did move to cluster around Sogamoso and Tibasosa. The A value for the Colonial rank size distribution of the estimate population for the local communities falls inside the 90 % confidence zone for the *A* value of the Late Muisca rank size distribution (Figure 3.35). This suggested that it is very likely that differences in the A values for the Early Muisca, Late Muisca and Colonial periods represented merely the vagaries of sampling. Therefore, despite the settlement distribution changes that occurred between the prehispanic sequence and the Colonial period in the Sogamoso valley, the supra-local organization probably held a very similar structure.

3.4.3 Forces driving human interaction

3.4.3.1 Landscape use

Human occupation during the Colonial period was established across all the soil zones available in the Sogamoso valley (Figure 3.36 and Figure 3.37). Soil zones III, V and VII showed occupation values very similar to expected. Soil zones VIII and VI showed lower occupation than expected based on their areas in the Sogamoso valley. Soil zone IV had higher percentages of occupation than would be expected given their availability inside the survey area. Human occupation in soil zone IV represented 29% of the overall regional population during the Colonial period, which represents 12% more than the expected population. Most of soil zone IV (89%) is located on the gentle slopes around the valley, while only 2.3 km^2 (11%) of this soil class is located on the floodplain. The documented preference for occupying soil zone IV and the distribution of this soil inside the survey area suggested that in the same fashion as the prehispanic sequence, during the Colonial period the human population in the Sogamoso valley preferred to establish their dwellings on the gentle slopes rather than directly on the floodplain. Nevertheless, the only zone on the gentle slopes classified as soil class III, which represents areas where labor requirements for agriculture are the lowest inside the survey area, had most of the occupation of the settlement cluster of Tibasosa. For this reason, the degree to which settlement clusters were caused by some integrative force or simply were the result of people deciding to locate their dwellings in low risk agricultural areas was explored by comparing the expected population and the actual observed populations in a set of 1 km^2 that divided the survey area (Figure 3.38). The result of this analysis reveal a very weak correlation between the expected and the observed populations among the 1 km^2 squares ($r = 0.349$, $p < 0.0005$, $Y = 0.982X + 0.181$). As before, the high apparent significance of this result is illusory because of spatial autocorrelation. Considering this evidence, it can be suggested that although some of the overall regional populations occupied

soils where practicing agriculture requires less effort, for most of the local populations in the Sogamoso valley the desire to inhabit the best areas for agricultural practices was less important than other variables, even after the Conquest. It looks like this settlement nucleation responded to integrative forces that were attracting people to the same areas as during the prehispanic sequence but with different intensities. Sogamoso and Tibasosa attracted more people than Firavitoba. For example, the 1 km^2 square enclosing the densest part of the occupation around Sogamoso showed around eight times more population than would be expected based on its soil class availability. There was some spatial continuity with the settlement pattern of the Late Muisca period, nevertheless, most of the settlements shifted toward Sogamoso and Tibasosa, breaking apart or reducing prehispanic nucleations such as Firavitoba.

3.4.3.2 Exchange, decorated sherds and tools

Exchange activities during the Colonial period were probably intensified in the Eastern Highlands. The Spaniards exploited the highland resources by means of several specialized settlements that in prehispanic times probably produced/exploited the same specific goods/resources (Beltrán-Beltrán 2008). During the last years of the Colonial period the Eastern Highlands became a small-scale manufacturing center thanks to economic systems such as the one constituted by the Society of Jesus through its haciendas in the lowlands and boarding schools in the highlands (Rausch 1994). Although within a market regulated by the Spanish Crown, European settlers probably maintained and created new commercial links with Europe, which in turn expanded the exchange network of the Americas.

The feasting cycle of prehispanic populations described in Spanish accounts continued under the new religious system. Feasting activities were incorporated under Catholic concepts and systems

such as confraternity of lay people (Sotomayor 2004). Unfortunately the spatial distribution and intensity of these activities could not be approached with the archaeological record collected during the regional survey. The differences in the spatial distribution of the decorated ware from the ceramics of the Colonial period were not explored as in the case of the decorated sherds from the prehispanic sequence. Although the Spanish Conquest brought technical diversity in decoration and production for wares produced in the new world (Therrien, et al. 2002), almost all Colonial sherds were classified as glazed ware, which very often have some kind of decoration. Lithic technologies were probably slowly replaced by the iron and steel tools brought by Europeans in the 16th century. Only three collection units with more than 60% of Colonial sherds had lithics. Two possible tools and three objects associated with debitage composed this assemblage.

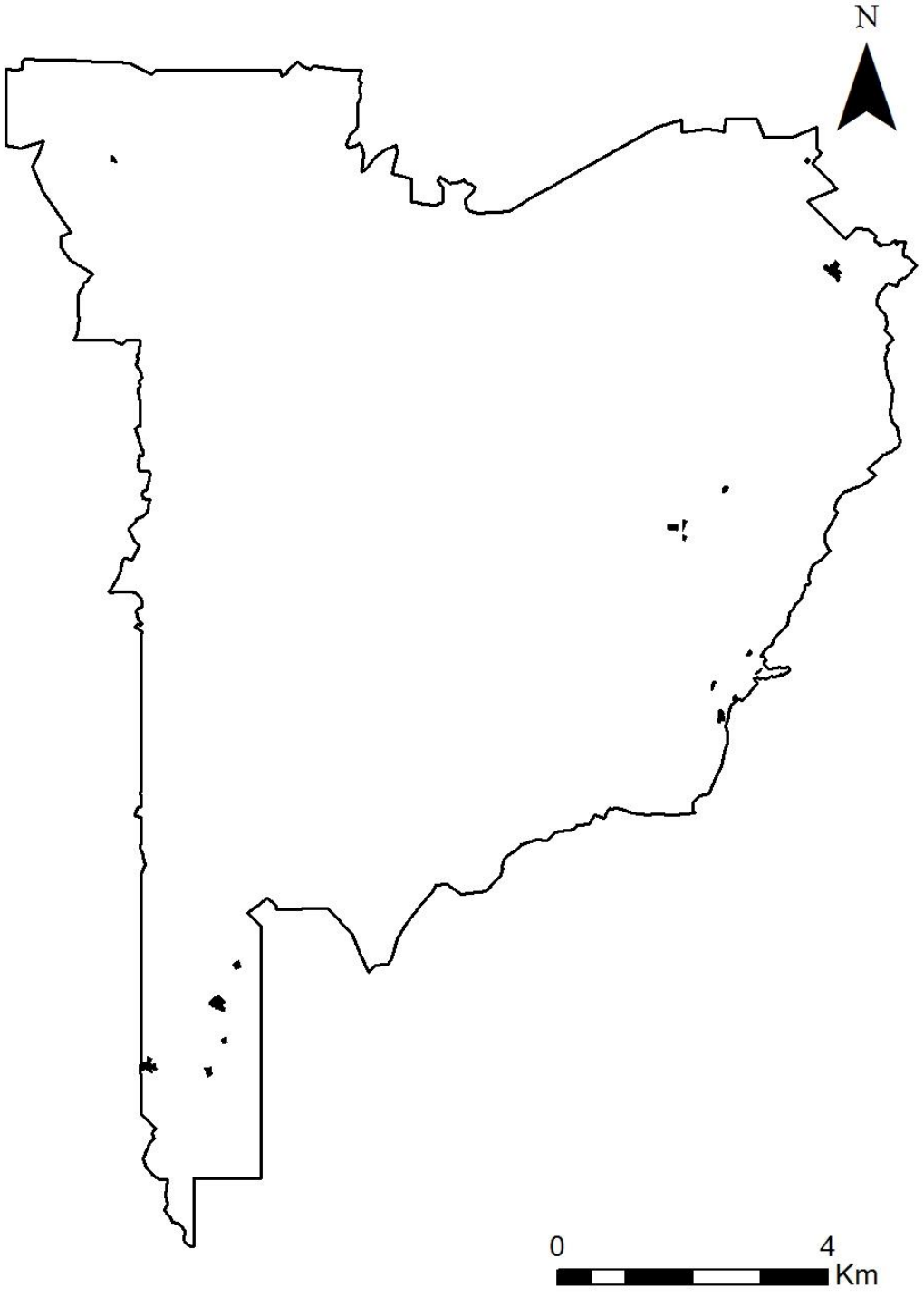

Figure 3.1 Herrera period settlement distribution

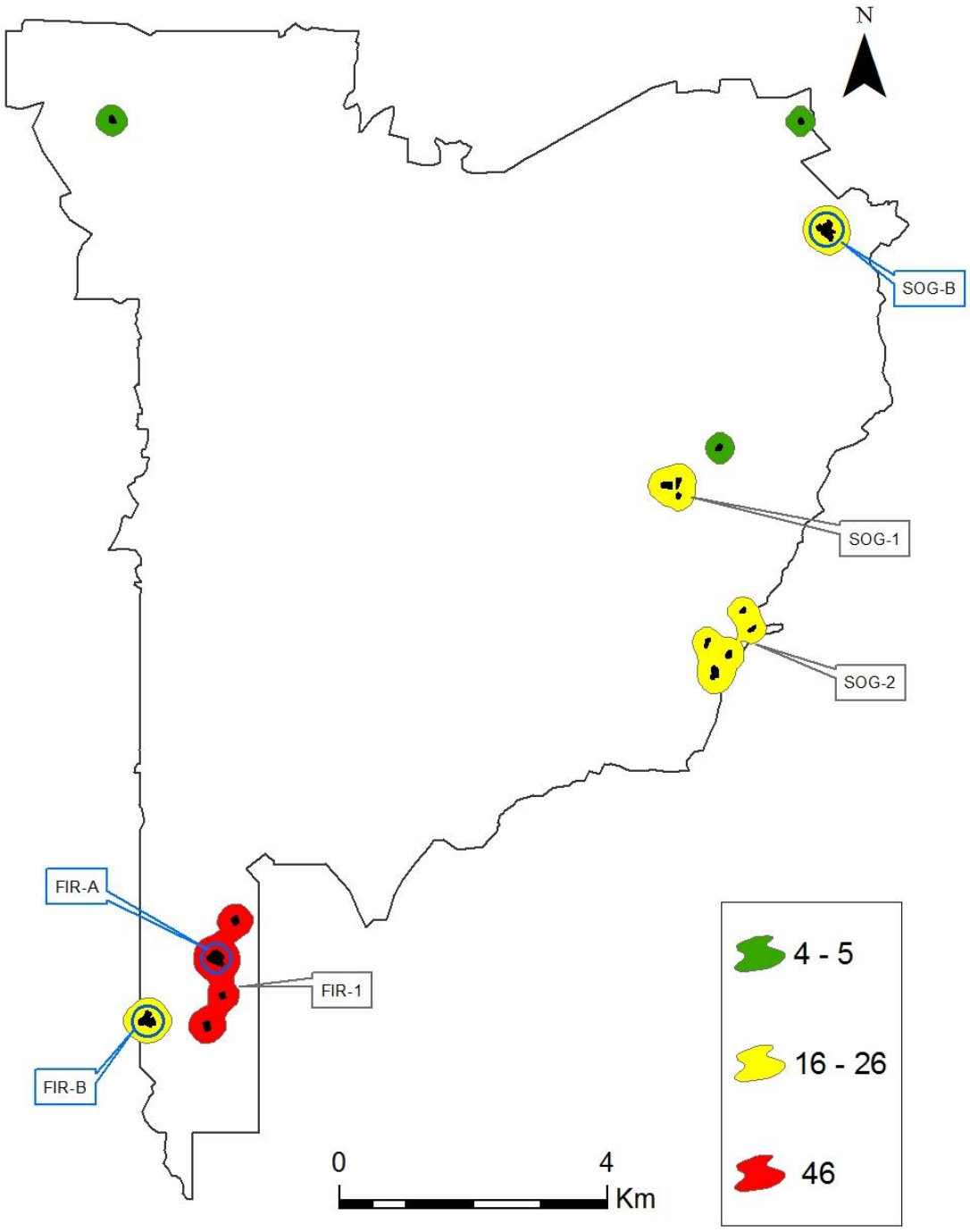

Figure 3.2 Herrera local communities (circled in blue), clouds of farmsteads (yellow and red) and disconnected farmsteads (green) showing average population estimates. Hamlets and clusters of dispersed farmsteads are shown with callouts. Callouts with a letter suffix indicate hamlets. Callouts with a number suffix indicate clouds of farmsteads

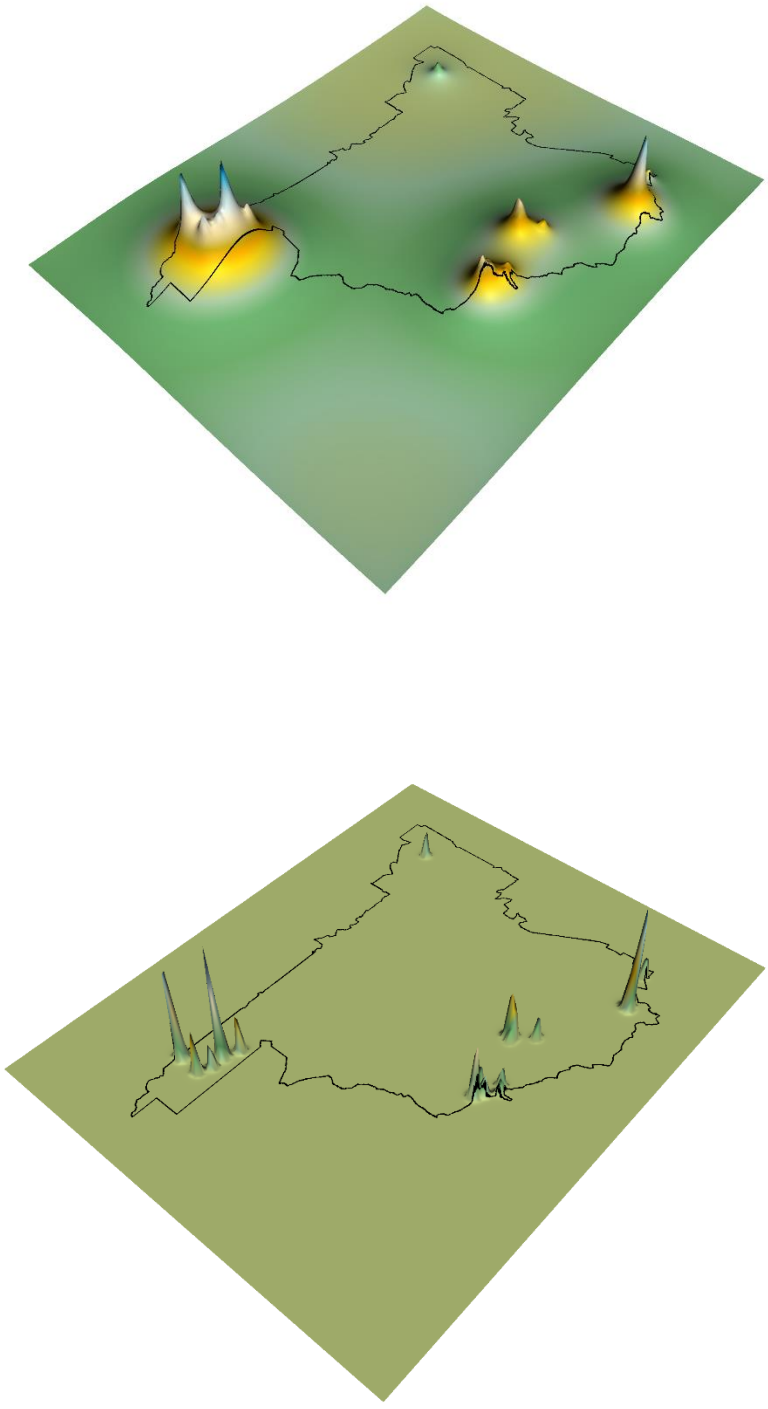

Figure 3.3 Smoothed and unsmoothed surfaces of human densities in the Herrera period

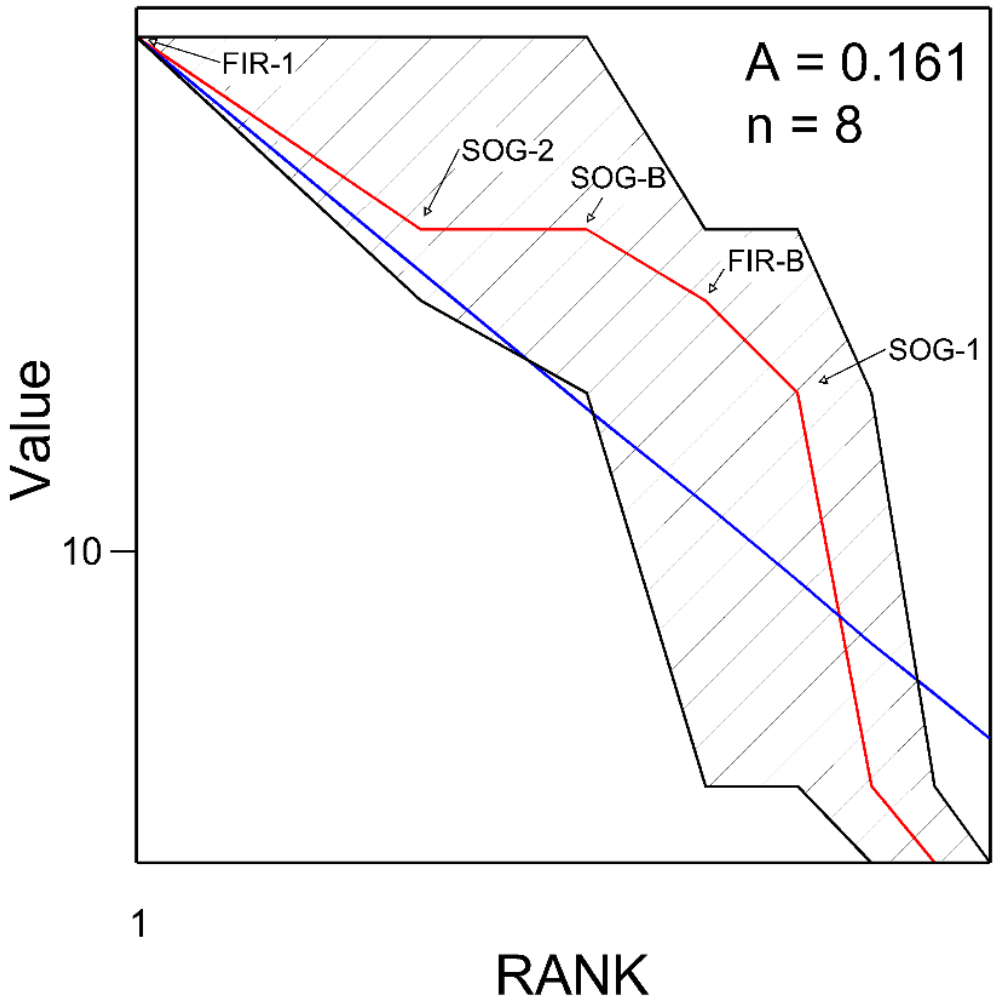

Figure 3.4 Rank size graph based on the average population estimate calculated for Herrera hamlets, clusters of farmsteads and disconnected farmsteads. Callouts show the location in the function of hamlets and clusters of farmsteads

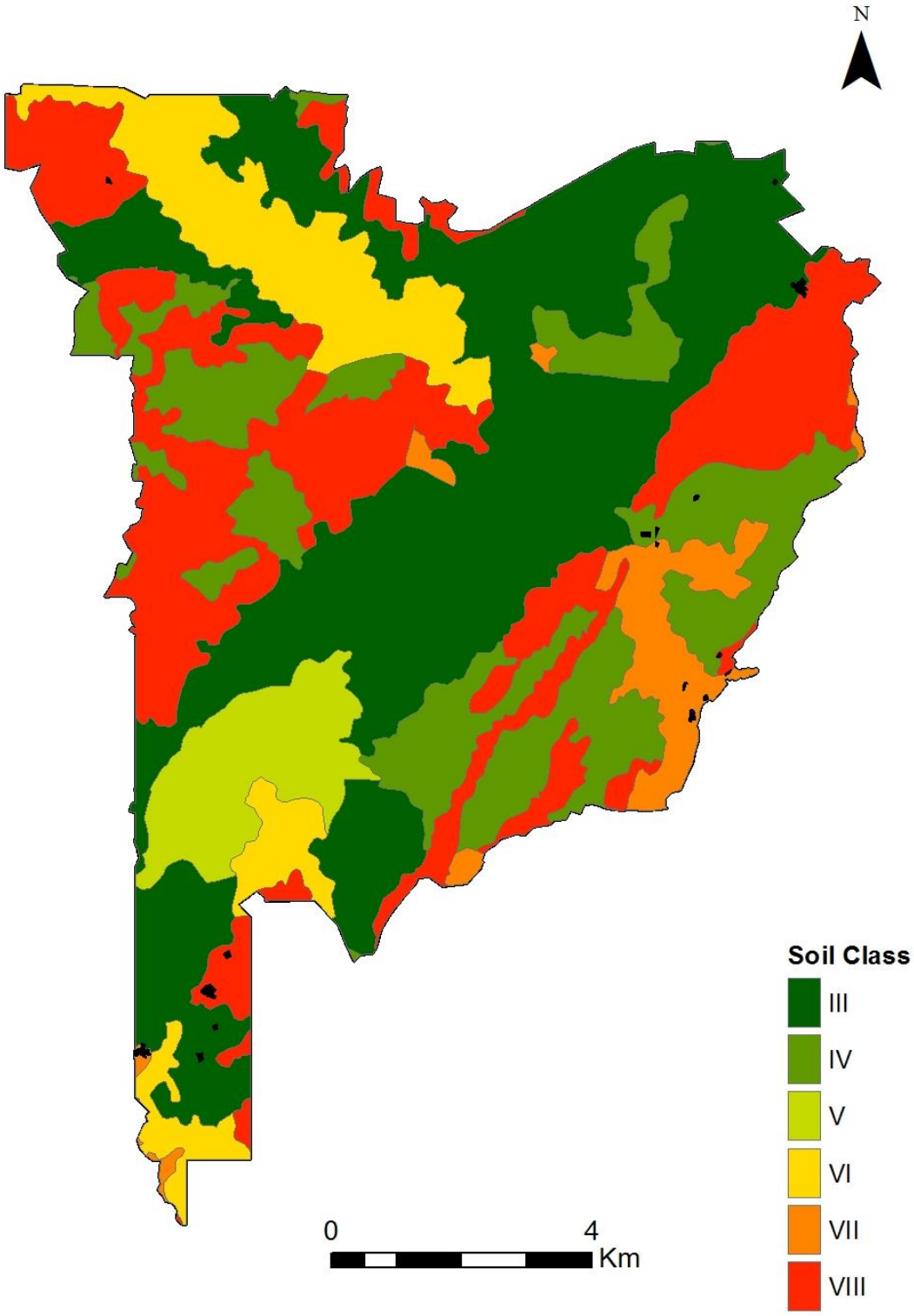

Figure 3.5 Soil classes and Herrera settlement distribution

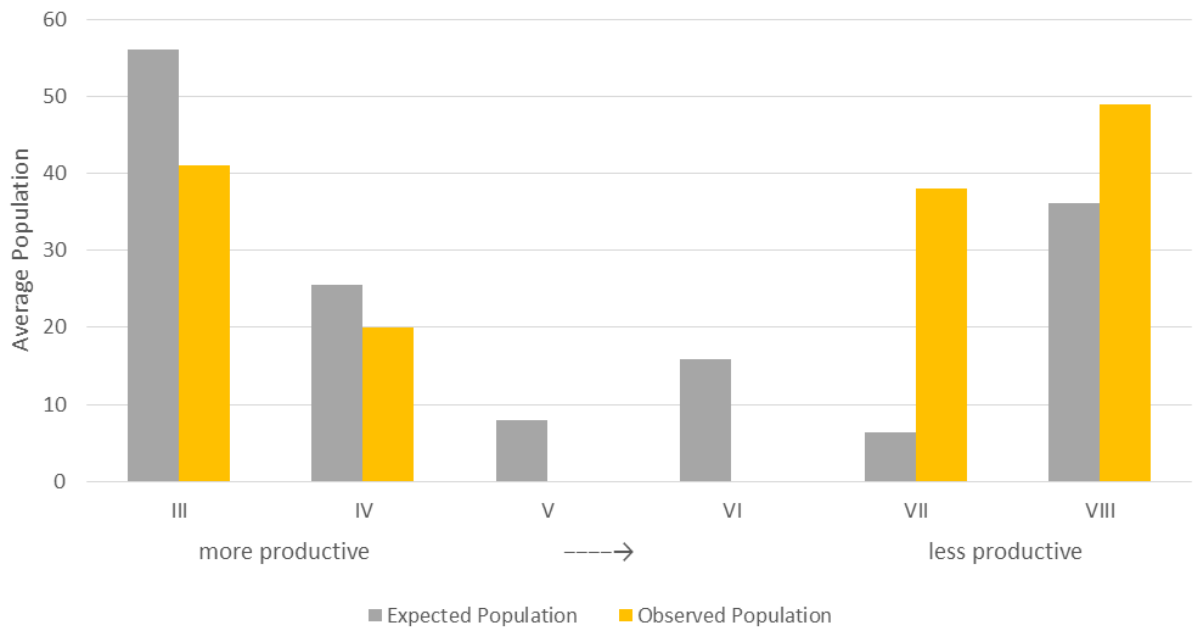

Figure 3.6 Expected versus observed Herrera population estimates given soil classes available inside the survey area

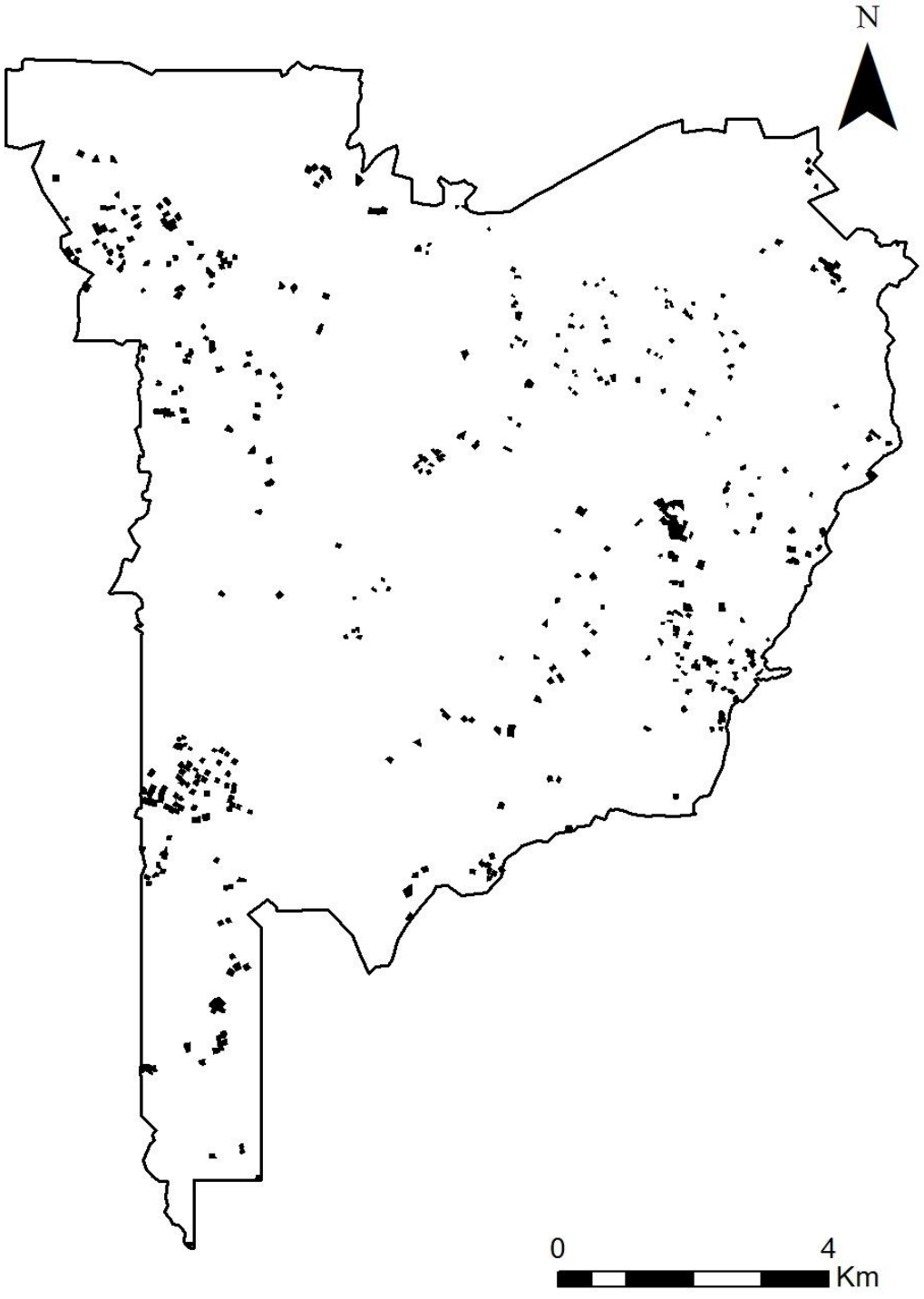

Figure 3.7 Early Muisca period settlement distribution

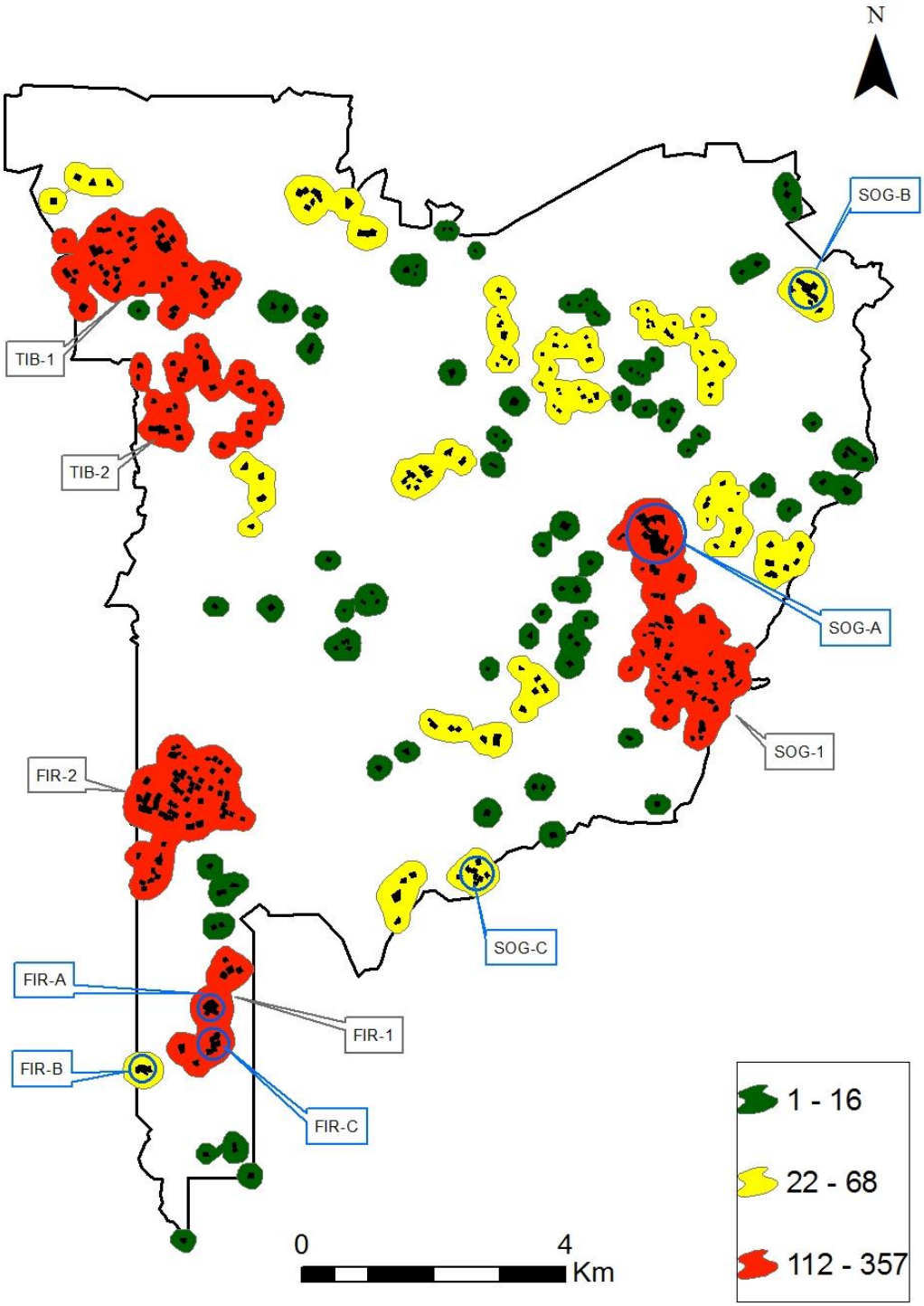

Figure 3.8 Early Muisca local communities (circled in blue), clouds of farmsteads (yellow and red) and disconnected areas with occupation (green) showing average population estimates. Local communities and clouds of farmsteads are shown with callouts. Callouts with a letter suffix indicate local communities. Callouts with a number suffix indicate clouds of farmsteads

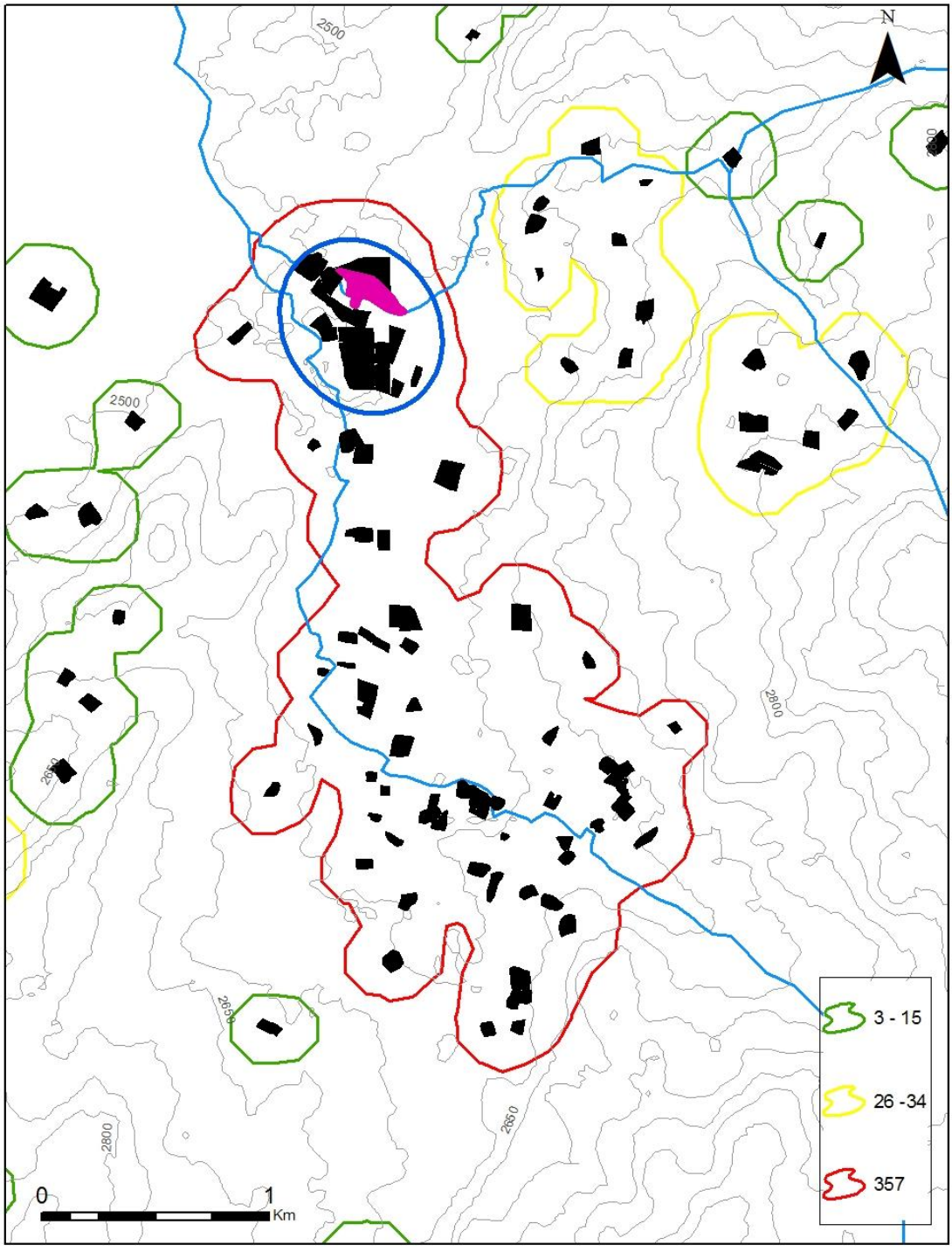

Figure 3.9 Sogamoso´s local community (circled in blue) showing location of local museum (purple) and different average population estimates for near cloud of dispersed farmsteads (yellow and red) and disconnected areas with occupation (green)

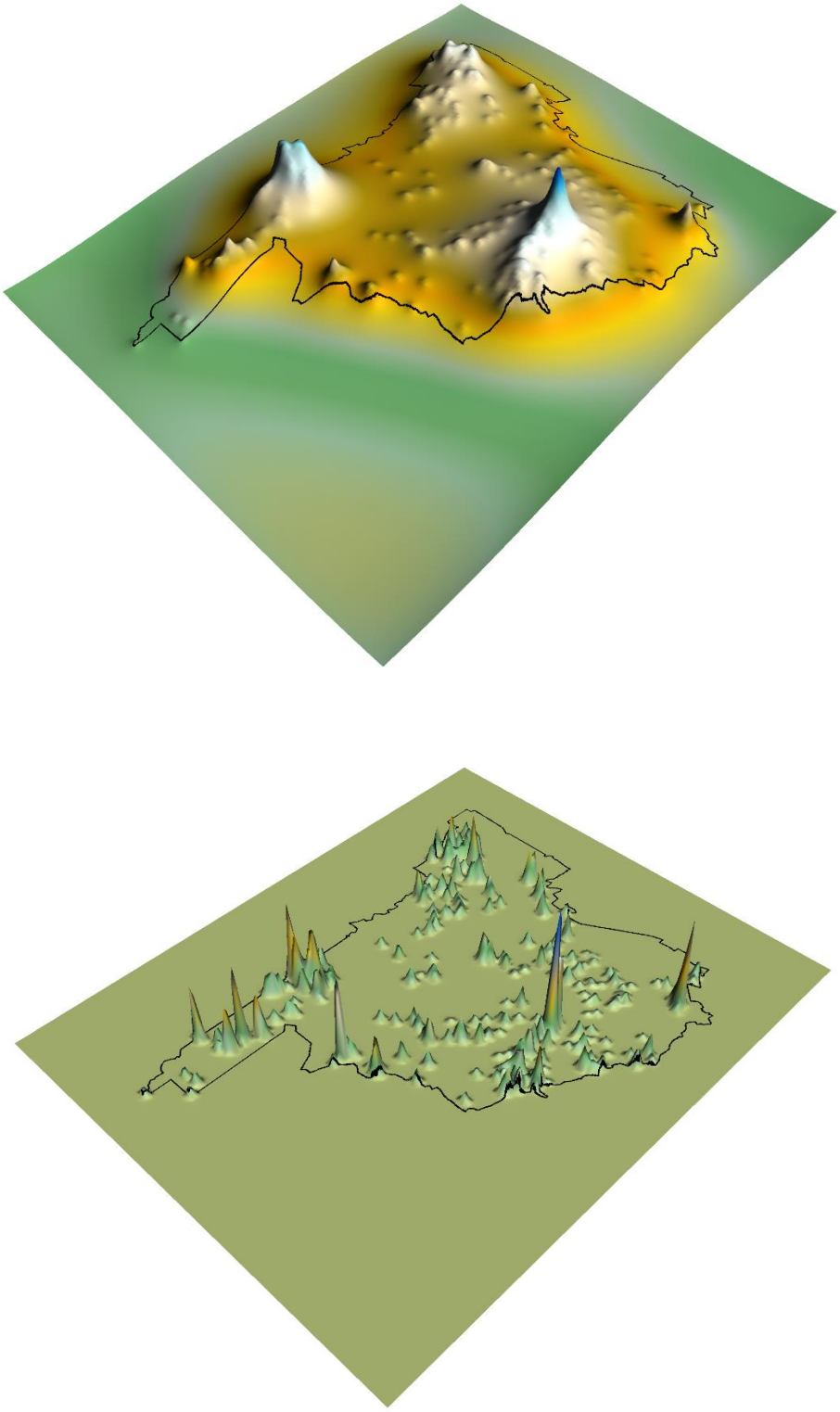

Figure 3.10 Smoothed and unsmoothed surface of human densities for the Early Muisca period

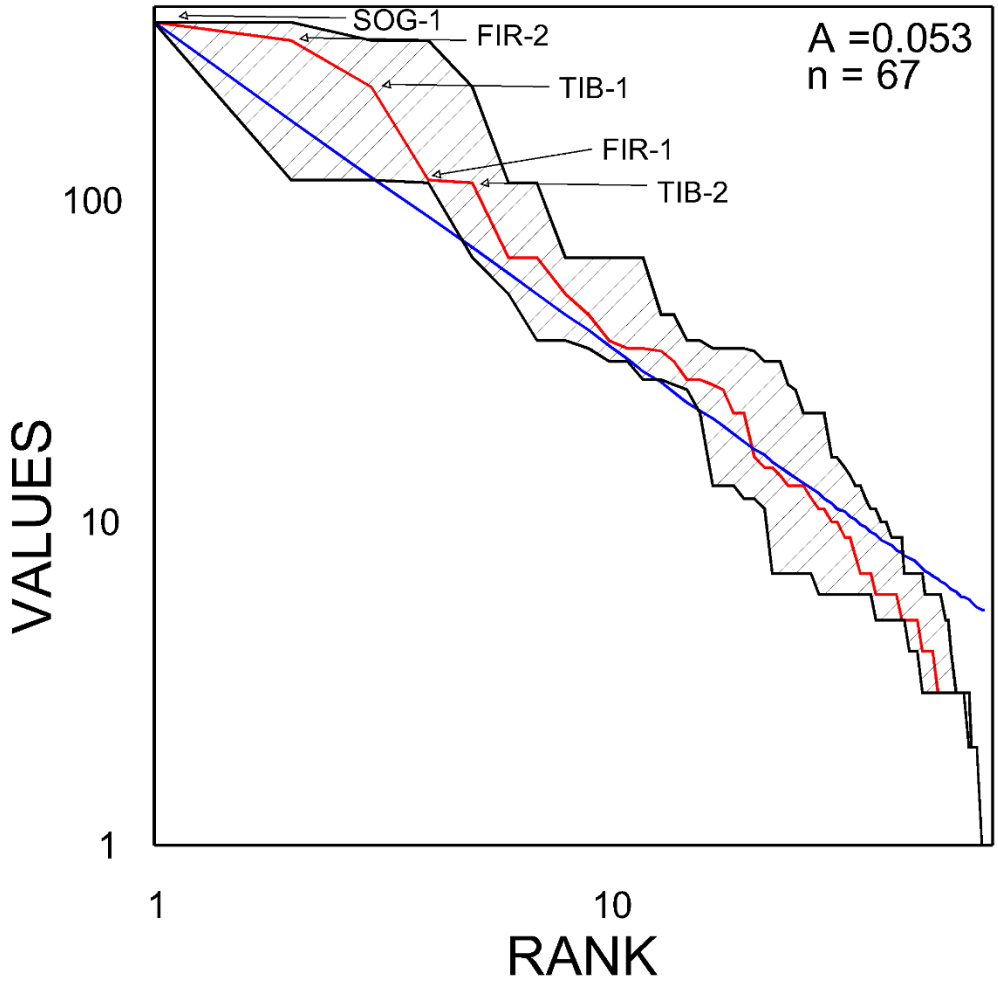

Figure 3.11 Rank size graph based on the average population estimate calculated for Early Muisca clouds of farmsteads and disconnected areas with occupation. Callouts show the location in the function of the largest clouds of farmsteads

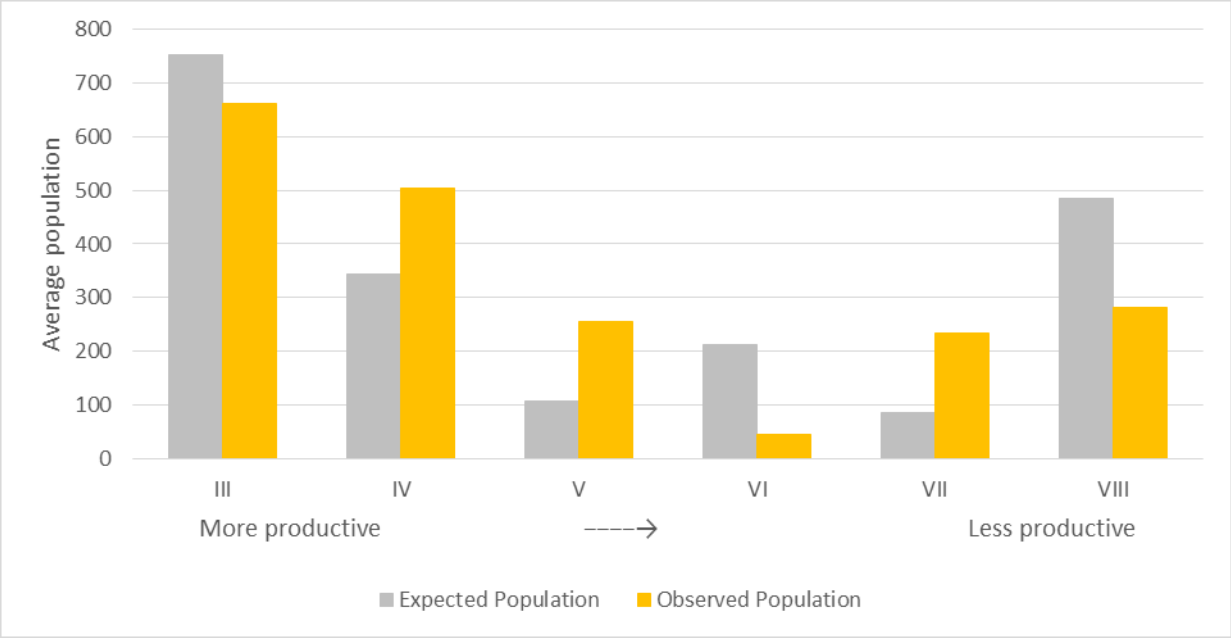

Figure 3.12 Expected versus observed Early Muisca population estimates given soil classes available inside the survey area

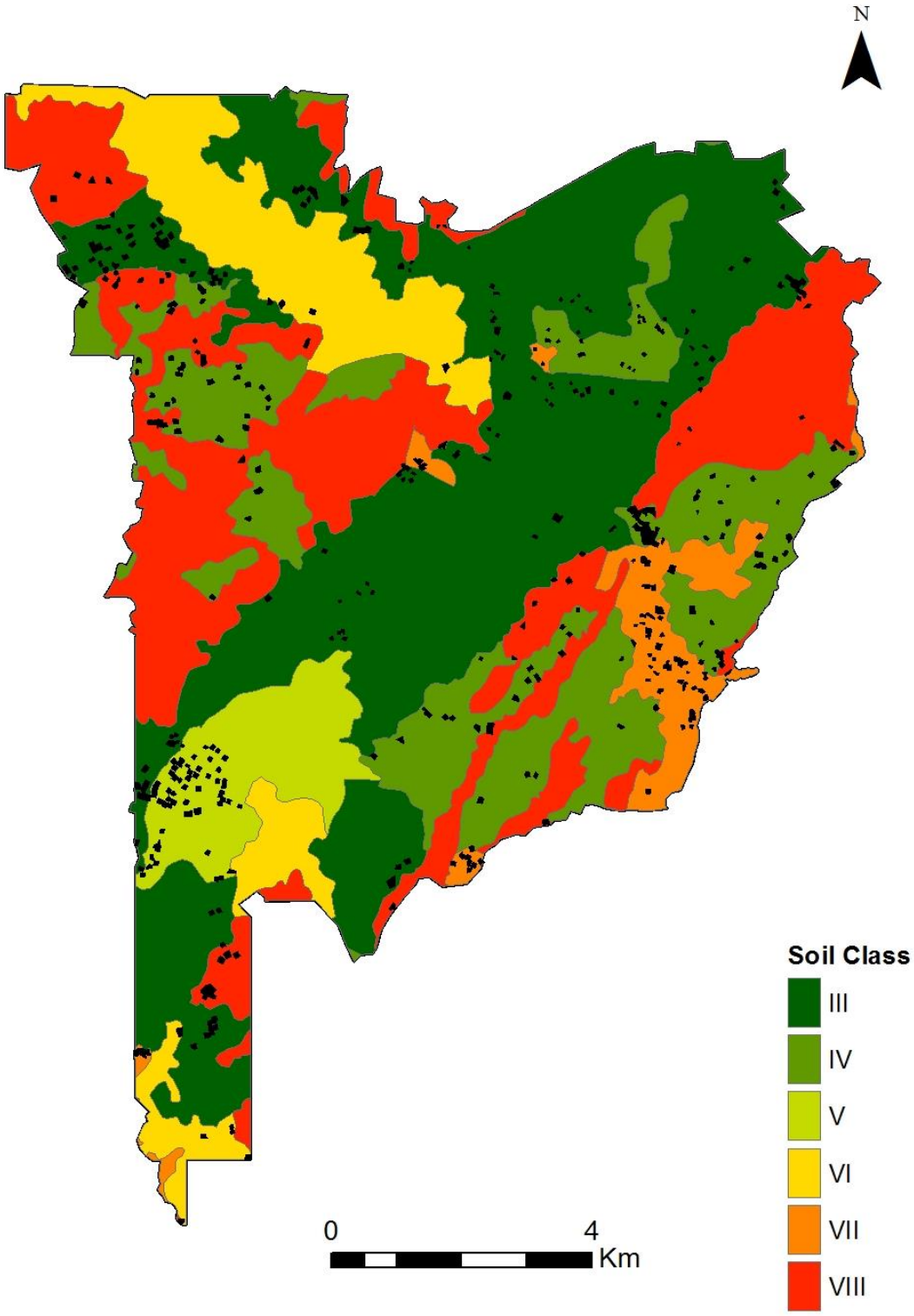

Figure 3.13 Soil classes and Early Muisca settlement distribution

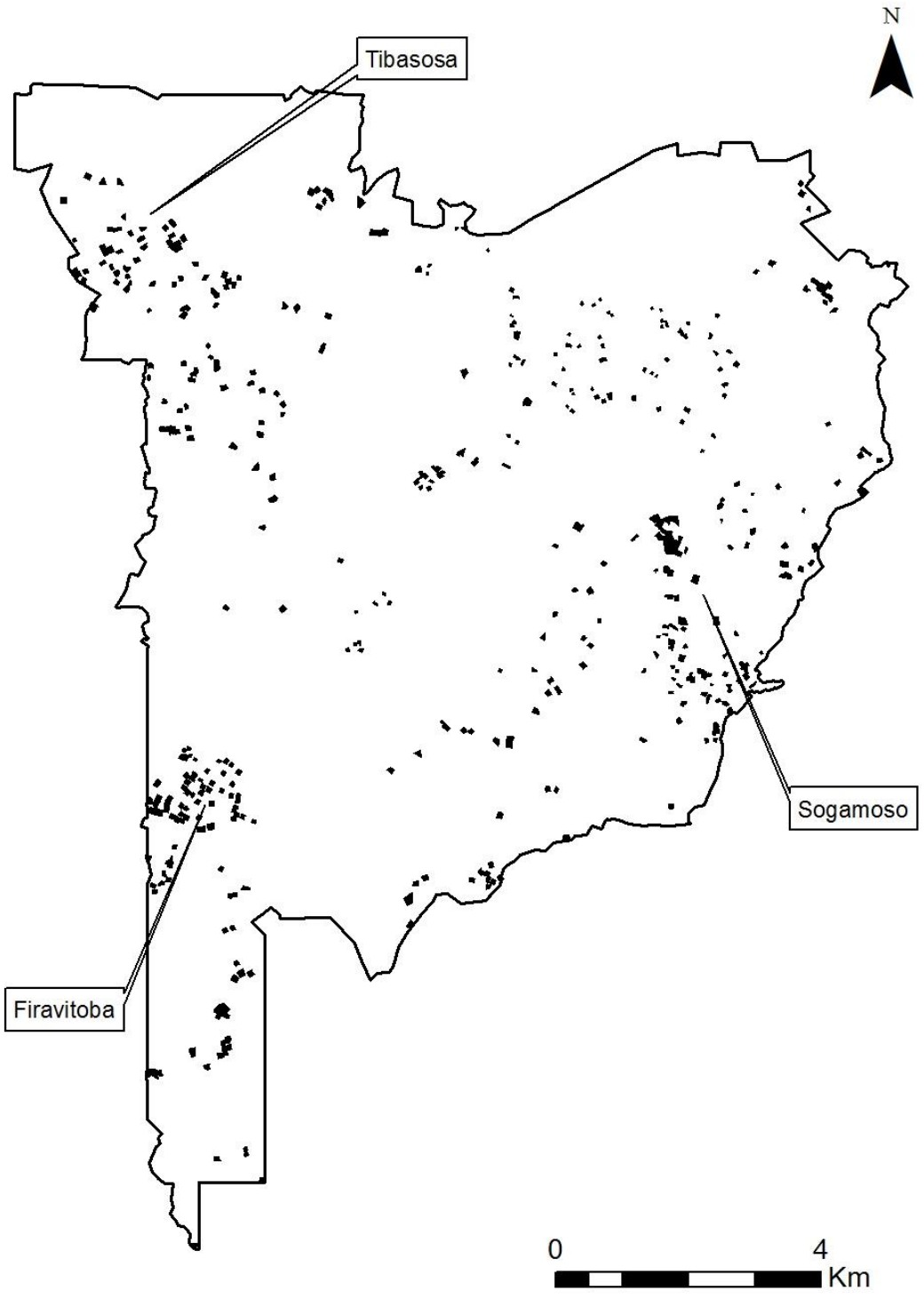

Figure 3.14 Occupation clusters Early Muisca period

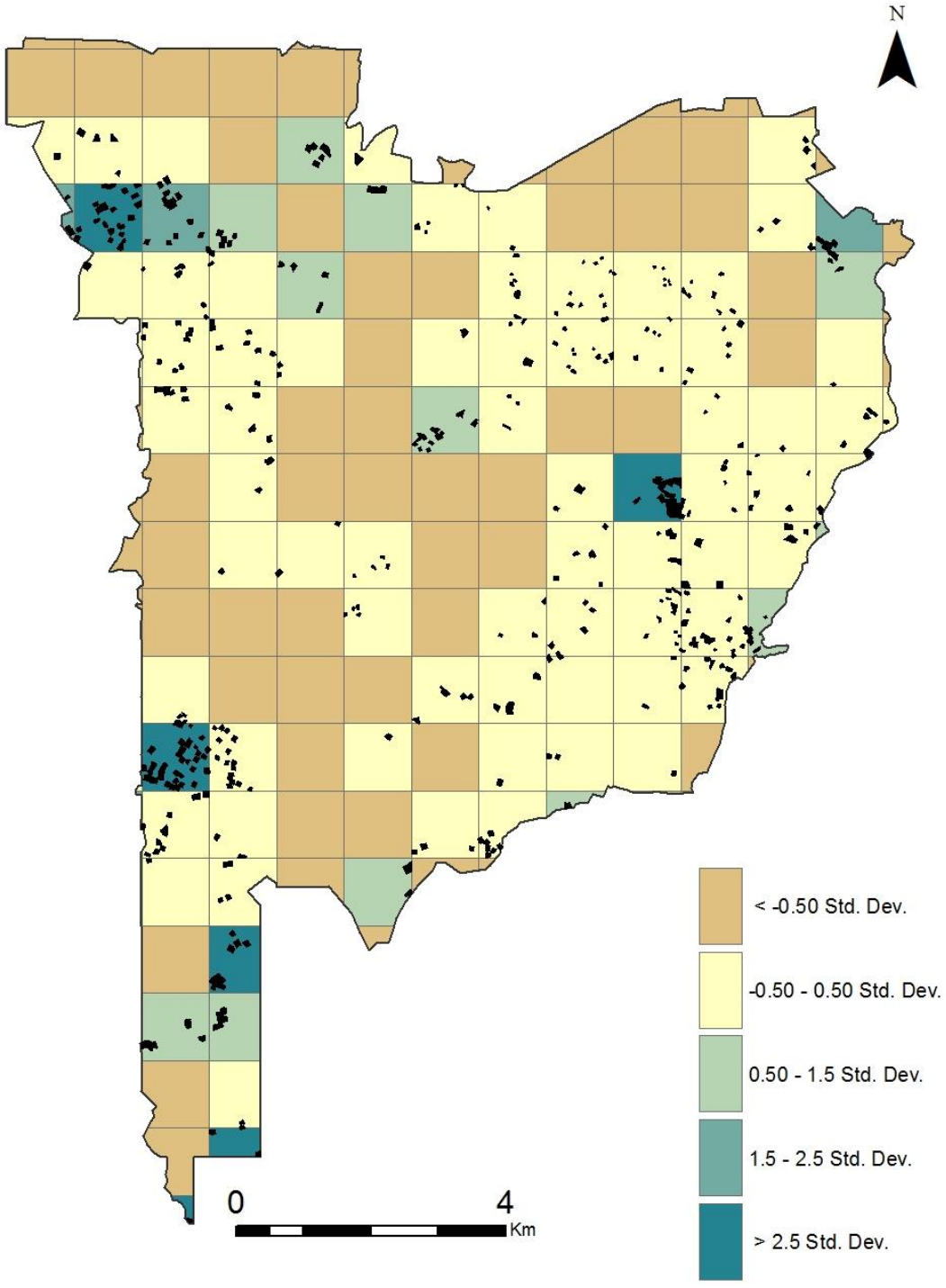

Figure 3.15 1 km^2 Grid squares showing standard deviation values from the mean of observed/expected ratios for Early Muisca average population estimate given the soil classes available in each square

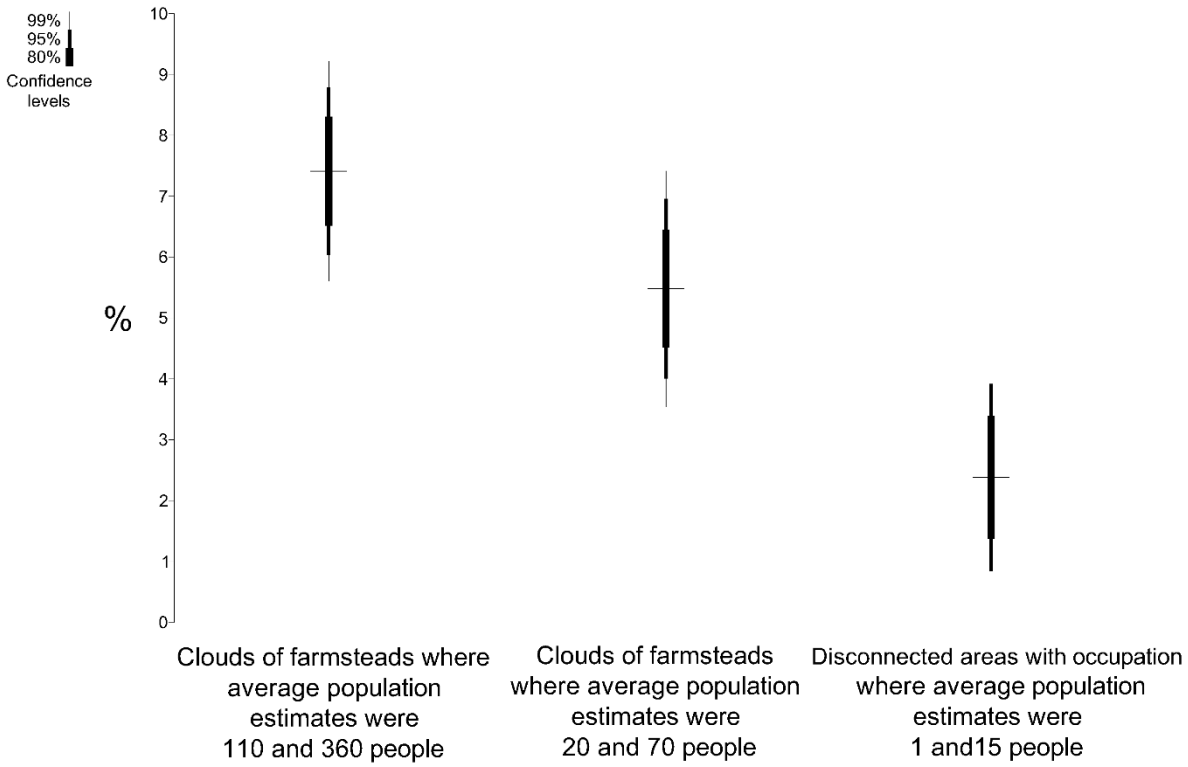

Figure 3.16 Bullet graphs comparing percentage of decorated sherds among clouds of farmsteads and disconnected areas with occupation during the Early Muisca period. Local communities are included with its associated cloud of farmsteads. The local community of Sogamoso is part of one of the clouds of farmsteads with population estimates between 110 and 360 people

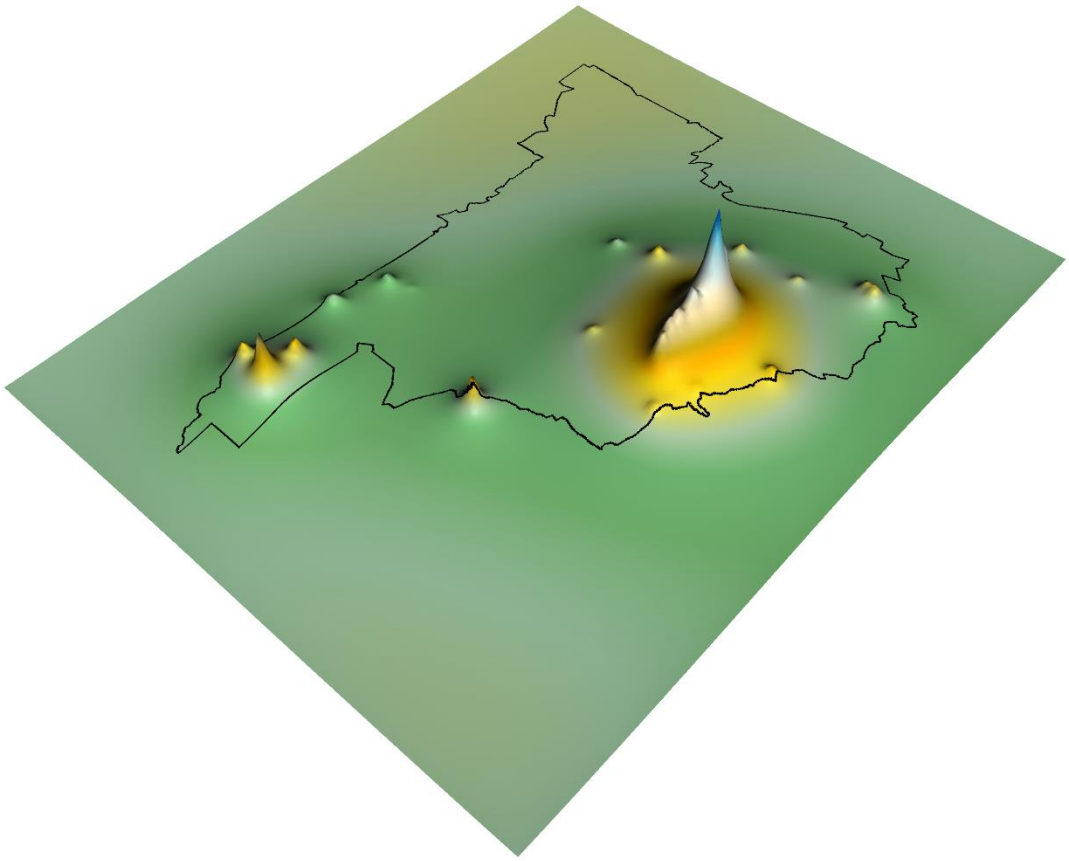

Figure 3.17 Smoothed surface lithic distribution

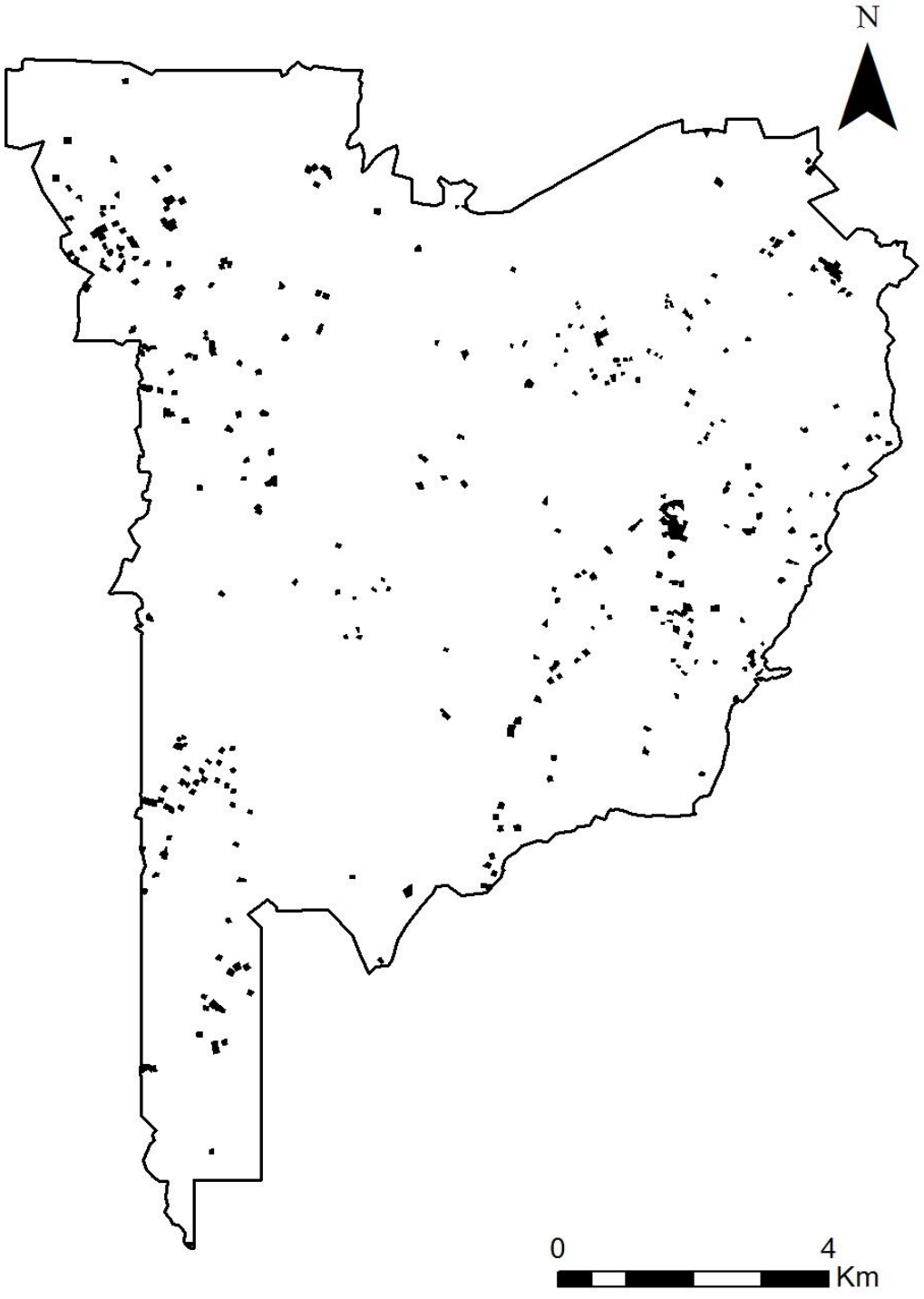

Figure 3.18 Late Muisca period settlement distribution

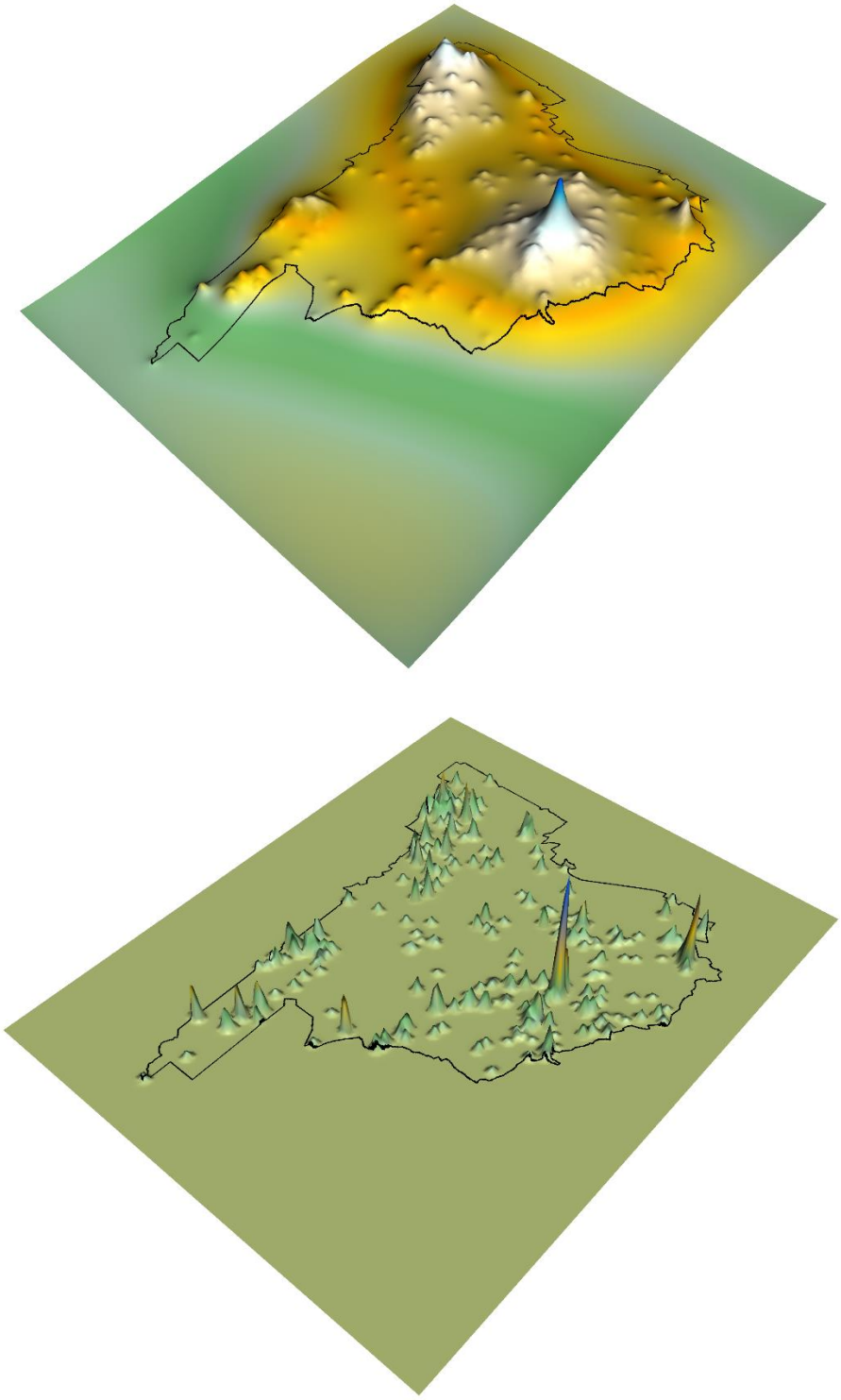

Figure 3.19 Smoothed and unsmoothed surfaces of human densities in the Late Muisca period

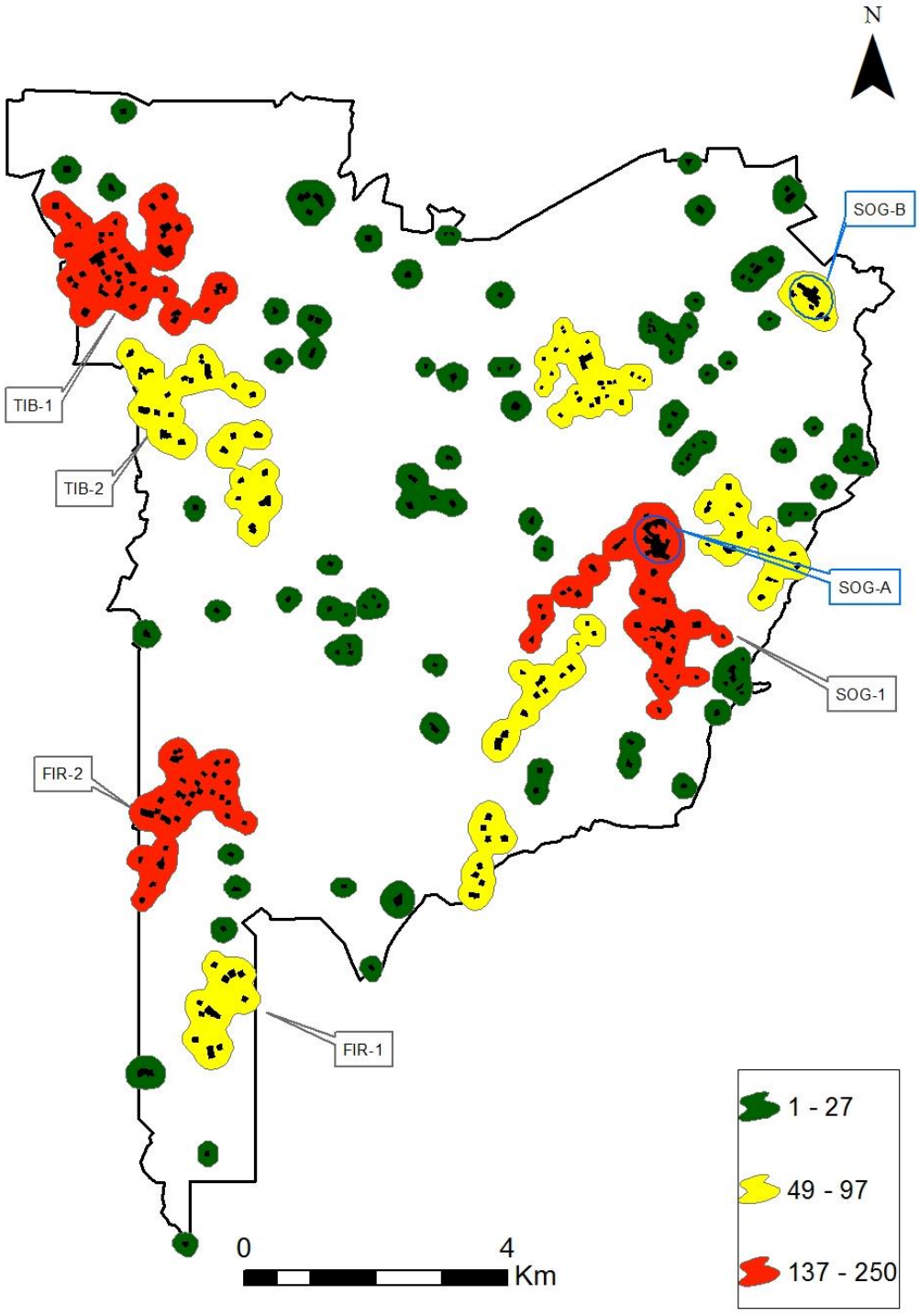

Figure 3.20 Late Muisca local communities (circled in blue), clouds of farmsteads (yellow and red) and disconnected areas with occupation (green) showing average population estimates. Local communities and clouds of farmsteads are shown with callouts. Callouts with a letter suffix indicate local communities. Callouts with a number suffix indicate clouds of farmsteads.

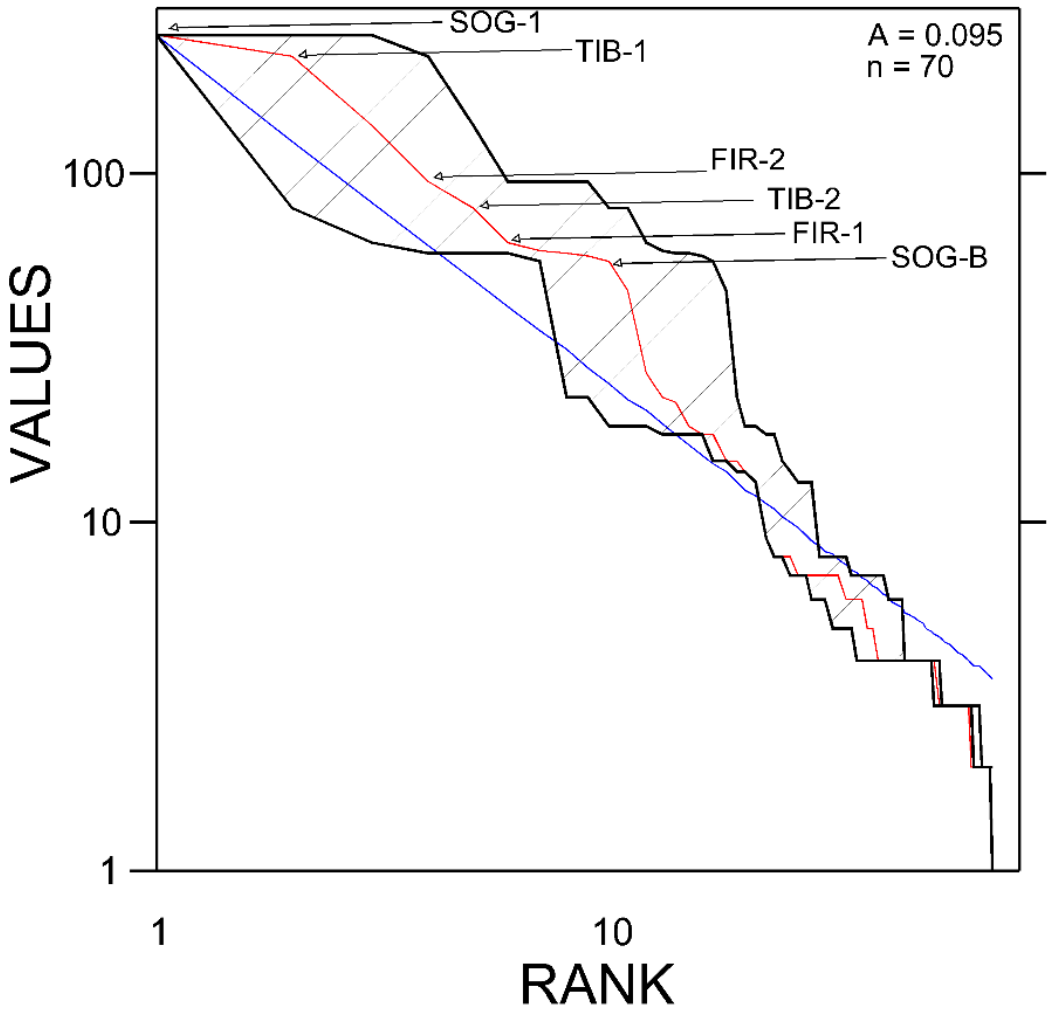

Figure 3.21 Rank Size graph base on average population estimates Late Muisca clouds of farmsteads and disconnected areas with occupation. Callouts show the location in the function of the largest clouds of farmsteads and one local community (SOG-B).

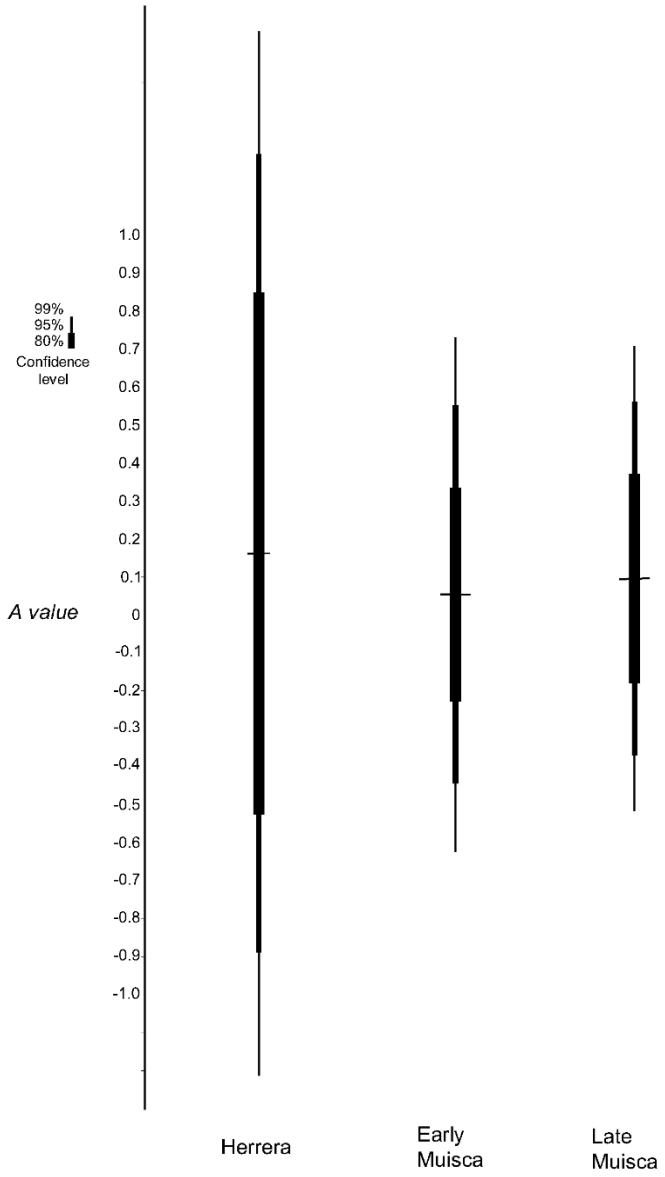

Figure 3.22 Comparison by bullet graphs of A Values for the prehispanic sequence of the Sogamoso valley

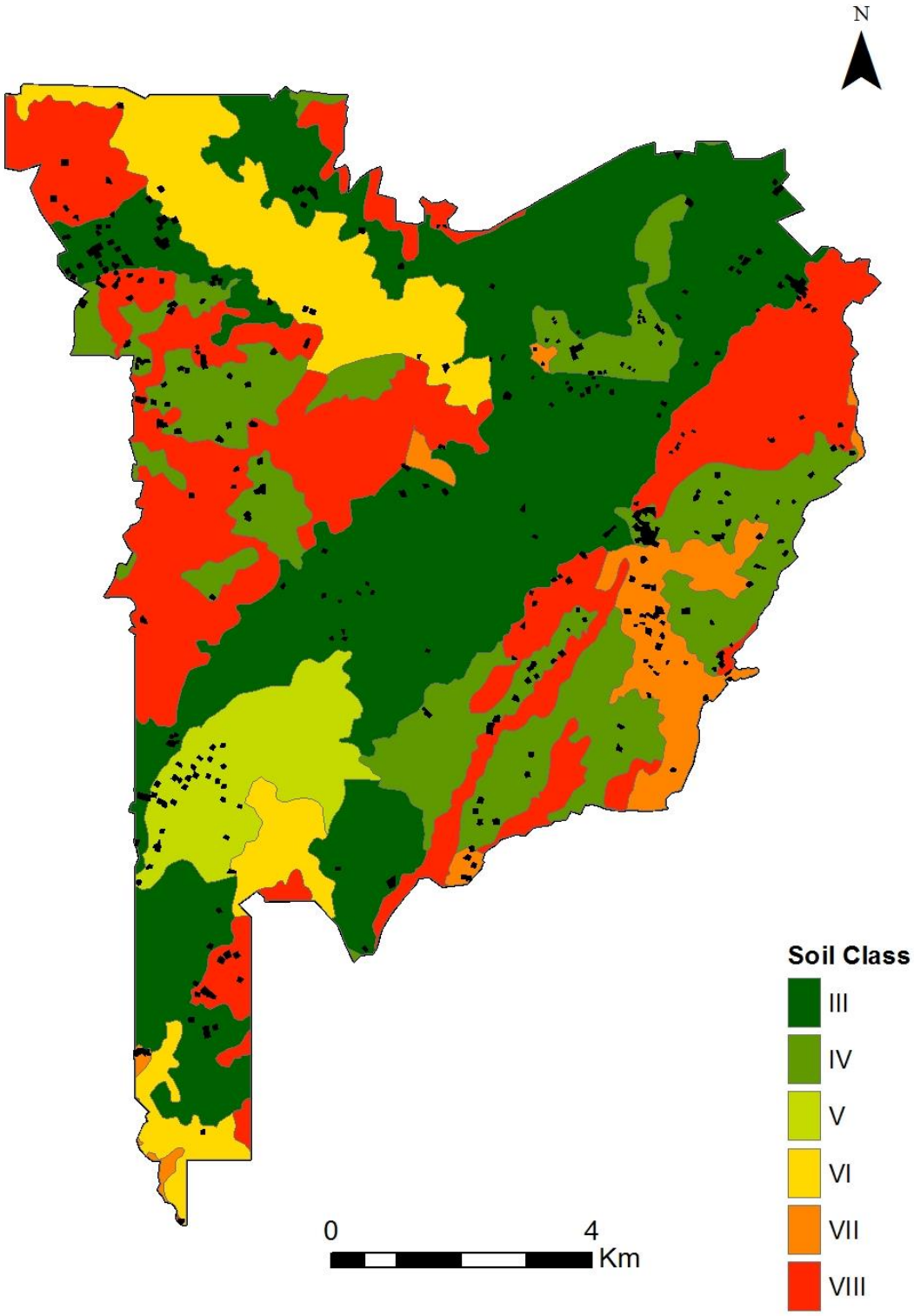

Figure 3.23 Soil classes and Late Muisca settlement distribution

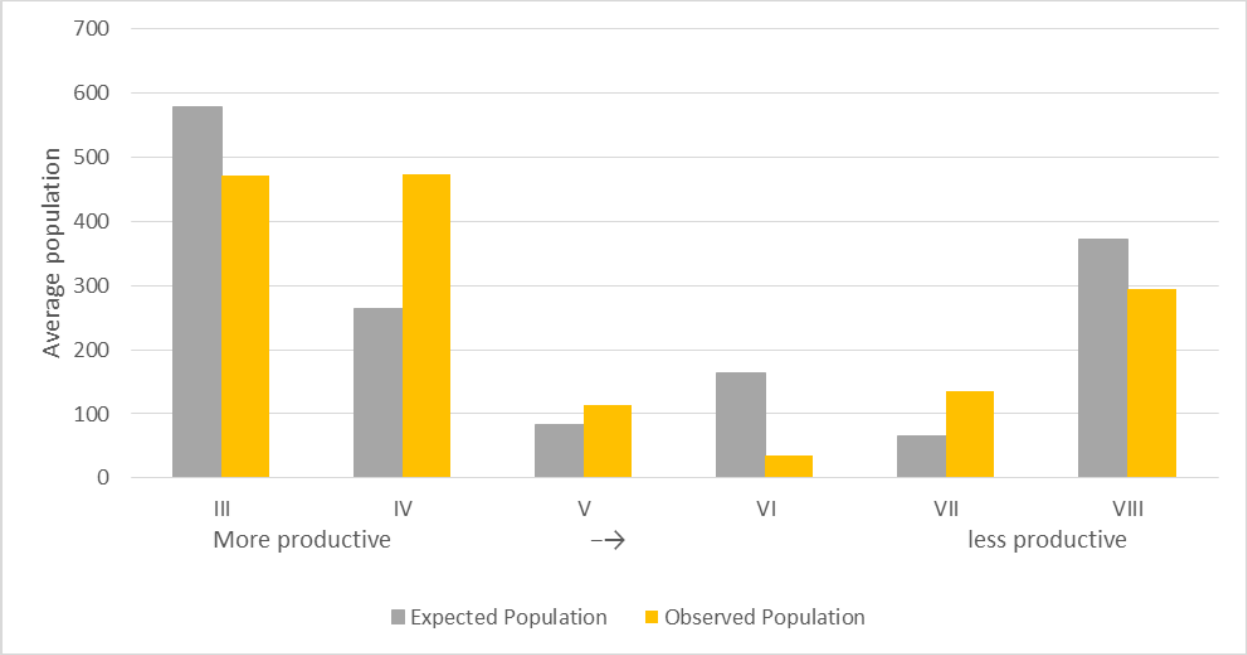

Figure 3.24 Expected versus observed Late Muisca population estimates given soil classes available inside the survey area

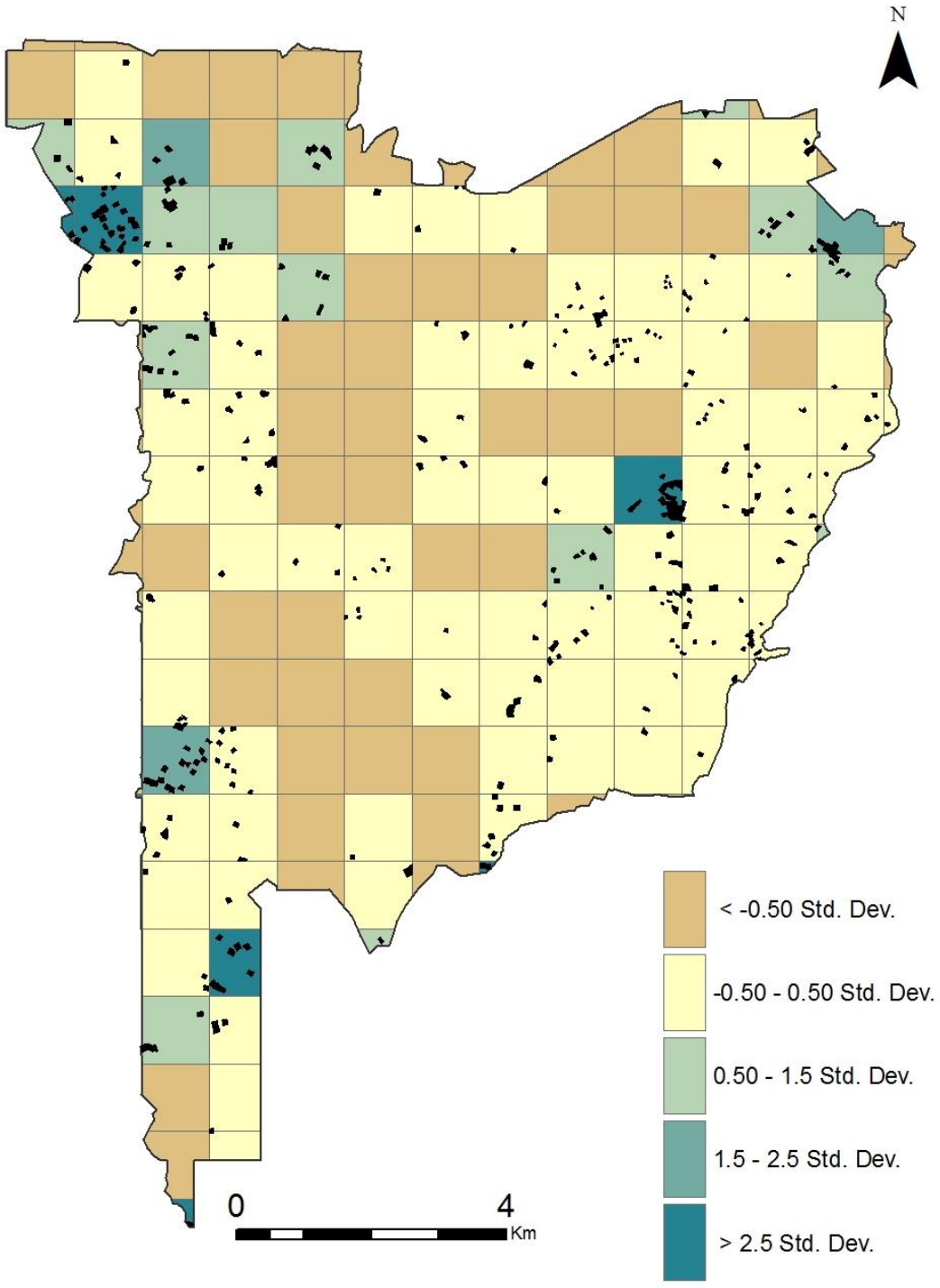

Figure 3.25 1 km^2 Grid squares showing standard deviations values from the mean of observed/expected ratios for Late Muisca average population estimate given the soil classes available in each square

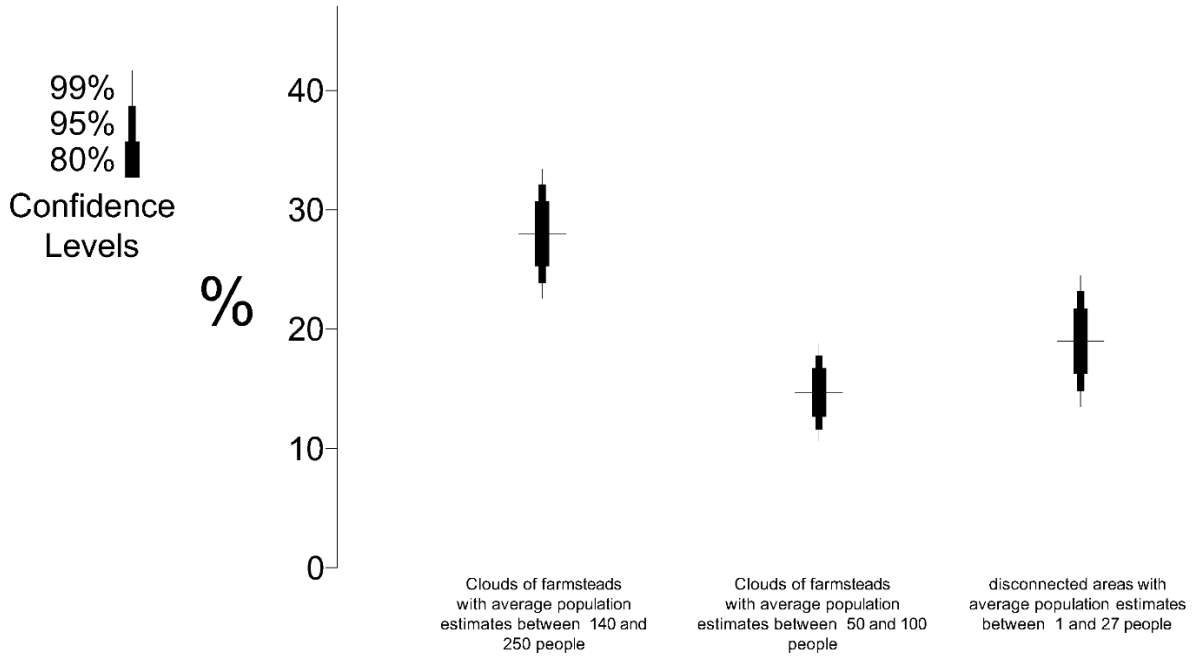

Figure 3.26 Bullet graphs comparing percentage of non-local sherds among clouds of farmsteads and disconnected areas with occupation during the Late Muisca period. Local communities are included with its associated cloud of farmsteads. The local community of Sogamoso is part of one of the clouds of farmsteads with population estimates between 140 and 250 people

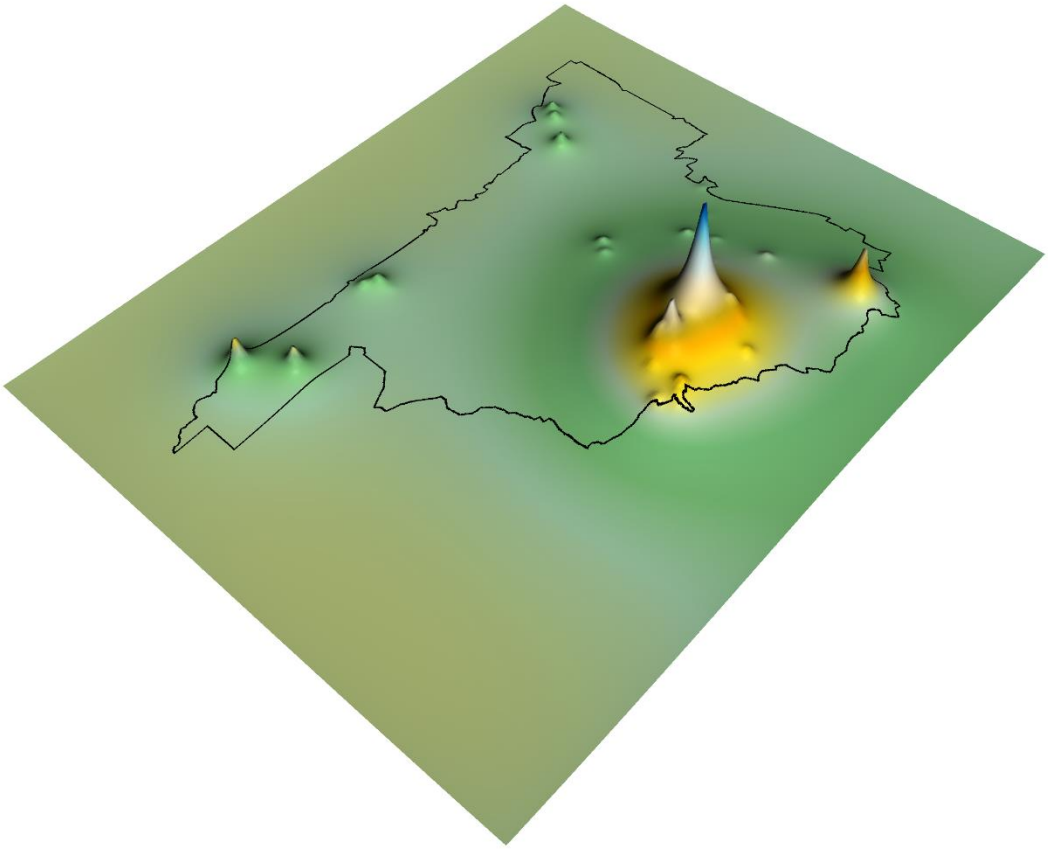

Figure 3.27 Smoothed surface of the ratio of Late Muisca non-local sherds and total Late Muisca sherds inside the survey area

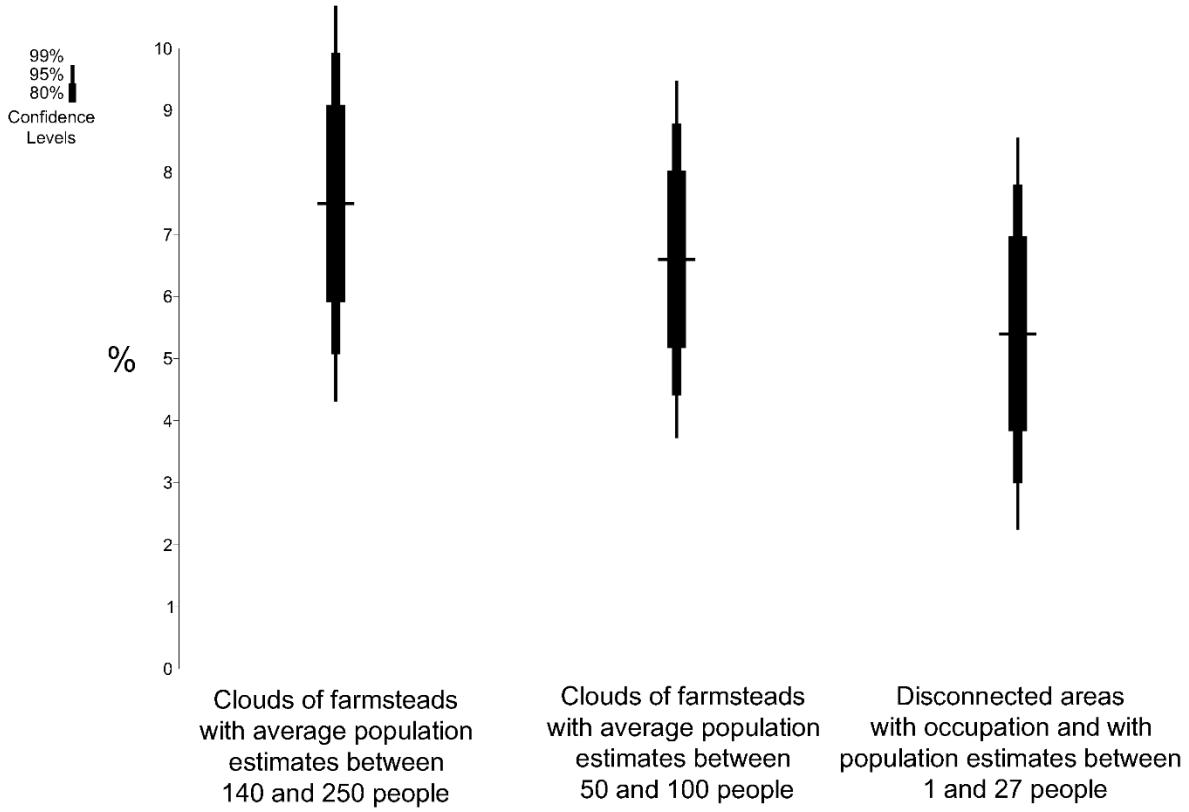

Figure 3.28 Bullet graphs comparing percentage of decorated sherds among clouds of farmsteads and disconnected areas with occupation during the Late Muisca period. Local communities are included with its associated cloud of farmsteads. The local community of Sogamoso is part of one of the clouds of farmsteads with population estimates between 140 and 250 people

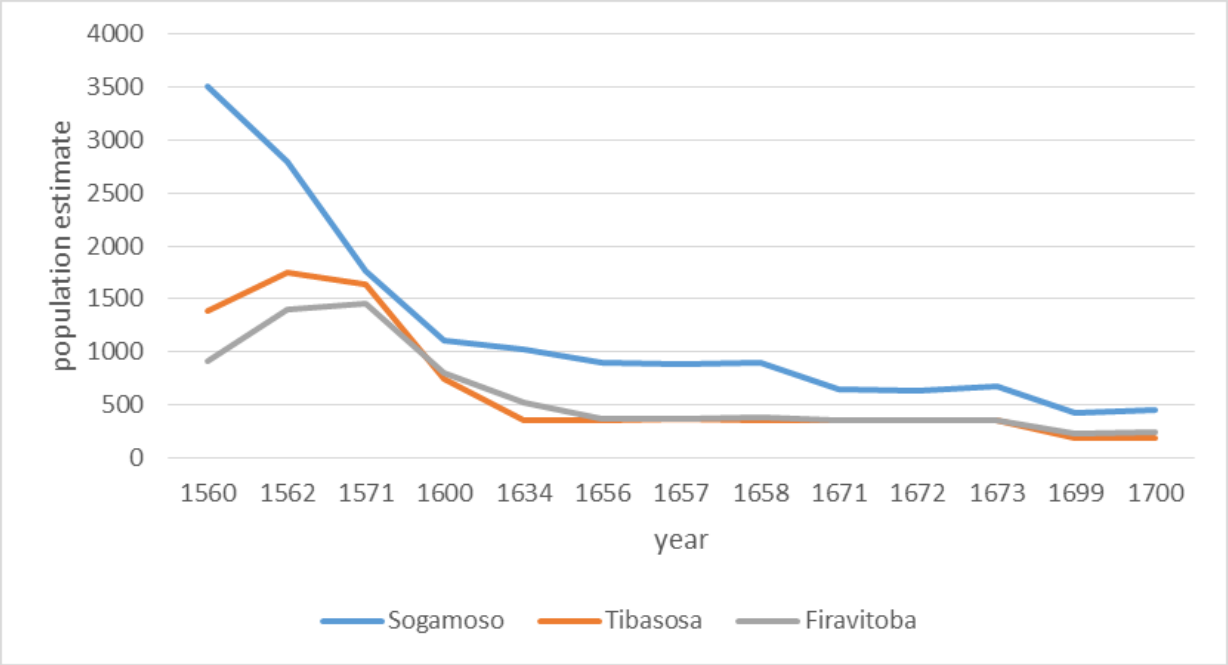

Figure 3.29 Population change during 1560-1700 using counts of taxpayers in Sogamoso, Tibasosa and Duitama from Table 3.15 Population estimate based on an average configuration of 3.5 individuals per taxpayer from Table 3.15

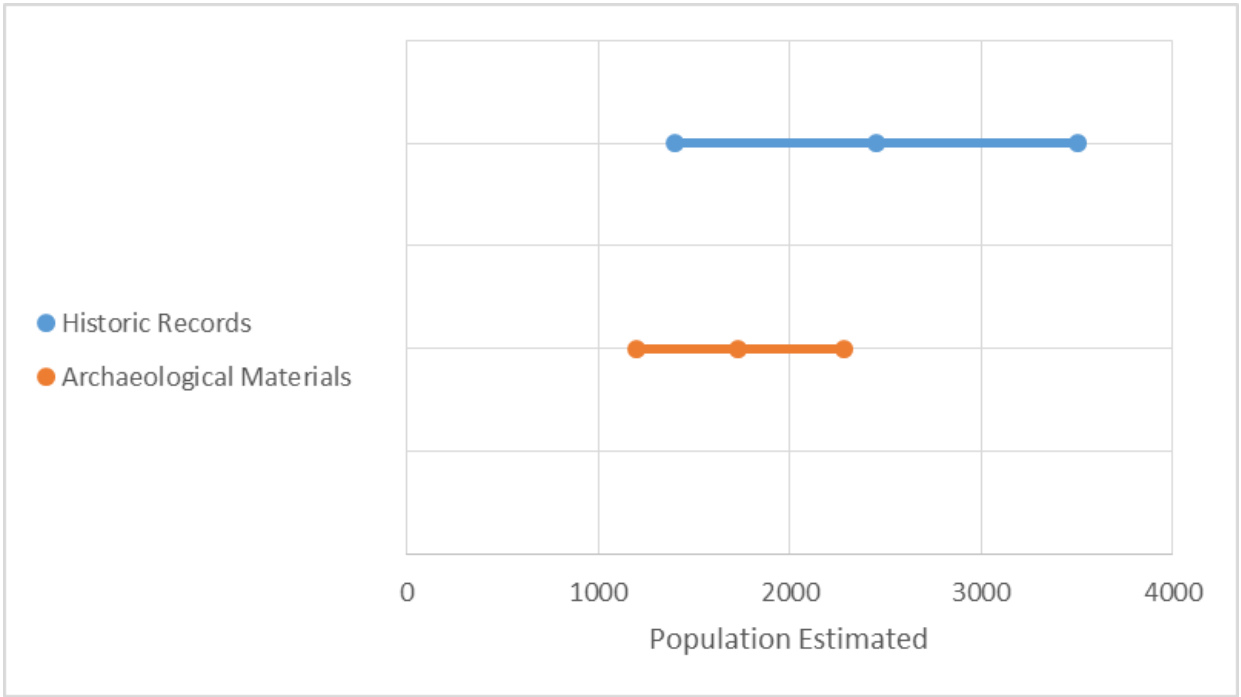

Figure 3.30 Ranges of Colonial population estimates based on historic records and archaeological materials

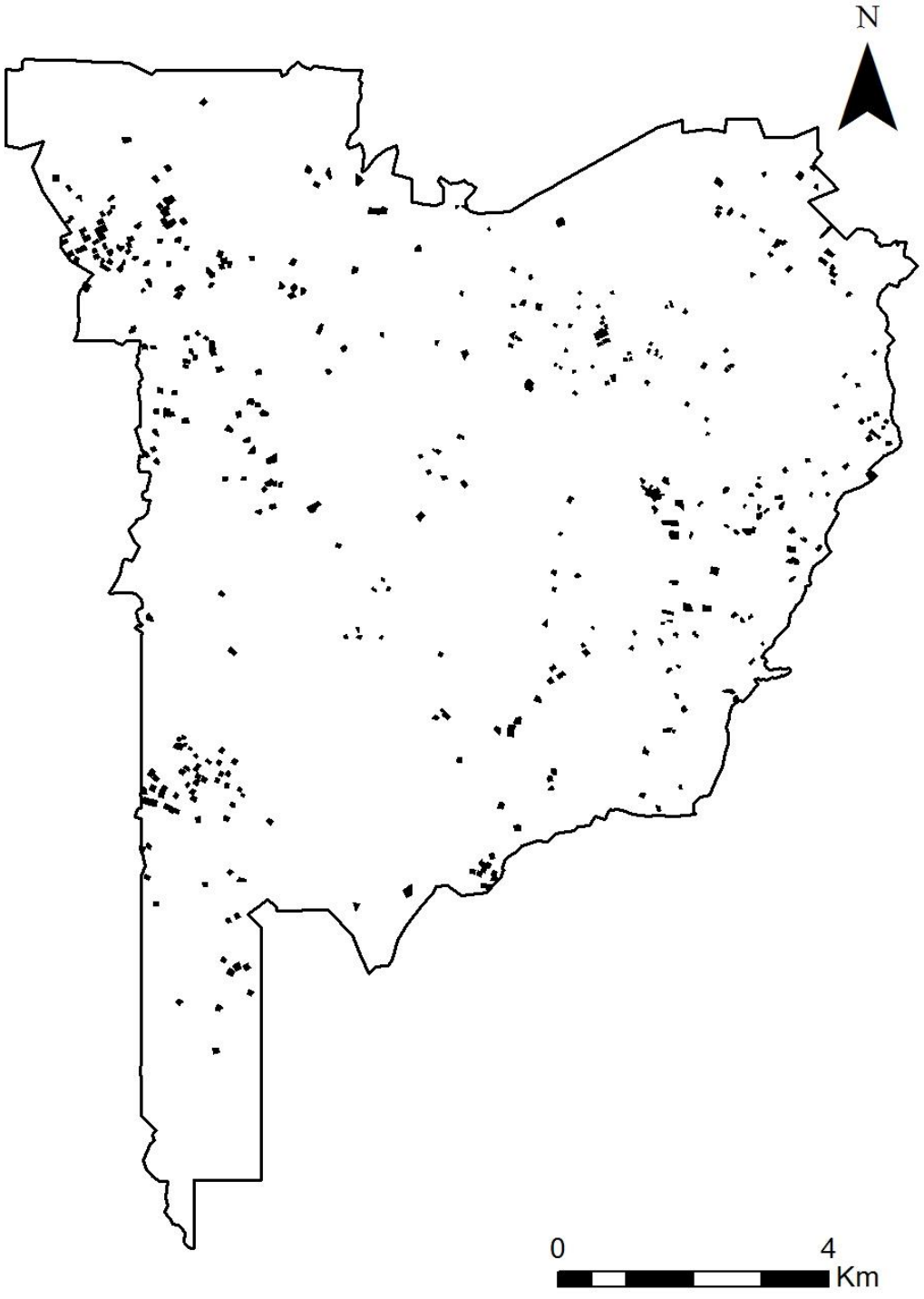

Figure 3.31 Colonial period settlement distribution

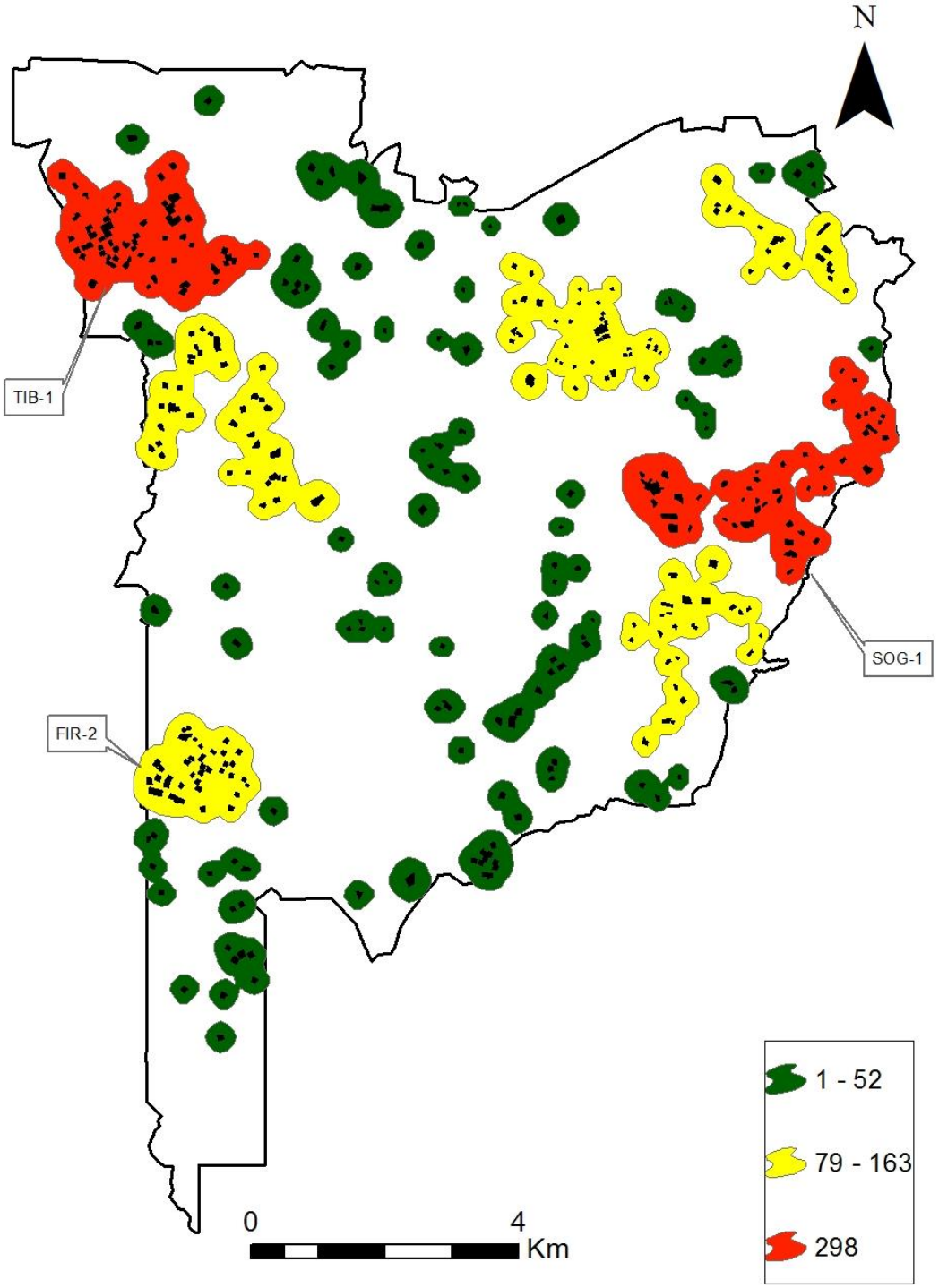

Figure 3.32 Colonial clouds of farmsteads (yellow and red) and disconnected areas with occupation (green) showing average population estimates

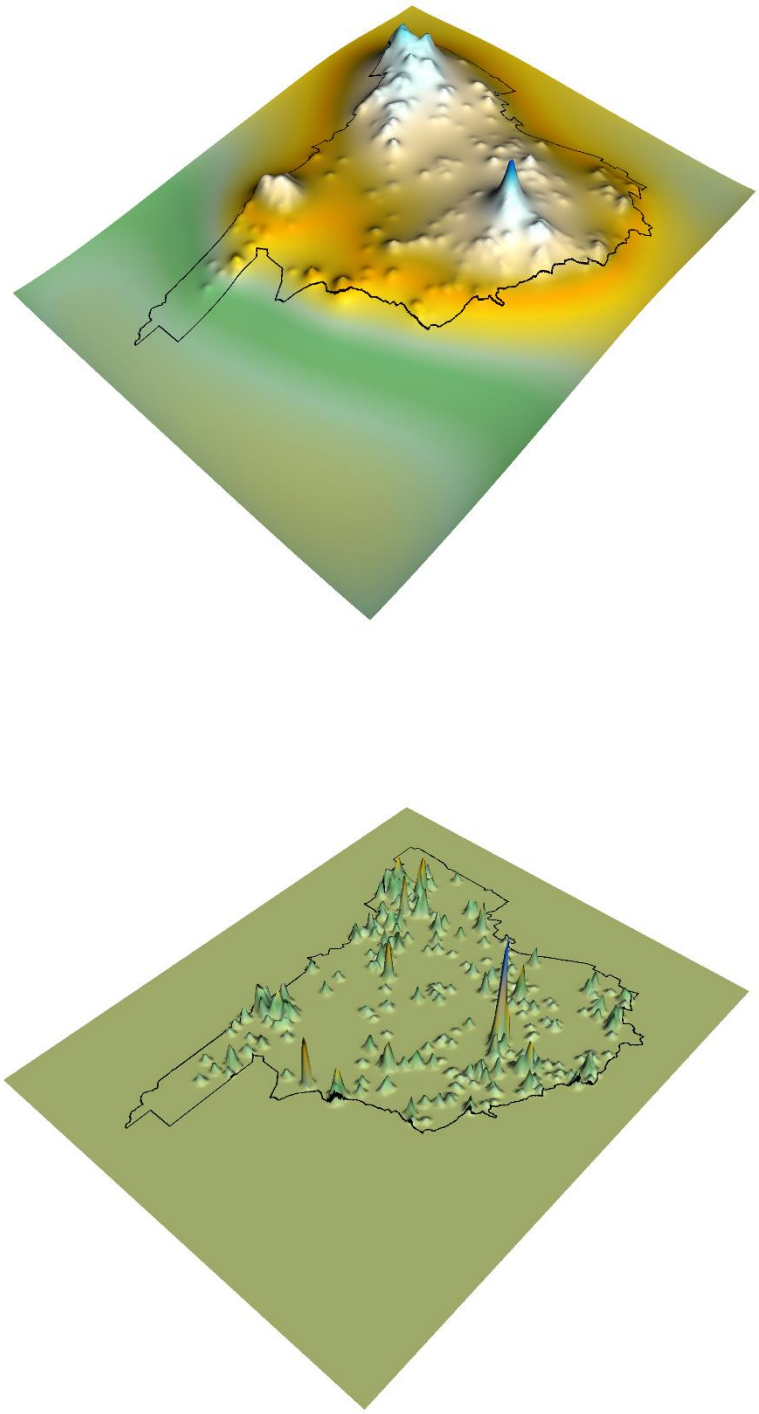

Figure 3.33 Smoothed and unsmoothed surfaces of human densities in the Colonial period

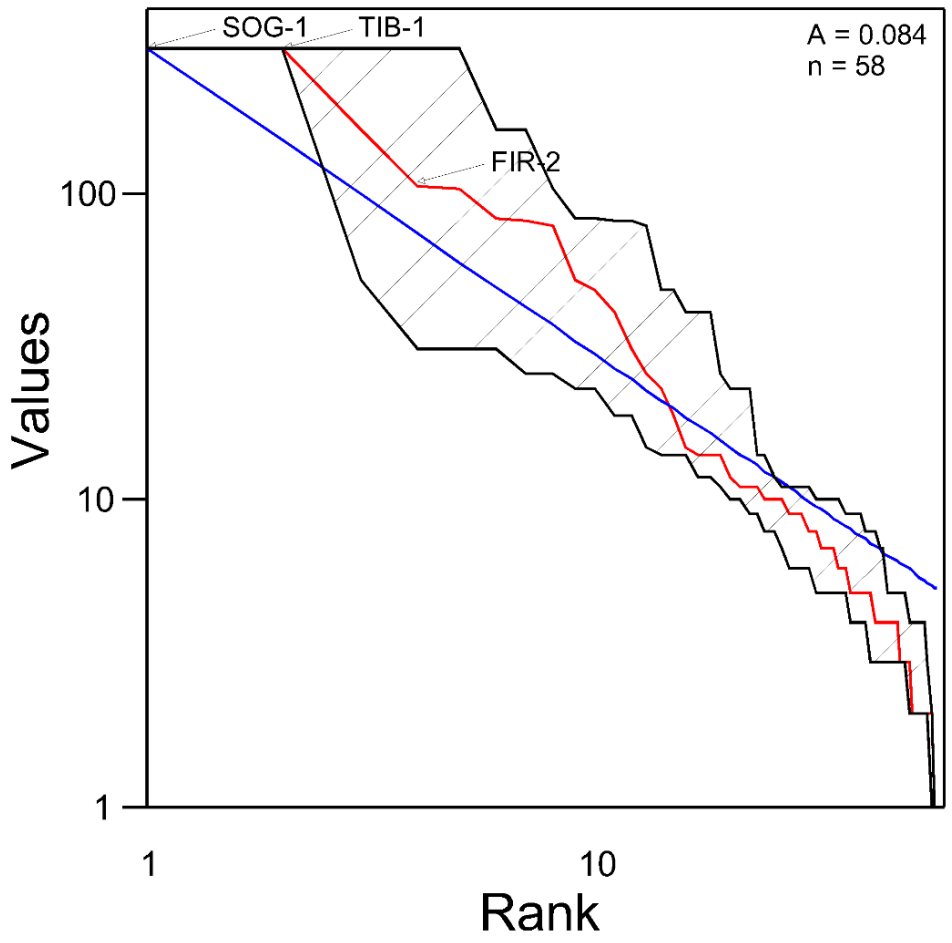

Figure 3.34 Rank size graph based on average population estimates of Colonial clouds of farmsteads and disconnected areas with occupation

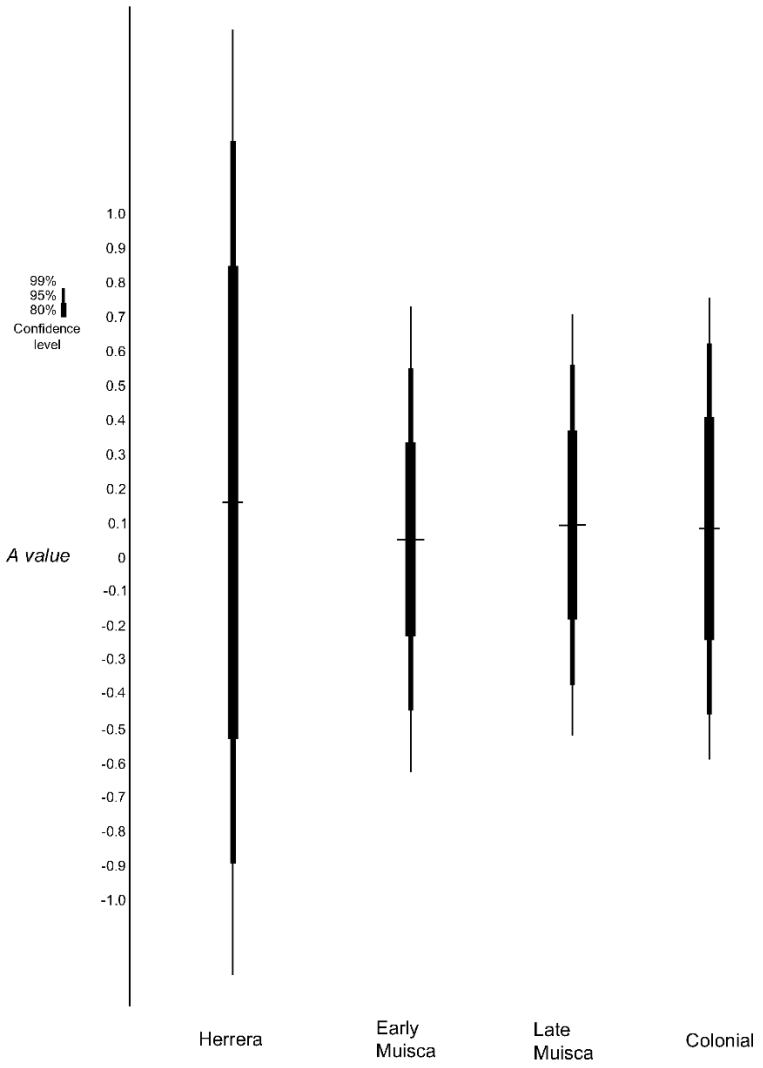

Figure 3.35 Comparison by bullet graphs of A Values for the prehispanic and Colonial periods in the sequence of the Sogamoso valley

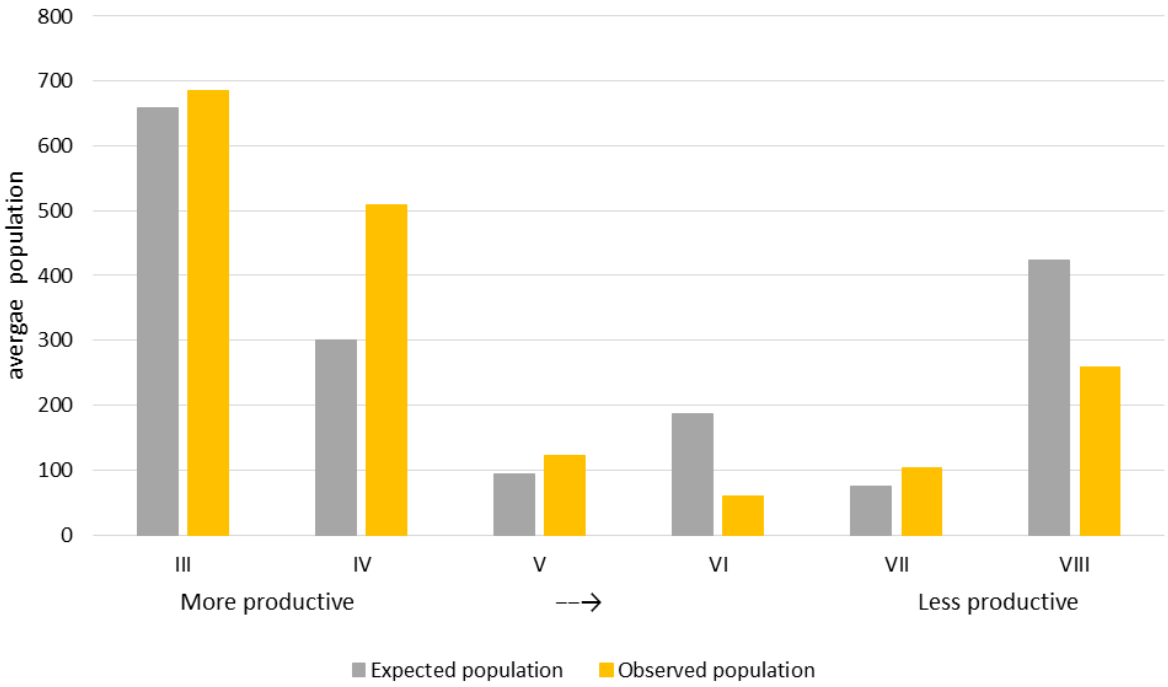

Figure 3.36 Expected versus observed Colonial population archaeological estimates given soil classes available inside the survey area

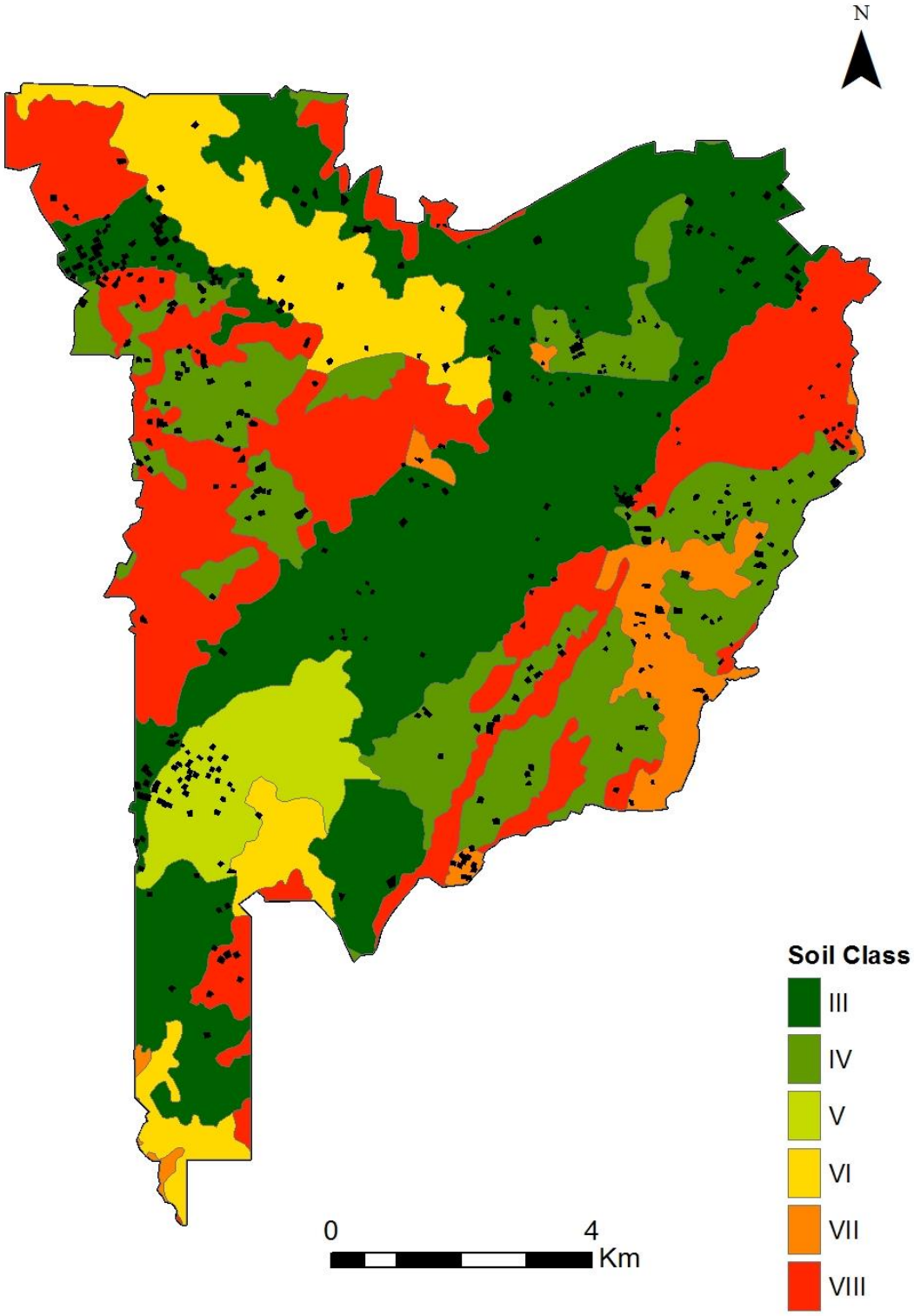

Figure 3.37 Colonial occupation and soils zones

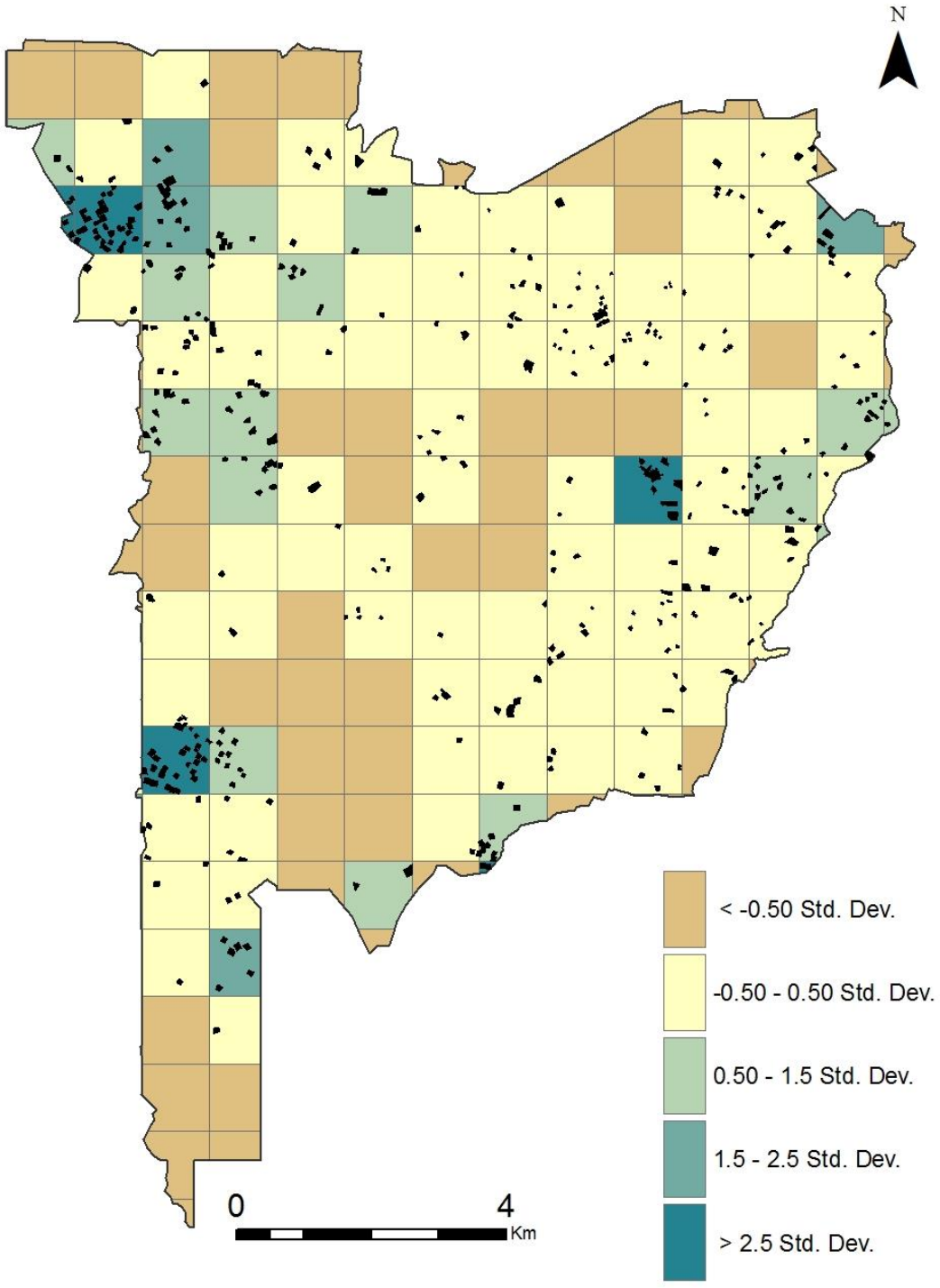

Figure 3.38 1 km^2 Grid squares showing standard deviations values from the mean of observed/expected ratios for Colonial average population archaeological estimates given the soil classes available in each square

Table 3.1 Population estimates Herrera period

Number of collection lots		*33*
Area of occupation Herrera period (ha)		19.5
Herrera period Regional population estimates	Minimum	100
	Average	148
	Maximum	197
Herrera period Regional population (average) density (people/km^2)		1.26

Table 3.2 Expected and observed Herrera population in each soil class given the overall average population estimates for the survey area

Soil Class	Area km^2	Percentage soil class	Expected population	Observed population
III	46.8	38%	56	41
IV	21.4	17%	26	20
V	6.7	5%	8	0
VI	13.2	11%	16	0
VII	5.3	4%	6	38
VIII	30.2	24%	36	49

Table 3.3 Observed number of Herrera decorated and non-decorated sherds from hamlets and farmsteads

	Non-decorated Herrera sherds	Decorated Herrera sherds	**total**
Hamlets	70	65	135
Farmsteads	25	12	37
TOTAL	**95**	**77**	**172**

Table 3.4 Population estimates Early Muisca period

Number of collection lots		*463*
Area of occupation Early Muisca period (ha)		224.98
Early Muisca period Regional population estimates	Minimum	1406
	Average	1986
	Maximum	2563
Early Muisca period Regional population (average) density (people/km^2)		16.9

Table 3.5 Occupied areas and percentage of change between the Herrera and Early Muisca periods in settlement pattern studies conducted in the Muisca area

	Occupied Hectares		Percent Increase
	Herrera	Early Muisca	
Sogamoso valley	19.54	224.98	1051%
Leiva valley (Langebaek 2001)	21.7	34.77	60%
Fúquene and Susa valleys (Langebaek 1995)	31.78	61.43	93%
Bogotá Savannah. Cota, Suba and Chia Section I (Boada 2006)	20	348.4	1642%
Bogotá Savannah. Cota, Suba and Chia Section II (Boada 2013)	13.65	90.85	566%
Bogotá Savannah. Funza Section (Boada 2013h)	87.4	343.6	293%

Table 3.6 Population estimates and regional densities for the Early Muisca period in settlement pattern studies conducted in the Muisca Area

	Population estimates Early Muisca period			*Net Survey*[1]	*Regional population density*
	Minimum	Average[2]	Maximum	(km^2)	People/km^2
Sogamoso valley	1406	1986	2563	117.3	16.9
Leiva valley (Langebaek 2001)	174	261	348	182.2	1.4
Fúquene and Susa valleys (Langebaek 1995)	845	982	1118	51.2	19.2
Bogotá Savannah Cota, Suba and Chia Section I (Boada 2006)	697	2068	3438	57.7	35.8
Bogotá Savannah Cota, Suba, Chía Section II (Boada 2013a)[3]	182	409	636	49.2	8.3
Bogotá Savannah Funza Section (Boada 2013h)[4]	1718	2577	3436	46.3	55.7

[1] Net survey represents the total survey area minus inside zones not cover due to urbanization, construction rubble and owners´ unwillingness to provide permits (Langebaek 1995:24 &90; Boada 2006:61, 2013a:13, 2013h: 49-51).

[2] Average population estimates are calculated based on the data provided in Langebaek (2001:70, 1995:92) and Boada (2006:75-76, Boada 2013h: 55). The procedure followed to calculate population estimates for Boada (2013a) is indicated in the next footnote.

[3] Population estimates are not provided. They were calculated using the same parameters for the minimum and preferred maximum included in Boada (2006: 75-76).

[4] The Early Muisca period in this article roughly represents the late Herrera period.

Table 3.7 Early Muisca observed values of non-decorated vs decorated sherds by estimated human densities

	Non-decorated sherds	decorated sherds	**Total Sherds**
Collection units with densities of 13 people/ha of higher	1569	123	1692
Collection units with densities of less than 13 people/ha	950	39	989
Total	2519	162	2681

Table 3.8 Early Muisca observed values of non-decorated vs decorated sherds by clouds of farmsteads and disconnected areas with occupation

	Non decorated sherds	decorated sherds	Total Sherds
Clouds of farmsteads with 70-360 estimated population	1287	103	1390
Clouds of farmsteads with 20-70 estimated population	863	50	913
disconnected areas with occupation with 1-20 estimated population	369	9	378
Total	2519	162	2681

Table 3.9 Occupied Areas and percentage of change between the Early Muisca and Late Muisca periods in settlement pattern studies conducted in the Muisca Area

	Occupied Hectares		Percent Increase
	Early Muisca	Late Muisca	
Sogamoso valley	224.98	185.8	-17%
Leiva valley (Langebaek 2001)	34.77	307.2	784%
Fúquene and Susa valleys (Langebaek 1995)	61.43	195.2	218%
Bogotá Savannah. Cota, Suba and Chia Section I (Boada 2006)	348.4	450.9	29%
Bogotá Savannah. Cota, Suba and Chia Section II (Boada 2013)	90.85	236.9	161%
Bogotá Savannah. Funza section (Boada 2013h)	343.6	420.7	22%

Table 3.10 Population Estimates Late Muisca Period

Number of collection lots		*374*
Area of occupation Late Muisca period (ha)		185.8
Late Muisca period Regional population estimates	Minimum	1062
	Average	1525
	Maximum	2007
Late Muisca period Regional population (average) density (people/km^2)		13

Table 3.11 Population estimates and regional densities for the Late Muisca period in settlement pattern studies conducted in the Muisca area

	Population estimates Late Muisca period			*Net Survey*	*Regional population density*
	Minimum	Average [5]	Maximum	(km^2)	People/km^2
Sogamoso valley	1062	1525	2007	117.3	13.0
Leiva valley (Langebaek 2001)	1536	2305	3073	182.2	12.6
Fúquene and Susa valleys (Langebaek 1995)	2948	3547	4146	51.2	69.2
Bogotá Savannah Cota, Suba and Chia Section I (Boada 2006)	902	2142	3381	57.7	37.1
Bogotá Savannah Cota, Suba, Chía Section II (Boada 2013a)[6]	474	1066	1658	49.2	21.7
Bogotá Savannah Funza Section (Boada 2013h)[7]	2104	3155	4207	46.3	68.1

[5] Average population estimates are calculated based on the data provided in Langebaek (2001:70, 1995:109) and Boada (2006:80-81, Boada 2013h: 57). The procedure followed to calculate population estimates for Boada (2013a) is indicated in the next footnote.

[6] Population estimates are not provided. They were calculated using the same parameters for the minimum and preferred maximum included in Boada (2006: 75-76).

[7] The Muisca period in this article roughly corresponds with the Late Muisca period.

Table 3.12 Late Muisca observed values of non-decorated vs decorated sherds by estimated human densities

	Non-decorated sherds	decorated sherds	**Total Sherds**
Collection units with densities of 13 people/ha of higher	223	13	236
Collection units with densities of less than 13 people/ha	978	72	1050
Total	1201	85	1286

Table 3.13 Late Muisca observed values of non-decorated vs decorated sherds by clouds of farmsteads and disconnected areas with occupation

	Non-decorated sherds	decorated sherds	**Total Sherds**
Cloud of farmsteads with 140-250 estimated population	419	34	453
Cloud of farmsteads with 45-100 estimated population	464	33	497
Disconnected areas with occupation with 1-30 estimated population	318	18	336
Total	1201	85	1286

Table 3.14 List of pueblos de indios of the corregimiento of Sogamoso in 1602 (extracted from Colmenares 1997:84-85)

Name
Sogamoso
Monquirá
Tirén
Tota
Guáquira
Bombaza
Toquecha
Moquecha
Iza
Cuítiva
Toquilla
Firavitoba
Monguí
Tutasá
Tibasosa
Nobsa
Chámeza

Table 3.15 Taxpayers counts in the pueblos de indios of Sogamoso, Tibasosa and Firavitoba 1560-1700

Encomienda	Year	Taxpayers	*Encomendero*	Historic Record	Reference	Comments
Tibasosa	1560	396	Miguel Holguín	Archivo Real Academia de la Historia (Madrid) *Relaciones Geográficas*, 4661, 14-IX.	Tovar (1988)	
Sogamoso	1560	1,000	de la real Corona	Archivo Real Academia de la Historia (Madrid) *Relaciones Geográficas*, 4661, 14-IX.	Tovar (1988)	
Firavitoba	1560	260	Juan Quincoces de Llana	Archivo Real Academia de la Historia (Madrid) *Relaciones Geográficas*, 4661, 14-IX.	Tovar (1988)	Originally wrote as Furabita
TIbasosa	1562	500	Miguel de Holguín	AGI,Sevilla,Justicia 649	Francis (2005)	It includes data from the *pueblo de indios* of Chámeza
Firavitoba	1562	400	Luis de Sanabria	AGI,Sevilla,Justicia 649	Francis (2005)	It includes data from the *pueblo de indios* of Cormechoque
Sogamoso	1562	800	de la real corona	AGI,Sevilla,Justicia 649	Francis (2005)	
Tibasosa	1571	467	.	AGI,Sevilla, Santafe 56a, N.17;AGN, Bogotá, Visitas de Boyacá, 30, exp. 11.	Francis (2005)	It includes data from the *pueblo de indios* of Chameza
Firavitoba	1571	415	Luis de Sanabria?	AGI,Sevilla, Santafe 56a, N.17;AGN, Bogotá, Visitas de Boyacá, 30, exp. 11.	Francis (2005)	

Table 3.15 (continued)

Encomienda	Year	Taxpayers	*Encomendero*	Historic Record	Reference	Comments
Sogamoso	1571	504	de la real corona	AGI,Sevilla, Santafe 166: AGN, Bogotá, Caciques e Indios, 70, nos. 11 y 19	Francis (2005)	
Tibasosa	1600	214	Diego Holguín Maldonado	AGI, Sevilla; Santafe18,R.A., No. 29	Francis (2005)	
Firavitoba	1600	229	Martin de Rojas	AGI, Sevilla; Santafe18,R.A., No. 29	Francis (2005)	
Sogamoso	1600	318	de la real Corona	AGI, Sevilla; Santafe18,R.A., No. 29	Francis (2005)	
Tibasosa	1634	100	Miguel de Holguín de Fig	AGN, Bogotá, Visitas de Boyacá, 11.	Francis (2005)	
Firavitoba	1634	148	Sebastián Velandia	AGN, Bogotá, Visitas de Boyacá, 11.	Francis (2005)	
Sogamoso	1634	294	de la real corona	AGN, Bogotá, Visitas de Boyacá, 11.	Francis (2005)	It includes data from the *pueblos de indios* of Moniquirá y Tiren
Tibasosa	1656	101	Luisa de Guebara	AGI,Contaduria, 1346A	N/A	
Firavitoba	1656	105	Martin de Rojas	AGI,Contaduria, 1346A	N/A	
Sogamoso	1656	257	de la real Corona	AGI,Contaduria, 1346A	N/A	
Tibasosa	1657	107	Luisa de Guebara	AGI,Contaduria, 1346A	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1657

Table 3.15 (continued)

Encomienda	Year	Taxpayers	*Encomendero*	Historic record	Reference	Comments
Firavitoba	1657	106	Martin de Rojas	AGI,Contaduria, 1346A	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1657
Sogamoso	1657	253	de la real Corona	AGI,Contaduria, 1346A	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1657
Tibasosa	1658	103	Luisa de Guebara	AGI,Contaduria, 1346A	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1658
Firavitoba	1658	109	Martin de Rojas	AGI,Contaduria, 1346A	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1658
Sogamoso	1658	256	de la real Corona	AGI,Contaduria, 1346A	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1658

Table 3.15 (continued)

Encomienda	Year	Taxpayers	*Encomendero*	Historic record	Reference	Comments
Tibasosa	1671	102	Luisa de Guebara	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1671
Firavitoba	1671	101	Martin de Rojas	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1671
Sogamoso	1671	187	de la real Corona	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1671
Tibasosa	1672	100	Luisa de Guebara	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1672
Firavitoba	1672	101	Martin de Rojas	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1672

Table 3.15 (continued)

Encomienda	Year	Taxpayers	*Encomendero*	Historic record	Reference	Comments
Sogamoso	1672	182	de la real Corona	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1672
Tibasosa	1673	100	Luisa de Guebara	AGI,Contaduria, 1553	N/A	
Firavitoba	1673	101	Martin de Rojas	AGI,Contaduria, 1553	N/A	
Sogamoso	1673	194	de la real Corona	AGI,Contaduria, 1553	N/A	
Tibasosa	1699	55	Conde de Escalante	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1699
Firavitoba	1699	66	Martin de Rojas	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1699
Sogamoso	1699	123	de la real Corona	AGI,Contaduria, 1553	N/A	Average from the data collected in June (San Juan) and December (Navidad) in the year 1699. It includes data from the *pueblos de indios* of Monquirá.

Table 3.15 (continued)

Encomienda	Year	Taxpayers	*Encomendero*	Historic record	Reference	Comments
Tibasosa	1700	55	Conde de Escalante	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1700
Firavitoba	1700	68	Martin de Rojas	AGI,Contaduria, 1553	N/A	average from the data collected in June (San Juan) and December (Navidad) in the year 1700
Sogamoso	1700	129	de la real Corona	AGI,Contaduria, 1553	N/A	Average from the data collected in June (San Juan) and December (Navidad) in the year 1700. It includes data from the *pueblos de indios* of Monquirá.

Table 3.16 Marriages in the pueblos de indios of Bombasa and Suta from Mingarro Arnandis (2004:97)

Pueblo de indios	year	Marriages					
		without children	1 child	2 children	3-4 children	5 children	6 children
Bombasa	1601	105	1	24	9	0	0
Suta	1636	7	8	17	10	1	1

Table 3.17 Population estimates Colonial period based on historic records for the pueblos de indios inside the survey the area

Number of years with observations		*13*
Number of Pueblos de indios (Sogamoso, Tibasosa and Firavitoba)		3
Colonial period population estimates based on in historic records	Minimum (2 individuals on average per taxpayer)	1401
	Average (3.5 individuals on average per taxpayer)	2452
	Maximum (5 individuals on average per taxpayer)	3502
Colonial period regional population (average) density (people/km^2)		21

Table 3.18 Population estimates Colonial period based on archaeological data within the survey area

Number of collection lots		*419*
Area of occupation Colonial period (ha)		210.7
Colonial period Regional population estimates	Minimum	1197
	Average	1732
	Maximum	2284
Colonial period Regional population (average) density (people/km^2)		14.7

Table 3.19 Occupied areas and percentage of change between the Late Muisca and Colonial period in settlement pattern studies conducted in the Muisca area

	Occupied Hectares		Percent Increase
	Late Muisca	Colonial	
Sogamoso valley	185.8	210.7	13%
Leiva valley (Langebaek 2001)	307.2	996	224%
Fúquene and Susa valleys (Langebaek 1995)	195.2	469.2	140%
Bogotá Savannah. Cota, Suba and Chia Section I (Boada 2006)	450.9	No data	--
Bogotá Savannah. Cota, Suba and Chia Section II (Boada 2013)	236.9	146.58	-38%
Bogotá Savannah. Funza Section (Boada 2013h)	420.7	No data	--

4 THE SOGAMOSO VALLEY IN THE EASTERN HIGHLANDS

The study was set up to explore whether economic and non-economic forces fostering social interaction produced similarities or dissimilarities in their social outcomes among pre-industrial societies. The Eastern Highlands of Colombia and its prehispanic and Colonial phases were used as the social contexts to discuss this issue; more specifically, this research documented the social trajectory developed in the Sogamoso valley with the aim of comparing its nature with other trajectories in the Colombian high plain. The first task required to approach this topic was to document the nature of community organization in the Sogamoso valley during prehispanic and Colonial times. Therefore, the study estimated the demographic scale of communities in the Sogamoso valley from the Herrera period to the Colonial period. The possibility of a settlement configuration arranged in local communities was also explored, and since it seemed that local communities existed in the social trajectory, questions like how many, how large, how nucleated could those local communities have been and how did these patterns change, from the beginning of the sedentary occupation until the Colonial times, were also answered. Because the prehispanic settlement pattern in the Sogamoso valley suggested the formation of supra-local communities, those same questions at the regional scale were examined. These analyses were required to compare how different forces driving human interaction produced different kinds of human communities and social outputs across the Eastern Highlands. Answers to what kind of centripetal forces were attracting large populations into supra local communities in the Sogamoso valley were also provided. The results found in the Sogamoso valley were compared against the characteristics of other local and supra-local communities documented by means of regional surveys across the Eastern Highlands. The degree of centralization, the magnitude of social formations, the degrees of inequality and the possible forces in charge of pulling people together in prehispanic times were compared between these regional studies. The objective of this

comparison was to assess whether those phenomena differed in important ways or whether they had a similar nature among the polities that emerged in the Muisca territory during prehispanic and Colonial times. This section provides some answers to each of the previous questions for the context of the Eastern Highlands.

4.1 THE DEMOGRAPHIC SCALE OF HUMAN COMMUNITIES

The Herrera period in the Sogamoso valley was characterized by very low human populations spatially organized in small hamlets, clusters of farmsteads and some few isolated farmsteads. The regional population on average during this period, was probably between 100 and 200 people (Table 3.1). The eastern slopes of the valley were preferred as settlement locations and each settlement was usually separated by at least 2 km from others. The demographic scale of the Herrera period is similar across the Eastern Highlands. In the Leiva valley Herrera population was estimated around 200 people (Langebaek 2001:70). This assessment is very similar to the population estimates calculated for the Sogamoso Valley. In the Fúquene and Susa valleys, Langebaek suggested that population in the Herrera period could range between 150 and 550 individuals (Langebaek 1995:76). Herrera population in Fúquene and Susa seemed somewhat bigger but not radically different from Herrera populations of the Sogamoso and Leiva valleys.

The magnitude of the Herrera populations in the Bogotá Savannah was significantly larger than in the northern valleys. In Section I of the Bogotá survey, Herrera population was estimated around 40-400 people (Boada 2006:70). Populations estimates for Section II were not provided but the occupied hectares and the number of sherds found there were very similar to the results

of the Section I (Boada 2013b:19-21). Therefore, population estimates for Section II could have been very similar to the calculations made for Section I. The Herrera population estimates for these two sections of the Bogotá survey did not differ radically from the calculations made for the Sogamoso, Leiva, Fúquene and Susa valleys. On the contrary, the Funza section Herrera period population estimate is between 400 and 900 people (Boada 2013a:54), which is considerably larger than any other population estimates based on settlement data calculated in the Eastern Highlands.

Together the three sections of the Bogotá survey covered an area similar to those surveyed in the Sogamoso and Leiva valleys and around three times the area of the Fúquene and Susa survey. The comparison of population estimates across the Eastern Highlands indicated that Herrera populations in the Bogotá Savannah were at least two times larger than those documented in the other areas of the Eastern Highlands. Cardale (1981a:154) has suggested that the area of Zipaquirá—also in the Bogotá Savannah—encompassed a large human population since the beginning of the sedentary sequence due to exploitation of salt springs. Although a systematic settlement pattern study has not been conducted around the location of the salt springs, settlement data for the Bogotá Savannah did not imply Herrera populations as large as those suggested by Cardale. The population there seemed larger than in any other part of the Eastern Highlands but the total Herrera population across the Eastern Highlands probably never surpassed the low thousands. If pottery, agriculture, salt production and sedentism were introduced during this very long archaeological period, then the settlement data collected put forward a scenario in which these technological and organizational innovations did not immediately imply strong changes in the size and organization of populations. Nor were they communicated and diffused within large populations.

The Early Muisca period marked a dramatic increase in regional population in the Sogamoso valley. Dispersed farmsteads and some nucleated areas represented an increment in occupation with a magnitude of more than ten times that documented during the previous period (Table 3.5). Human densities reached between 1500 and 2500 inhabitants and settlements were dispersed across the whole valley (Table 3.4). The floodplain, the gentle slopes and some of the mountain spurs were occupied or at least they showed evidence of human activities during this period. Scattered farmsteads were the most common settlement configuration, but some nucleated areas also occurred in this period.

Human populations increased dramatically in all regions in the Eastern Highlands but with different intensities. Early Muisca population in the Leiva valley was estimated around 170 to 350 people (Langebaek 2001:70). The basis to reach these estimates multiplied a figure of 5 to 10 people per hectare by the number of hectares with Early Muisca sherds identified in the Leiva valley. Although these population estimates did not strongly differ from the estimates calculated for the Herrera period in the Leiva valley, it seemed that in reality the population increased more than the estimates indicated. In the Leiva valley compared with the Herrera period, the numbers of sherds associated with the Early Muisca period indicated that human activities strongly increased. The number of Early Muisca sherds increased by 1420% with respect to the number of Herrera sherds (Langebaek 2001:50). This evidence indicated that in the Leiva valley there was considerable population growth between the Herrera and Early Muisca periods. This increment was not represented in the total occupied area but rather in the human densities of the two nucleated settlements that emerged in the valley: *Suta* and *El Infiernito*. In the Fúquene and Susa valleys, the number of sherds associated with the Early Muisca period increased as well. In this case the total occupation doubles to about 61 ha with a mixed settlement pattern of small hamlets in easily defendable areas and some dispersed and very small settlements (Langebaek

1995:90-93). The Fúquene, Susa and Leiva valleys showed significant population growth but less than that in the Sogamoso valley.

The prehispanic settlement data for the Bogotá Savannah showed a slightly stronger population growth than the one documented in the Sogamoso valley. Section I of the Bogotá survey probably had roughly between 700 and 3500 inhabitants (Table 3.6), representing an increment of about 8 times compared with Herrera population estimates. In Section II of the Bogotá survey the pattern was similar to what occurred in the Leiva, Fúquene and Susa valleys. Occupied areas did not increase as much as in Section I (Table 3.5), but Early Muisca sherds increased by 1274% with respect to the number of Herrera sherds (Boada 2013b:21-24). Early Muisca people in Section I also preferred to live closer to each other, more than in the Fúquene and Susa valleys but less than in the Sogamoso and Leiva valleys. In the Funza section, Early Muisca populations increased as much as in Section I and could encompass 1700 to 3500 inhabitants (Table 3.6).

Section I and the Funza section of the Bogotá survey probably had the largest and densest population in the Eastern Highlands during the Early Muisca period. Population growth between the Herrera and Early Muisca period was similar in the Bogotá Savannah and the Sogamoso valley but because in the Bogotá Savannah the initial Herrera population was larger, this resulted also in a larger population. Although the net survey areas of sections I and II of the Bogotá survey are the smallest from all the settlement pattern studies conducted in the Muisca area, the total number of Early Muisca sherds found was at least two times larger than in any other survey (Boada 2006:72; 2013a:54; 2013b:23; Langebaek 1995:92; 2001:50; APPENDIX). The other regions surveyed, including Section II of the Bogotá survey and the Sogamoso valley, showed population growth but at the same time suggested smaller populations. Section II is the

northernmost section of the Bogotá survey. This evidence is consistent with a scenario in which during the Early Muisca period the northern part of the Eastern Highlands, including the north of the Bogotá Savannah, in terms of demographic growth, was a peripheral zone. The core of the demographic explosion documented across the Eastern Highlands during the Early Muisca period was probably located in the south of the Bogotá Savannah. Nevertheless, it is still possible that areas such as those located near the salt springs (e.g. Zipaquirá) or the area near Tunja could have sheltered a sizable population during the Early Muisca period; further study is needed to address this possibility.

During the Late Muisca period, regional estimates suggest a slight reduction in the overall population in the Sogamoso valley, which now showed population estimates between 1000 and 3000 people. Occupation continued as a mixed settlement system consisting of a few nucleated areas and a larger number of dispersed farmsteads distributed across the different landscape settings within the survey limits. When compared with the Early Muisca period, the percentage of dispersed population probably increased. The stratigraphic excavations highlighted the possibility that the occupied area during this period was underestimated because Coarse Caramel ware, which is more strongly related to the Early Muisca period, could have also been used during the Late Muisca period. For this reason, a possible underestimation range of Late Muisca occupation was calculated (section 2.3.1.2). The decrease in regional population during the Late Muisca period falls into the underestimation range calculated. This suggests that the changes in population documented between the Early Muisca and Late Muisca period could have just been a by-product of the nature of the archaeological record in the Sogamoso valley. If true, this indicates that populations during the Late Muisca period might have been very similar to those documented for the Early Muisca and Colonial periods. Regardless of the possible underestimation of population for the Late Muisca period, the three last periods of the sedentary

sequence documented using archaeological materials (the Early Muisca, Late Muisca and Colonial periods) had very similar population estimates, usually in the low thousands (Tables 3.4, 3.10, 3.17 and 3.18). Therefore, the general population trend of the social sequence in the Sogamoso valley could be showing that populations increased dramatically during the Early Muisca period but then they probably increased more and more slowly or even stagnated.

Late Muisca populations in other regions of the Eastern Highlands probably increased their numbers scaling their sizes to 1500-4000 inhabitants within each of the survey areas (Table 3.11). The demographic scenario suggested by the population estimates divides the north and the south of the Eastern Highlands. On one hand, the Sogamoso and Leiva valley probably had similar population estimates during the Late Muisca period. The Leiva valley seemed to have a population roughly between 1500 and 3000 inhabitants (Langebaek 2001:70), while in the Sogamoso valley population estimates were calculated between 1000 and 2000 people (Table 3.10). On the other hand, the surveys in the Bogotá Savannah and the survey conducted in Fúquene and Susa valleys suggested regional populations higher than in the north (Table 3.11). It is possible that this pattern was produced because the area of Tunja—which was probably the largest center in the north during the Conquest—has not been documented at the regional scale. On the contrary, the Bogotá survey did include the most probable locations for at least a part of the large polity found by the Spaniards in the Bogotá Savannah. In both scenarios, Late Muisca populations in the Sogamoso and Leiva valleys seemed, demographically speaking, peripheral and less significant than expected based on ethnohistoric accounts, and the archaeological evidence found SOG-A and *El Infiernito* the two local communities that functioned as cores attracting human populations in these valleys. The Sogamoso and Leiva valleys probably had a small demographic scale but they showed spatial and organizational patterns usually expected in larger populations not only during the Late Muisca period but also during the Early Muisca period.

Population estimates for the Colonial period in the Sogamoso valley were calculated in two different ways. First, Colonial accounts were used to create estimates based on the historic records. Then, the distribution and density of ceramic ware associated with the Colonial period provided population estimates based on archaeological data. Colonial documents suggested an average population between 1500 and 3500 people inside the survey area (Tables 3.17). Archaeological data indicated slightly lower population estimates with a maximum around 2000 inhabitants inside the survey limits (Table 3.18). Archaeological estimates for the Colonial period overlapped with the lower range of population estimates resulting from historic records. Considering all the sources of possible bias in both datasets, the demographic stories told by these two different lines of evidence had a considerable level of agreement. Both historic and archaeological data provided other valuable information. On the one hand, historic accounts provided evidence about the changes and the roles of communities in the Sogamoso valley for the Colonial period. First, the demographic catastrophe created by contagious diseases, together with the severe punishments inflicted by Colonial administrators on the local population and the disruption of indigenous social networks by relocation of population occurred at a rate fast enough that it could only be spotted at the resolution provided by Colonial accounts. Second, Colonial accounts suggested that Sogamoso was the political and economic center of a large Colonial province whose territory extended toward the eastern flank of the Highlands, outside of the survey limits. This, in addition to the fact that Sogamoso was one of the few *pueblos de indios* in the Eastern Highlands without an *encomienda* and directly assigned to the Spanish crown suggested that Sogamoso had an important role in the Colonial structure at the macro-regional level and this position was probably inherited from the role it played in prehispanic times. Nevertheless this importance was not expressed in higher demographic estimates nor was it an important economic center.

The Colonial demographics of the Sogamoso valley and the rest of the Eastern Highlands showed significant variation. In the Fúquene and Susa valleys population estimates indicated between 2000 and 5000 inhabitants (Langebaek 1995:141). Colonial population estimates were even higher for the Leiva valley, reaching the several thousands (Langebaek 2001:69). In the Bogotá survey the Colonial population estimates for Section II indicate a population reduction during the Colonial period based on a decrease of occupied area (Boada 2013b:28). The other two sections of the Bogotá survey did not report Colonial demographic information based on archaeological data. The settlement data available for the Colonial period suggests that the new Colonial structure had different demographic effects in the regions of the Eastern Highlands, being especially disruptive in the Bogotá Savannah where a larger prehispanic population experienced the first contacts with the European pioneers.

4.2 THE CHARACTERISTICS OF LOCAL COMMUNITIES

Through the archaeological sequence of the Sogamoso valley, local population lived in a settlement configuration mixing a few nucleated settlements with a large number of dispersed farmsteads. Population seemed to be spatially organized at the local level in a very few local communities as well as in clouds of farmsteads spread over the landscape.

At the beginning of the sedentary occupation, during the Herrera period, local groups never surpassed 50 inhabitants but they showed some degree of nucleation. Three local communities were found inside the survey area (SOG-B, FIR-A and FIR-B) these local communities have

population estimates between 15 and 30 inhabitants and occupied 3 to 4 ha. These three very small hamlets and two clusters of farmsteads, covering some 4 ha each, showed evidence of the beginning of intensive inter-household interaction. Dispersed farmsteads in isolation also occurred and their patterns of interaction with other households were probably less intensive. In the south of the survey area a very small hamlet (FIR-A) with a few dispersed farmsteads gravitating around its periphery but together with its dispersed farmsteads, it averaged a population between 30 and 60 inhabitants during the whole Herrera period. Local interaction during the Herrera period in the Sogamoso valley was characterized by very small groups of households separated by large areas of unoccupied territory. The dispersed farmsteads around FIR-A could suggest that incipient attempts at centralization were conducted in some of the very small hamlets.

The nature of Herrera local communities documented in the Sogamoso valley exhibited characteristics present in other regions of the Eastern Highlands. In the Leiva valley, however, Herrera local communities did not emerge in the landscape. Hamlets or other types of local communities showing characteristics of central places were not reported. Herrera population occupied very small dispersed settlements more likely representing farmsteads (Langebaek 2001:48). On the contrary, local communities emerged in the Fúquene and Susa valley during the Herrera period. VF 494, VF 718 and VF 724 with settlement sizes ranging between 3 and 6 ha represented these local groups (Langebaek 1995:75). Using both Langebaek´s population proxies, each of these local communities probably sheltered between 15 and 70 inhabitants, nevertheless, around 63% of the Herrera settlements in the Fúquene and Susa valleys were probably small dispersed farmsteads (Langebaek 1995:77). This mixed configuration is very similar to the patterns documented in the Sogamoso valley, except that instead of only one local community attracting some dispersed farmsteads, two small hamlets, VF 718 and VF 494 had

some very few dispersed farmsteads gravitating near them (Langebaek 1995 Figure 4.2). In the Fúquene and Susa valleys some degree of centralization could have occurred along with some kind of competition between nucleated settlements.

The Bogotá survey documented patterns similar to those of the northern areas, except that Herrera local communities showed two hierarchical levels. Section I showed extremely dispersed settlements, most of them occupying less than 1 ha. Although the presence of small nucleated hamlets occupying areas of some 1.5 ha was suggested (Boada 2006:63-65), these areas are very small and not extremely different from dispersed farmsteads. Section II showed a Herrera settlement pattern mixing dispersed farmsteads and two small hamlets. Boada did not report how big these hamlets were nor how many people could have lived there but the settlement distribution map of this period suggests that these hamlets did not differ in important ways from the Herrera hamlets found in the Sogamoso, Fúquene and Susa valleys (2013b:21, Figure 12). Conversely, in the Funza section, Boada identified small household clusters that probably represented the remains left by local communities. These household clusters were located close to each other, separated by distances of 200 to 1200 m. *El Cacique* was the largest one of these clusters and it was probably around 12 ha with a population estimated between 60 and 120 inhabitants (Boada 2013a:51). Based on its size and estimated population one could argue that *El Cacique* represented a higher and unique level of local community not only in the Funza section but also across the Eastern Highlands. The second tier was formed by the other household clusters and hamlets found in Funza and Section II of the Bogotá survey, which probably were very similar to the Herrera local communities identified in the Sogamoso, Fúquene and Susa valleys (Boada 2013a:Figure 3.2). *El Cacique* was probably larger and more densely populated that the local community attracting dispersed population in the Sogamoso valley (FIR-A) but there was one similarity in their nature. *El Cacique* and FIR-A attracted not only dispersed population but also

other local communities. In the case of *El Cacique* at least three local communities with occupied areas similar to those documented in the Sogamoso valley were located less than 1 km away (Boada 2013a:Figure 3.2). FIRA-A had only one other local community (FIR-B) located roughly 1 km from it (Figure 3.2). If in the region near the Bogotá Savannah Herrera occupation started as early as 800 ± 100 BC or 500 ± 200 BC (Cardale de Schrimpff 1981b; Peña 1991), then it could be possible that Herrera occupation started later in the Sogamoso valley with population detached from the Bogotá Savannah and because this, Herrera population in the Sogamoso valley resembled the patterns documented in the Funza section.

Local communities in the Sogamoso valley during the Early Muisca period increased their numbers but they differed in their nature. Six local communities were established in the Early Muisca period and only the local community of SOG-A showed the capacity for attracting considerable dispersed population toward it. SOG-A apparently emerged from one of the small clusters of households created during the Herrera period. SOG-A was the largest and densest local community and it could have encompassed at least some 13 ha of continuous occupation and probably had between 100 and 200 inhabitants. An additional level of local interaction occurred in the Sogamoso valley. Clouds of settlements loosely defined by natural features existed in the Sogamoso valley. They varied considerably but the largest had average population estimates above 100 inhabitants and, although with less potential than the local community of Sogamoso, some of them attracted populations at the regional scale. FIR-1 and FIR-2 in the south and TIB-1 and TIB-2 in the northwest represented these clouds of farmsteads that attracted population. These areas lacked a core local community. FIR-2 seemed to have been loosely rooted in the social structure created by the largest local community during the Herrera period, but it did not exactly correspond with its location. TIB-1 and TIB-2 were loosely located on the best conditions for agriculture in the valley. Very small areas disconnected from the clouds of

settlements appeared dispersed in isolation over the landscape. These areas, mostly on the floodplain soils, acted as settlements in zones almost unoccupied between the clouds of farmsteads. For this reason, rather than dwellings, they could represent temporary activity areas of some households with plots far from their permanent residences.

Local communities during the Early Muisca period also emerged in other parts of the Eastern Highlands. In the Leiva valley two settlements (*Suta* and *El Infiernito*) were concentrated in 1 km^2 each and aggregated almost all the population during the Early Muisca period. One part of these settlements resembled the characteristics of the local communities identified in other parts of the Eastern Highlands. In *Suta* and *El Infiernito*, local communities were probably represented by the densest and nucleated areas with human occupation, which covered some 5 ha (Langebaek 2001:50). Population estimates for these possible local communities were not provided, but the population of the complete settlement of *El Infiernito* has been estimated between 50 and 200 people (Langebaek 2001:53). Population estimates for *El Infiernito* seem low when compared with the local community of SOG-A and its cloud of dispersed farmsteads. The local community of SOG-A by itself showed similar population estimates, not for the most dense and continuous occupied area but for the complete settlement of *El Infiernito*. When the cloud of farmsteads associated with SOG-A was included in the estimation (between 250 and 450 people), it seems twice as big as the complete settlement of *El Infiernito*. SOG-A had more occupied area and probably more human population than the local community inside *El Infiernito* and *El Infiernito* as a whole settlement, nevertheless, the demographic scale of both places is still one of the lowest documented for central places of early complex societies.

Early Muisca local communities also emerged in the Fúquene and Susa valleys. The local communities identified during the Herrera period (VF 718, VF 494 and VF 724) continued during the Early Muisca period with the same occupied areas, except for VF 718 which decreased from around 5 to 3 ha (Langebaek 1995:93). Two more local communities emerged during the Early Muisca period in easy defendable areas. VF 320 appeared on the hill top of *Cerro Chinzaque* with a contiguous area of some 3 ha with several small settlements gravitating around. Including the small lots gravitating and VF 320 the total occupation in *Cerro Chinzaque* could have been up to 8 ha. The other local community (VF 365) appeared in Netecupa Island with an occupied area of some 3 ha (Langebaek 1995:93). Population estimates for these two areas are not provided but using the population estimates proposed by Langebaek (1995) VF 320 and VF 365 could have had on average between 15 and 30 inhabitants. Considering these population estimates, local communities in the Fúquene and Susa valleys had around one fourth less demographic weight than the local communities of the Sogamoso and Leiva valleys.

Local communities emerged during the Early Muisca period in the Bogotá Savannah but some of them were larger and denser than any other local group identified in the Eastern Highlands. Sections I and II suggested the presence of household clusters with dispersed population gravitating around them but neither occupied areas nor population estimates for these household clusters were reported (Boada 2006, 2013b). Although large parts of the survey areas of sections I and II are obscured due to the presence of modern buildings, the figures showing the Early Muisca settlement distribution in both sections implies continuous areas that could be labeled as local communities separated from each other by at least 1 or 2 km (Boada 2006: Figure 12; 2013b:Figure 13). Based on these two figures, these continuous areas of occupation give the impression of being similar in size to the local communities identified in the Sogamoso valley, which ranged from 3 to 13 ha. Meanwhile, in the Funza section, Boada indicated that Herrera

settlements grew in size and density during the Early Muisca period and new ones were founded in the center of the survey region along a swamp (Boada 2013a:13). *El Cacique* continued in the same place and showed slight growth in occupation but it was not the largest local community during the Early Muisca period. *El Hato* and *La Ramada* formed two large nucleated occupied areas, separated by a swamp 200 m wide (Boada 2013a:55). The exact occupied area and the population estimates for *El Hato* and *La Ramada* were not reported, nevertheless, the figure showing the settlement distribution suggested that each area could have had around 70 ha of continuous occupation (Boada 2013a: Figure 3.3). The characteristics of *El Hato* and *La Ramada* indicated that these two settlements were by far the largest local communities identified in the Eastern Highlands during the Early Muisca period. One more characteristic of the Early Muisca local communities in the Funza section is worth mentioning. Although *El Cacique*—founded during the previous period—probably continued to be an elite location, *El Hato* and *La Ramada* represented clusters with more wealth and clearly had larger occupied areas (Boada 2013a:57). A similar shift was documented in the Sogamoso valley. FIR-A continued as a local community during the Early Muisca period, however it was not the largest and densest Early Muisca local community. SOG-A emerged during the Early Muisca period some 10 km northeast of FIR-A´s location and it showed around three times the occupied area and the estimated population of FIR-A during the Early Muisca period. The evidence across the Eastern Highlands is consistent with a scenario in which central places during the Early Muisca period emerged, not necessarily on top of the densest Herrera settlements.

Local communities during the Late Muisca period in the Sogamoso valley were reduced in numbers. SOG-A continued as the only local community attracting dispersed population toward it. Although it is difficult to estimate the size and population of SOG-A because some part of it could be covered by modern constructions, this local community showed population estimates

between 100 and 160 inhabitants in an area of about 12 ha. There was only one more local community (SOG-B) located in the northeast but it appeared rather isolated. The number of clouds of farmsteads was reduced as well. The clouds of farmsteads near the modern Firavitoba (FIR-1 and FIR-2) and Tibasosa (TIB-1 and TIB-2) continued attracting population at the regional scale. Smaller groups of dispersed settlements clustered around these core areas, but the number of these groups also seems smaller. FIR-2 reduced its size from between 200 and 400 during the Early Muisca period to around 100 to 200 during Late Muisca. Moreover, FIR-2 was less surrounded by other local communities. TIB-1 and SOG-1 were roughly similar in size and human density, each showing population estimates between 150 and 300 inhabitants, but SOG-1 continued to be more centralized around the local community of SOG-A. Areas representing the activities of very small households dispersed in isolation over the landscape increased in number. These areas continued occupying the floodplain over those zones with very little population.

Late Muisca local communities in the Leiva valley were bigger in area than those identified during the Early Muisca period and they also increased in numbers of inhabitants. Instead of only two, there were probably five local communities in different parts of the survey area (Langebaek 2001:55). Langebaek reported that some of these local groups were hamlets of about 10 ha (Langebaek 2001:55). Unlike during the Early Muisca period when only two nucleated communities agglutinated the total population, during the Late Muisca period several dispersed farmsteads emerged. In the Fúquene and Susa valleys, the largest Early Muisca local community VF 494 showed during the Late Muisca period about the same size (3-6 ha) while VF 718 increased in size from around 3 to 6 ha. The largest concentration of occupation in this period occurred in *Cerro Chinzaque* (Langebaek 1995:107-109). Although they were not reported, population estimates were probably in the low hundreds in each local community.

The local communities during the Late Muisca period in the Bogotá Savannah were established in the same places where Early Muisca communities were located but some of them increased their sizes. Although comparisons are challenging because occupied areas and population estimates for each local group were not provided, it seems that all local communities founded in Early Muisca times increased their sizes in sections I and II (Boada 2006: Figure 12, Figure 13; 2013b:Figure 13, Figure 14). Although the existence of large areas covered by modern buildings made it difficult to estimate the population, the same increase documented among local communities in sections I and II also occurred in the settlements in the Funza section (Boada 2013a:59).

The patterns identified are consistent with a scenario in which Late Muisca local communities emerged in the same places where Early Muisca local communities were established across the Eastern Highlands. Late Muisca communities usually increased their size or maintained similar occupied areas and population estimates to those of the Early Muisca period. Nevertheless local communities in the Sogamoso and Leiva valleys were not strongly attracting population while those located in the Bogotá and to some extent in the Fúquene and Susa valleys were attracting people to live very close to each other in nucleated settlements. Local communities were not necessarily central places; some of the local communities identified during the Late Muisca period did not attract population towards them while others in fact did. SOG-A in the Sogamoso valley, and *La Ramada* and *El Hato* in the Bogotá Savannah were the three local communities that attracted the most population.

Archaeological data indicate that the mixed settlement system that combined some a nucleated areas with a larger number of dispersed farmsteads continued during the Colonial period in the

Sogamoso valley. Local communities did not clearly appear in the archaeological record. Despite the fact that Colonial towns were religious and economic centers, the indigenous population preferred to avoid them for permanent dwellings because of the control policies implemented by the Colonial administration. The Colonial period did not interrupt the nature of the changes in local interaction initiated during the Late Muisca period among local communities within the Sogamoso valley. During this period, local communities also seemed less important, at least in terms of their power to attract permanent residents. Historic records and the settlement data suggest that Colonial towns were nodes of temporary interaction. Clouds of dispersed farmsteads continued in the archaeological record but they seem larger and less numerous than in the previous period. The largest clouds of farmsteads continued in the east (SOG-1), the northwest (TIB-1) and to some extent in the south (FIR-2). The local community of SOG-A appears less clear in the archaeological record but its cloud of farmsteads is still evident. Sogamoso and Tibasosa formed a continuum of occupation in the north of the survey area without easily distinguished limits at the regional scale. Firavitoba looked like an isolated cluster smaller than Tibasosa and Sogamoso, probably indicating that most of the interaction of its inhabitants was driven at the local scale. The very small areas that represented activities of isolated households in zones without dense occupation continued during the Colonial period. They mostly occupied the north of the survey area and they were usually located on the floodplain. These occupied areas were also registered on the slopes of the valley, especially on the limits between the gentle slopes and the floodplain.

The local communities in the Sogamoso valley during the Colonial period showed characteristics similar to other local communities archaeologically documented in the Eastern Highlands. Clear local communities were hard to identify in the Colonial material in the Leiva, Fúquene and Susa valleys (Langebaek 2001:57). It seemed than in the northern region, Colonial population preferred to live dispersed over the landscape, even more than during the prehispanic sequence. This

evidence suggested that the Colonial policies failed to nucleate the local populations in the north part of the Eastern Highlands. The Colonial context of the Bogotá Savannah suggested that Colonial policies developed to nucleate local populations were slightly more effective in this area than in other parts of the Eastern Highlands. Although only Section II of the Bogotá survey reported the archaeological findings associated with the Colonial period, the settlement distribution suggested a decrease in occupied area and Colonial settlements slightly more nucleated but in the same places where the Late Muisca settlements were located (Boada 2013b).

4.3 THE CHARACTERISTICS OF SUPRA-LOCAL COMMUNITIES

Supra-local communities in the Sogamoso valley could not be identified in the archaeological record of the Herrera period. Hamlets, clusters of farmsteads and a few isolated farmsteads existed but the size of their populations and their distribution over the landscape can hardly be labeled as evidence of supra-local organization. The largest agglomeration of settlements (FIB-1) was located in the south end of the survey area. It was probably the remains left by a small hamlet and some farmsteads gravitating around it with an added population than on average never reached more than 50 inhabitants. Although smaller settlements existed inside the survey limits the differences between them and the community in the south were negligible. The occupied area of each hamlet and cluster of farmsteads were separated from each other by at least 2 km and they did not cover more than 3 ha.

The dispersed pattern was stronger in the Leiva valley than in the Sogamoso valley during the Herrera period. The largest settlement was only about 2.1 ha and most of the collection lots were

around 1 ha. Areas that could be associated with local communities such as hamlets or villages were not found, nor were other settlement patterns that could be associated with the formation of supra-local communities (Langebaek 2001:48-49). Although in the Fúquene and Susa valleys Herrera settlements showed small isolated farmsteads and small hamlets (Langebaek 1995: Figure 4.5), there were very few indicators that these valleys were integrated at the supra-local level. As in the Sogamoso valley, small hamlets and dispersed farmsteads were not extremely different in terms of size and population density (see section 4.2). On the contrary, if the three sections of the Bogotá survey area are considered as a whole, then it is possible to suggest the existence of a supra-local community centered in the local community of *El Cacique* in the north of the Funza section (Boada 2013a). The demographic scale of this supra-local community—documented by the three sections of the Bogotá survey—could have ranged between 500 and 1500 inhabitants during the Herrera period (Boada 2006:68-71; 2013a:51; 2013b:21)

The Early Muisca period witnessed the rise of supra-local communities in the Sogamoso valley. Three supra-local communities—Sogamoso, Firavitoba and Tibasosa—emerged during this period. Sogamoso gravitated around the local community of SOG-A while Firavitoba and Tibasosa did around two cloud communities: FIRA-2 and TIB-1, respectively. The largest supra-local community was the one centered in SOG-A, in the eastern flank of the survey area. This supra-local community could have included on average 500 to 1000 inhabitants and it was clearly centered in the local community around the local museum of Sogamoso. The supra-local community of Firavitoba in the south was centered in a cloud of farmsteads of FIR-2. This regional entity was probably half the size (between 300 and 550 people) of Sogamoso´s supra-local community but it also showed some degree of nucleation. The last supra-local community was located in the northwestern zone of the survey area, roughly over the territory of the municipality of Tibasosa. This supra-local community probably had on average 300 to 600 people during the

Early Muisca period and it was basically characterized by a continuous group of dispersed farmsteads. Despite the clear structuration of supra-local communities during this period, there were several dispersed areas with occupation and some small hamlets in between these three supra-local communities. Most of the dispersed areas without association with any supra-local community were located in the floodplain of the valley. These small areas probably represented zones where isolated farmsteads conducted agricultural activities with some degree of intensity but without permanent occupation. The small hamlets outside the supra-local communities (SOG-B and SOG-C) were usually toward the eastern slopes of the valley. They were very similar, in terms of area and human density, to those small hamlets documented during the Herrera period, however, only one hamlet in the northeast (SOG-B) spatially correlated with a Herrera hamlet. These patterns might suggest that the forces driving regional integration lacked the strength to unify the population inside the Sogamoso valley into a single political unit. Because the three regional entities identified were very similar and there were several areas with dispersed and nucleated occupation that could not be directly related with only one of these supra-local communities, it could be possible that they acted, at a regional level, with a high degree of interdependence.

The Early Muisca period marked the beginning of supra-local integration in the Eastern Highlands. In the Leiva valley, the settlement data collected for this period suggested the presence of at least two supra-local communities, one centered in the local Community of *Suta* and the other in *El Infiernito*. The population estimates suggest that together these two supra-local groups probably had 200 to 400 inhabitants (Langebaek 2001:71). These could be conservative estimates, especially because they were based only on the occupied area and did not systematically include sherd densities in the approximation. Nevertheless, even if one imagines that population could be two or three times larger, the demographic weight and total occupation of these supra-local

communities together were still only just at the level of the largest supra-local community in the Sogamoso valley. In the Fúquene and Susa valleys two competing supra-local communities, one in each valley, were suggested on the basis of the settlement size and the distribution of settlements across the landscape (Langebaek 1995:95). The one in the Susa valley was probably the smallest supra-local group identified in the Eastern Highlands. It did not have a clear center and it was probably formed by a group of extremely dispersed settlements. In the Susa valley the two largest settlements (VF 365 and VF718) had 2 to 3 ha, while most of the settlements (93%) never reached more than 1 ha each. (Langebaek 1995: Figure 5.3). The magnitude of the supra-local groups was about the same in the Fúquene valley, except that one settlement located in *Cerro Chinzaque* (VF 320) probably functioned as a central place. Together these two valleys had a population for the Early Muisca period estimated between 800 and 1200 people (Langebaek 1995:93). The degree of centralization in these two valleys seems even lower than that documented in the Sogamoso valley.

Supra-local interaction during the Early Muisca period in the Bogotá Savannah differed in important ways from the other trajectories documented so far in the Eastern Highlands. The Bogotá survey documented several small and dispersed settlements distributed along the water courses of the Bogotá River and its tributaries and the ecotone between the high plain and the hilly areas (Boada 2006, 2013a, 2013b). The small settlements gravitated around areas of contiguous occupation that could easily be related with villages of different sizes, suggesting some kind of settlement hierarchy (Boada 2013b:23). Detailed information about the size and demographic estimates of these communities was not provided, but the settlement distribution maps suggest more than one supra-local community in the sections I and II of the Bogotá survey (Boada 2006, 2013a). Together these two areas could have included a total population around 900 and 4000 inhabitants in a combined net area of some 107 km^2. Although with slightly larger

population estimates, these calculations roughly resembled the same demographic estimation in a similar net area (117 km^2) for the supra-local communities in the Sogamoso valley during the Early Muisca period. The most remarkable change in the Bogotá Savannah occurred in the Funza section. In this part of the Bogotá survey emerged the largest supra-local community of the Early Muisca period. This supra-local community was probably centered in the local community of *Catama,* in the same place were the Herrera local community of *La Ramada* has been (Boada 2013a:55). In an area of around 46 km^2, population estimates suggest that around 1700 to 3500 inhabitants could have resided in this supra-local community. Considering that the area covered was about half the areas surveyed in the Sogamoso valley and in sections I and II together, that a large part of the survey area in Funza could not be studied due to the presence of modern buildings or the owners´ unwillingness to give permission, and the size of the local community in the center (see section 4.2), the supra-local community that emerged in Funza was larger and more centralized than any other supra-local group documented so far in the Eastern Highlands. Moreover, Funza and sections I and II could have been one supra-local community centered in Funza with population estimates of between 3000 and 8000 individuals. Unfortunately it is very difficult to evaluate this possibility because of the modern urban expansion of Bogotá.

Regional interaction in the Sogamoso valley was probably structured around two supra-local communities during the Late Muisca Period. The supra-local community in the east continued gravitating around Sogamoso´s central place. During the Late Muisca period, this regional entity had some 400 to 700 residents mostly distributed over the landscape in dispersed fashion. The other supra-local community of the Late Muisca period, Tibasosa, was located in the northwestern zone of the survey area. This community probably had 300 to 600 individuals, which indicates that both regional entities had a very similar demographic weight. Tibasosa was less nucleated and it lacked a clear core around which occupation was attracted. Although some clustering was

still evident near Firavitoba, the human density and size of the occupation could hardly be labeled as evidence of a supra-local community during the Late Muisca period. Other settlements outside of the spheres of influence of the two supra-local communities still existed, but their demographic weight decreased. The forces attracting population at the regional level seemed stronger during this period in the Sogamoso valley, nevertheless, they did not concentrate the total population in one single supra-local community. Moreover, the similarities in terms of demographic weight between the two supra-local communities of the Late Muisca period could suggest that the demographic dynamics were no longer at the resolution of the survey area but that they could have been at play at a larger scale, including areas outside of the survey limits.

Meanwhile, in the Leiva valley the Late Muisca occupation increased in the form of several dispersed settlements probably representing the location of individual farmsteads. Langebaek (2001:55) suggested that at least five local communities emerged during the Late Muisca period but only three supra-local communities, organized as chiefdoms, were clearly differentiated in the archaeological record of the Leiva valley. One of these supra-local organizations was centered in the local-community of *El Infiernito,* which was renamed as *Sachencipá* for the Late Muisca period and showed an occupied area of 9.5 to 11 ha. The Early Muisca local community of *Suta* also showed similar occupied area and some power to attract dispersed population around it, which indicated that could have had demographic weight and degree of centralization similar to *El Infiernito*. Finally a new local community (*Monquirá)* on the eastern side of the Sutamarchán River showed 14-10 ha of continuous occupation in two sectors and it attracted some dispersed population as well (Langebaek 2001:55-56). A considerable proportion of the dispersed settlements that emerged during this period could not easily be related with any of these supra-local groups. Although *Monquirá* looked larger than *El Infiernito* and *Suta*, the settlement distribution did not indicate that it attracted more dispersed population nor that was at the top of

a three-tiered settlement system. The documentation of these supra-local groups in the Leiva valley was heavily determined by the ethnohistoric accounts. Considering the low population estimates calculated (Table 3.11) and the small size of the areas surveyed, it is remarkable that in the Sogamoso and Leiva valleys more than one supra-local community with similar demographic weight could be suggested and even more outstanding that a proportion of the settlements could simply not be associated with any of these very small supra-local groups.

Something similar occurred in the Fúquene and Susa valleys, except that the degree of centralization and settlement nucleation seemed stronger than in the Sogamoso and Leiva valleys. Again three supra-local communities are suggested on the basis of the settlement distribution and the ethnohistoric accounts. A higher level of centralization was suggested by the degree of nucleation observed in the largest settlements. VF320, the largest settlement in Fúquene, covered around 22 ha while the largest settlement in Susa reached some 7 ha (Langebaek 1995:115). The overall population estimate for both valleys is still low, between 3000 and 4000 inhabitants (Table 3.11). These numbers are higher than the estimates for the Sogamoso and Leiva valleys but Langebaek also proposed other estimates that suggested populations with the same magnitude as those found in the Sogamoso and Leiva valleys (Langebaek 1995:109).

The archaeological record of the Bogotá Savannah intensified further the patterns documented during the Early Muisca period. Boada suggested that the presence of more nucleated local communities with more population than during the Early Muisca period existed but small and dispersed settlements also gravitated around these local communities (Boada 2006:81). When the settlement distribution of sections I and II were compared, around six areas with continuous

occupation could be suggested and they seemed connected by lines of dispersed settlements established near the Bogotá River and its tributaries (Boada 2006: Figure 13; 2013a: Figure 14). Together these two sections had a total population estimated between 1000 and 5000 people (Table 3.11). It was very difficult to establish areas that could represent limits to supra-local interaction in the Late Muisca occupation in these two sections of the Bogotá Survey, however, the settlement distribution suggested the presence of two or three supra-local communities formed by a large number of dispersed settlements and a local community represented by a large area with continuous occupation that functioned as a central place. The occupation documented in the Funza section increased moderately. Local communities from previous periods maintained roughly the same location and size, while dispersed population increased and the entire area became more densely populated (Boada 2013a:58-59). Only one supra-local community could be suggested in the Funza section. This supra-local group was strongly centered on one of the local communities in the center of the survey area separated by a swamp. The population estimate for the Funza section was 2000 to 4000 inhabitants suggesting around twice the number of inhabitants the Sogamoso valley had (Boada 2013a:57).

During the Colonial period, regional integration in the Sogamoso valley was probably structured again through two supra-local communities: Tibasosa and Sogamoso. The limits of these two supra-local communities were very diffuse. Together they did not include more than 2000 people (Table 3.18) and each had on average during the period between 400 and 800 inhabitants, but they represented most of the population documented within the survey limits. During this period, Firavitoba in the south emerged again as a clustered area but it was not connected with either of these two supra-local communities and it had on average 100 to 300 inhabitants. According to Spanish documents, the center of the regional political authority of the valley was located in the modern city of Tunja. Settlement data also showed that at the regional level Sogamoso and

Tibasosa continued attracting population with a similar strength, but unlike during the Late Muisca period, the two formed a continuous occupation that made their limits less clear than in the prehispanic sequence. Firavitoba did not disappear but it had a lower demographic weight, it appeared unconnected to the large settlement cloud formed by Sogamoso and Tibasosa and did not show capacity of attracting population on its own. The settlement pattern showed two demographic peaks found in the survey area, which have almost the same demographic weight and were connected by clouds of dispersed settlements around them. This is consistent with the hypothesis that when more than one demographic center with a similar weight is found within study area, it is likely that a higher decision making center is located outside the study limits (Underhill, et al. 2008).

The settlement pattern during the Colonial period in the Leiva, Fúquene and Susa valleys was consistent with an intensification of dispersed settlements (Langebaek 1995, 2001). The spatial organization seemed very similar to what has been documented for the Sogamoso valley where ethnohistoric accounts indicated the presence of *pueblos de indios* but the dispersed nature of the settlement patterns blurred the location of these places. There was some degree of continuity with respect to the location of the prehispanic settlements, however, it seemed that the dispersed character of the prehispanic communities was intensified by the new Colonial structure in these valleys. On the contrary, Boada (2013b) underscored that in Section II of the Bogotá Savannah the settlements continued in the same places as during the prehispanic period but the occupied area during Colonial times was reduced. What is more remarkable about this pattern is that the settlement distribution suggested the presence of a supra-local community centered around a local community in the northeast part of the survey area (Boada 2013b: Figure 15). The number of possible local and supra-local communities was reduced in Section II, but the general structure

and degree of nucleation found in prehispanic times continued while overall population decreased.

4.4 CENTRIPETAL FORCES ATTRACTING LARGE POPULATIONS AND DEGREES OF INEQUALITY

Population clustering during the Herrera period in the Sogamoso valley was probably driven by local conditions and sharing activities that might have created the conditions for the rise of a local elite. During this period, human communities systematically avoided occupation in the floodplain and preferred to settle at the boundary between the slopes and the floodplain. The Herrera population also looked for places near perennial streams. Besides two very isolated farmsteads, all the other settlements were less than 300 m from a water supply of fresh water. Soil productivity did not seem as important a variable for the location of settlements. It is more likely that occupation was organized in a random fashion than defined by the distribution of soil productivity zones. Evidence supporting the existence of intensive exchange activities with regions outside the Eastern Highlands did not appear in the archaeological record. Herrera settlements were located toward the eastern flank of the valley but ceramic sherds or other materials from the Eastern Lowlands were not found, suggesting that exchange activities with this region were unlikely. This is consistent with a settlement pattern driven by environmental reasons but not necessarily related to intensification of economic activities.

The distribution of decorated sherds suggested that settlements with a high degree of nucleation had larger proportions of decorated sherds. The very small hamlets had around 48% decorated

sherds while dispersed farmsteads showed 32%. The proportion of decoration in settlements with more nucleation and the fact that the most common forms of Herrera wares are bowls (Boada 2007:227-231; Cardale de Schrimpff 1981b:9), could indicate that the use of ceramics during the Herrera period was mostly focused on social activities, such as feasting. Moreover, because decorated ware requires more investment in its elaboration, and its aesthetics are usually interpreted as something conceived to be shown to others, its presence is often associated with elite activities. The settlement data did not provide direct evidence for what type of elites could have existed during the Herrera period, nevertheless, the differences in proportions between nucleated and dispersed settlements suggests that the degree of differentiation was moderate to strong.

The relationship between the Herrera settlements and the lithic distribution inside the survey area was explored but clear patterns could not be identified. Collection units with the majority of Herrera sherds did not show large quantities of lithics, but this could just be an indication that lithics and Herrera sherds had very low frequencies inside the survey area. The largest concentration of lithics overlaps with one cluster of Herrera farmsteads in the east of the survey area but it is not clear how many of these lithics could be associated with this period. One of the local communities (FIR-A) located in the southern limits seemed to attract some dispersed population. The population estimates and the total occupied area of this community and its associated dispersed settlements—between 30 and 60 inhabitants in some discontinuous 6 ha—are not large enough to indicate the presence of a supra-local community. The presence of activities that could have fostered centralization, such as feasting, was documented but there is no indication of the existence of this type of community during the Herrera period. Some degree of centralization around FIR-A and inequality in terms of access to decorated ware existed, but in the best case scenario both were very weak.

The degrees of centralization and inequality in the Leiva valley were probably lower than in the Sogamoso valley. Hamlets, farmstead clusters or other types of settlements that could suggest some degree of centralization did not exist in the Leiva valley. Some few dispersed farmsteads occupied areas with good conditions for agriculture near water sources (Langebaek 2001:49), indicating that the initial sedentary occupants of the Leiva valley probably established their dwellings prioritizing good environmental conditions. Excavations conducted in the Leiva valley but outside of the survey area, in a settlement of some 2 ha from the transition between the Herrera and the Early Muisca period, found weak inequalities within the settlement and the burials excavated. Two of eight burials excavated had grave goods, represented by a quartz crystal and one snail shell; these objects could be simply personal objects or deposited with the individuals unintentionally (Salamanca 2001:67). On the contrary in the Samacá valley near the Leiva valley, in a nucleated settlement that showed Herrera occupation in about 2.6 ha, strong differences in regard to access to decorated ware, access to meat and non-local objects were documented within the settlement (Boada 2007:114-118). This evidence suggested the possibility that some degree of inequality existed in the Herrera period. Moreover, inequalities were probably associated with the use of decorated ware, access to meat, and non-local objects, even within small Herrera settlements such as the one documented at *El Venado*. This suggested that some degree of inequality occurred in the Herrera period in the northeastern valleys not only between different types of settlements but also within settlements, regardless of their size and without clear indications of centralization at any scale. The reasons behind the inequality seen at *El Venado* and among local communities in the Sogamoso valley are unknown and they need to be explored with further research.

The settlement data of the Fúquene and Susa valleys showed some degree of centralization, suggested by the presence of the small hamlets of VF 724 VF718 and VF 494. These settlements encompassed 44% of the Herrera occupation, while the rest was associated with dispersed settlements (Langebaek 1995:77). The proportion of population nucleated in the small hamlets of the Fúquene and Susa valleys was similar to that documented for the three small hamlets that emerged in the Sogamoso valley during the Herrera period. Differences in regard to decorated ware or ceramic vessels were not reported in the Fúquene and Susa valleys (Langebaek 1995:79-80), suggesting that even though the small hamlets in the Fúquene and Susa valleys were between 2 and 3 ha larger than those documented in the Sogamoso valley they showed less indication of possible inequalities between them and the dispersed settlements (Langebaek 1995: Figure 4.5, Section 3.1.2.). Moreover, in the Fúquene and Susa valleys the settlement patterns suggest stronger centralization than in the Sogamoso and Leiva valleys but without indication of inequalities.

In sections I and II of the Bogotá survey, differences in archaeological assemblages between Herrera settlements did not exist, which suggests that the presence of strong inequalities should be rejected (Boada 2006:63-71; 2013a:19-21). Some degree of nucleation was suggested in Section I of the Bogotá Survey but the size of the settlements and the very low occupation could hardly indicate the presence of strong political or demographic centralization (Boada 2013a:23). A different pattern was documented in the Funza section. A degree of centralization higher than in any other region of the Eastern highlands was suggested by the presence of a concentration of settlements in *El Cacique* (Boada 2013a: figure 3.2). Moreover, Kruschek (2003) found in *El Cacique* the highest proportions of decorated ware, suggesting that inequalities during the Herrera period could have been indicated by the use and/or production of objects with higher labor investments, probably used as display objects in social events that involved elite

participation. Boada (2013a:63) did not suggest what kind of forces could have been maintained and nucleated the Herrera population in Funza, but she indicated that those forces probably existed. An intensive use of the swamp and riverine environment could have been behind the settlement patterns documented in the Funza section. The area surveyed by the three sections of the Bogotá survey covered some of the 157 km^2 with prehistoric raised fields. Two radiocarbon dates (738±40 BC and 1324±40 BC) from the sediments associated with different types of pollen suggest that some of these raised fields could have been in use since the Herrera period (Boada 2006). The presence of these landscape modifications suggested that economic forces related to the intensive use of the swamp and riverine environments could have allowed the degree of human nucleation, the centralization and the inequalities documented in the Bogotá Savannah since the Herrera period.

The Early Muisca period was characterized by the presence of mixed forces driving social interaction in the Sogamoso valley. For the first time in the sequence, settlements occurred not only in one specific landscape setting but were distributed over the floodplain, the gentle slopes and some mountain spurs. Soil productivity and population density in each soil class showed a moderate and fairly significant positive rank-order correlation. Occupation of productivity zones seemed more important than during the Herrera period, nevertheless at a regional scale, it was not the most important factor defining settlement location. Although the floodplain, which holds most of the high productivity zones, was occupied, most of the Early Muisca occupation was located in the gentle slopes where those soils are less available. It looks like the strongest settlement nucleation responded to other sorts of integrative forces and was not merely due to people´s desire to occupy areas of high productivity for agriculture. Nevertheless, the occupation clustering that occurred in the northwest of the survey area (TIB-1 and TIB-2) roughly correlates with the only place where the best productivity soils appear in the gentle slopes and not in the

floodplain. FIR-2 was located in soils that could be potentially very good but that required landscape modifications to cope with the possibility of flooding. TIB-1, TIB-2 and FIR-2 might have driven to these places in order to maximize their agricultural productivity. Landscape modifications such as raised fields were not found in any of these places. Nevertheless, the expected vs observed populations in the 1 km^2 squares that had more settlement clustering in TIB-1, TIB-2 and FIR-2 showed around seven times more observed population than the expected. In the east, most of the dispersed settlements associated with the local community of SOG-1 were located in a similar topographic setting, however, the soil zone that corresponded with this area presented the second worst conditions for agriculture in the survey area. Despite this condition the 1 km^2 square in which most of the population of SOG-1 was located—which also corresponded with the location of the local community SOG-A—showed around nine times more observed population than the expected. It is possible that the soil conditions documented near SOG-A were produced by intensive use of its soils for crop cultivation. This intensive use could have diminished the general soil productivity. Further studies will be required to assess whether the prehispanic occupation in this area during the Early Muisca period diminished the capacity of these soils. The supra-local community of Tibasosa, composed of clouds of dispersed farmsteads, could have emerged in that location with the purpose of intensifying the use of the best agricultural setting available in the Sogamoso valley, indicating that economic forces were probably integrating these dispersed households in the northwest of the survey area. Nevertheless, the local community of SOG-A showed other archaeological indicators not related with economic interaction that might explain the centralization that occurred around it.

The distribution of decorated sherds showed that when compared with the Herrera period, the Early Muisca period presented a reduction in the percentage of decorated sherds. The increase in occupation could have produced an increment in demand for ceramic technology, which in turn

probably led to more standardized production and reduced non-functional characteristics. Nevertheless, nucleated areas still showed slightly larger proportions of decorated sherds. Moreover, the local community of SOG-A, its closest dispersed population (SOG-1) and the clouds of farmsteads that seemed the core of the supra local communities of Firavitoba (FIR-1 and FIR-2) and Tibasosa (TIB-1 and TIB-2) also showed higher proportions of decorated sherds that differed from other clouds of farmsteads with a fair statistical significance. SOG-A had around 18% while SOG-1 by itself showed around 12% decorated sherds. SOG-1, TIB-1, TIB-2, FIR-1 and FIR-2 showed together more than 7.5% decorated sherds. The other settlements in the Sogamoso valley had less than 6% decorated sherds during the Early Muisca period. This distribution suggested that activities associated with decorated ware were probably less important than during the Herrera period. Nevertheless, local communities and clusters of farmsteads that acted as nuclei of supra-local communities still showed higher percentages of decorated sherds indicating some degree of inequality in terms of the access and use of more elaborate ceramic vessels.

The excavations conducted by Silva Celis suggested that the local community of Sogamoso functioned as a large burial place in which only 10% of the burials had grave goods. The ratio between possible residential structures identified and the number of burials excavated suggested that this place was used more for funerary than for residential purposes (Section 1.1.3). These excavations also exposed at least two large structures that could easily have held indoor communal activities. It is likely that the intensive use of SOG-A started at some point during the Early Muisca period. Considering the density of archaeological materials in the collection lots that characterized the local community of Sogamoso—which was higher than any other place within the survey area—it could be suggested that this place was intensively used since at least the Early Muisca period. Direct evidence of a residential use was documented by Silva Celis but it

seemed rather low, compared with the number of burials found by him and the ceramic densities collected during the survey. This could indicate that this place had a residential purpose but permanent occupation was less intensive than activities involving people who lived elsewhere. This suggests that social and religious activities related to burial practices and the use of large communal structures regularly gathered people from across the valley in this place but not as permanent residents. One possibility is that the residence in SOG-A was probably restricted to elites, and for this reason, clouds of farmsteads gravitated around it. This evidence suggests that religious and social activities were probably conducted in the local community of SOG-A with some degree of intensity at least since the Early Muisca period but these activities also prevented the creation of a large and strongly nucleated human community. These activities probably attracted population toward this local community but they do not seem the only activity that could have attracted population to this central place. This evidence also suggested that religious or social interaction do not necessarily require strong settlement nucleation to create several levels of human interaction, including supra-local communities.

The largest concentration of lithic materials overlaps with the nucleated area of SOG-A and with some of the dispersed farmsteads that were part of its cloud of farmsteads (SOG-1). The second largest concentration overlaps with some of the hamlets that existed in the Herrera period but that continued during the Early Muisca period in the northeast and the south of the survey area (SOG-B, FIR-A and FIR-B). Although it could simply be due to the fact that sherds associated with the Early Muisca period were more common than any other type of sherds, lithics were usually found in collection units with the majority of Early Muisca sherds. The lithic assemblage included debitage and tools, among which a few elaborate tools such as microliths were also found. This indicated that lithics were locally produced and used in the Sogamoso valley. If the spatial relationship between SOG-1 and SOG-A and the concentration of lithics are not merely due to

the nature of the archaeological record, then it is possible that activities related to the use and production of lithics also drew local populations to the nucleated area in the local community of SOG-A. The existence of this pattern could also suggest that social or religious factors were not the only forces attracting population to the nucleated area adjacent to the local museum of Sogamoso.

Exchange activities with other areas of the high plain or with different regions, such as the Eastern Lowlands, were apparently uncommon in the Sogamoso valley during the Early Muisca period. The very few sherds considered non-local were found in the survey area without association with a specific settlement type or place. Other materials or objects that could only be produced outside the valley were not found.

The activities that aggregated population in the Sogamoso valley during the Early Muisca period probably differed in each supra-local community. In the area of Tibasosa in the northwest, the dispersed nature of the settlements and the existence of the best setting for agriculture might have drawn population to this place. The Firavitoba area attracted population to a place where conditions for agriculture were less ideal because the area could be easily flooded. It is likely that the Early Muisca populations were attracted simply by the existence of two small hamlets (FIR-A and FIR-B) that emerged in the Herrera period on top of two hills near the floodplain. The small amount of space available in the hills could have made the establishment of a new settlement in the floodplain necessary, where more area was available. Finally, SOG-A, the place that was pulling population toward it with the most strength, probably had potential for drawing population from different sources. This place was one of the clusters of farmsteads identified during the Herrera period, which means that it is possible that ancient occupation could have attracted new

settlers to this place. Although it is not clear how much of the findings made by Silva Celis corresponded only to the Early Muisca period, a large burial place was also located in this area, which could have created social and religious forces that pulled population towards it. Those early excavations also documented large structures that could serve for communal activities and these activities could have been important as well. Finally the possible relationship between the concentration of lithics and the nucleated area inside the local community of SOG-A suggested that activities associated with the production and use of these objects were also important, indicating that economic activities were also probably at play as centripetal forces that drove population to the eastern part of the survey area. In any case, the centripetal forces pulling population within the Sogamoso valley seemed quite well covered by the scale and resolution of the study, which means that Early Muisca supra-local interaction was somewhat restrained to an scale of a few kilometers and that neither of the forces in the study area aggregated large populations. Even though the local community of SOG-A could have had different activities that attracted population, the size of its supra-local community was only some 100 people. It did not integrate all the communities in the survey area and even at its core is best described as a dispersed settlement pattern, suggesting that the combination of forces that attracted population was rather weak or that strong residential restrictions were at play in the local communities. If these indicators were real, these patterns suggested that economic and non-economic forces attracting human populations were at play in the Sogamoso valley but non-economic forces seemed more important, both in terms of power to aggregate population and restrict nucleation, in a demographic context of low population density.

An increase in centralization and the rise of some inequalities occurred in other parts of the Eastern Highlands with different magnitudes. In the Leiva valley one of the clusters of settlements established in the survey area around *El Infiernito* concentrated around half of the population.

The other cluster, Suta, aggregated around the other half of the population. What it is particularly remarkable about *El Infiernito* is the presence of around 50 carved stone menhirs, a dolmenic tomb and several other burials (Langebaek 2001, 2005, 2008; Salge 2005). In Suta the presence of a prehistoric mound feature was suggested (Henderson and Ostler 2005). Since previous Herrera occupation was not documented in Suta and in *El Infiernito* only covered 0.2 ha (Langebaek 2005), it is likely that some of these features were produced during the Early Muisca period. Strong inequalities were not reported within *Suta* and *El Infiernito* (Henderson and Ostler 2005; Langebaek 2005; Salge 2005), but at the regional scale the households located in *El Infiernito* showed more archaeological evidence associated with salt production, storage activities, meat consumption and use of decorated ware (Fajardo Bernal 2011; Henderson and Ostler 2005; Langebaek 2005; Salge 2005). This same archaeological evidence is more conspicuous in *El Venado* than in *El Infiernito,* although internal differences were strong within the settlement of *El Venado* (Boada 2007). This suggests that inequalities were expressed at the supra-local scale, between local communities and were probably less strong within local communities. The differences between local communities also suggests that these settlements were not always central places during the Early Muisca period.

The clusters of settlements were larger in the Fúquene and Susa valley, as well as the size of the local communities, nevertheless, the settlement patterns suggested some degree of centralization (Langebaek 1995:95). A very small sample of ceramic sherds suggests that activities associated with production, storage and consumption of corn beer could have been somewhat more intensive in the large settlements than in small settlements. Large settlements in the Fúquene and Susa valleys also included cemeteries. This large settlement–cemetery relationship is also documented in the Sogamoso and Leiva valleys, except that in these valleys the degree of inequality seemed stronger that in the Fúquene and Susa valleys but centralization was

apparently weaker in the Sogamoso valley and stronger in the Leiva valley. Langebaek also suggested that the degree of centralization observed in Fúquene and Susa was probably driven by a competitive environment that include feasting and warfare. The location of the largest settlement on a hill top and the occupation of the islands support this possibility (Langebaek 1995:95).

The Bogotá Savannah showed a strong degree of centralization when the three sections of the Bogotá survey were analyzed as a whole (Boada 2006, 2013a, 2013b). In the Funza section, two local communities of around 75 ha each separated by a swamp of some 200 m centralized most of the population documented so far in the Bogotá Savannah (Boada 2013a:55). In the sections I and II Early Muisca population showed some degree of nucleation but in smaller settlements. The settlement pattern indicated that when populations were not established in the nucleated settlements, they usually occupied the areas along the rivers located in the high plain (Boada 2006, 2013b). In the local communities formed in the Funza section high proportions of decorated ware were found (Kruschek 2003:187), suggesting the presence of inequalities between clusters of farmsteads, local communities and dispersed settlements rather than within them. It is not clear whether the large local communities in Funza also functioned as cemeteries or not, but several cemeteries have been reported in the south of the Bogotá Savannah (Boada 2000). The location of Early Muisca settlements overlapped with the prehistoric raised fields to a higher degree than during the Herrera period. This suggested that the same economic forces that aimed to intensify the swamp and riverine environments were also at play, and probably strengthened, during the Early Muisca period. Inequalities were probably mild to somewhat strong (Kruschek 2003) but additional research will need to explore the strength of these inequalities between the settlements located in Funza and those identified in sections I and II.

Again during the Late Muisca period, all the different landscape settings in the Sogamoso valley were occupied but people preferred to live in the gentle slopes rather than in the floodplain. The Late Muisca population could have taken into account soil productivity when they decided to locate their settlements but it was probably not an important variable. Nevertheless it seems that one of the largest supra-local communities of this period was formed on the best areas for cultivation. This was the case for the supra-local community located in the northwest of the survey area, near Tibasosa. The supra-local community of Tibasosa reached a similar demographic weight as the supra-local community that emerged around Sogamoso—both showed population estimates between 300 and 700 people—but its settlement pattern was rather a continuous distribution of dispersed population. This pattern suggests that the supra-local interaction in Tibasosa could have been fostered by its location and activities related to the use of prime agricultural settings. The supra-local community centered in the local community of Sogamoso continued to be roughly located in the second worst soil productivity area but more studies are required to identify whether the intensive use of these soils by prehispanic population diminished their productivity.

The Late Muisca period showed the clearest indications for the beginning of a type of supra-local interaction that exceeded the natural limits of the Sogamoso valley. Evidence of exchange activities seems more conspicuous during the Late Muisca period. Ceramic types usually associated with the south of the Eastern Highlands were found in the Sogamoso valley concentrated in SOG-A. Although some other settlements also showed presence of non-local sherds, SOG-A clearly centralized these objects. The distribution of decorated sherds showed similar proportions at different types of settlements. Moreover, the differences in regard to proportions of decoration probably just represented the vagaries of sampling, suggesting that during the Late Muisca period neither areas with different human densities nor types of clouds of

farmsteads are strongly differentiated in terms of their access to decorated sherds. Nevertheless, the local community of SOG-A on its own showed the largest proportion of decorated sherds. Lithics did not appear frequently in collection units with a majority of Late Muisca sherds, but this pattern could just be a product of the nature of the archaeological record rather than a chronological differentiation in the use of lithics. Firavitoba lacked evidence that suggested that particular activities such as exchange, feasting or lithic production were conducted intensively there. The latter, in addition to its location in an area of the floodplain with susceptibility to flooding, probably undermined its regional ability to draw in population during the Late Muisca period. It was probably because of this that its demographic weight (estimated between 160 and 300 people) diminished and it could not be labeled as a supra-local community anymore. The concentration of non-local sherds in Sogamoso´s central place and the negligible differentiation in decorated sherds among local communities suggests that local elites in SOG-A could have started to interact with other valleys in the Eastern Highlands somewhat more intensively, shifting the forces and the location of the cores that were attracting population. The fact that the demographic weight of the supra-local community of Sogamoso diminished during this period and that it was very similar to the other supra-local community of Tibasosa could also indicate that extending the exchange network to interact more intensively than before with other communities in the Eastern Highlands diminished the potential that the central place of Sogamoso had to pull population toward it. At the same time, this new macro-regional interaction probably opened the door to a regional system that included the survey area but that was centered in a place outside the Sogamoso valley. In other words, it seems that the Sogamoso valley during the Late Muisca period participated in a macro-regional system of interaction across the Eastern Highlands. The supra-local communities in Sogamoso, however, probably played a peripheral part rather than a central role in this system, especially in regard to their capacity to exert stable and strong demographic attraction across several valleys.

The settlement distribution during the Late Muisca period in the Leiva valley suggested that the population growth documented was not related with a strong degree of centralization. The number of hamlets increased, as well as their size, but the number of dispersed settlements also increased (Langebaek 2001:18-19). Moreover, a settlement such as *Suta* appeared less nucleated and more dispersed than during the Early Muisca period (Henderson and Ostler 2005). Langebaek suggested that the most plausible explanation is that at least three independent systems existed in the Leiva valley during the Late Muisca period (Langebaek 2001:57), which could be analogous to the three supra-local communities identified in the Sogamoso valley. Strong inequalities within *Suta* and *El Infiernito* were not reported (Henderson and Ostler 2005; Langebaek 2001, 2005) but the presence of monumentality at *El Infiernito* and household data from both settlements suggested that some inequalities between settlements could have existed (Fajardo Bernal 2011; Salge 2007). This suggests that inequalities between clusters of settlements and local communities seemed more evident than within them.

In the Fúquene and Susa valleys three hierarchical systems at the regional scale showed slight differences in degree of centralization. The system located in Fúquene and centered around VF 320, showed a higher degree of centralization than the one documented in Susa (Langebaek 1995:114). The Late Muisca nucleation also seemed to correspond with easily defendable areas and with good agricultural productivity (Langebaek 1995:121). The largest settlements were also associated with cemeteries and feasting activities to a stronger degree during the Late Muisca period (Langebaek 1995:118-120), indicating that settlement differentiation was likely and not only that warfare and agricultural productivity encouraged centralized social interaction but also social activities related with burial and death helped create the social interaction documented in

the Fúquene and Susa valleys. Moreover, the degree of centralization and nucleation seems more intense than in the Sogamoso and Leiva valleys.

During the Late Muisca period in the Bogotá Savannah the patterns previously identified were intensified. Population was more nucleated in the three sections of the Bogotá survey and the magnitude of the local communities was still larger in the Funza section (Boada 2006, 2013a, 2013b). Rivers and the foothills continued to attract the population not settled in any of the local communities or clusters of settlements. In the same way as in previous periods, settlements were located in areas where raised fields were identified, suggesting that the degree of centralization and nucleation observed could have been produced or fostered by the presence of these landscape modifications (Boada 2006). The centralization could also have been produced by public ceremonial activities as suggested by the presence of large scale structures represented by 26 separate inverted pyramid molds 30 m long excavated into a yellow clay layer at *La Ramada (*Gutierrez and Garcia 1985). Kruschek (2003:223) observed that there was increasingly restricted access to wealth even between the local communities and clusters of settlements located in the Funza section, which suggested that the differences between the nucleated settlements in Funza and those in the other two sections of the Bogotá survey could be even stronger, but this possibility has been not evaluated against the archaeological data.

The Colonial period created the conditions to intensify the patterns that already existed at the end of the prehispanic sequence. In the Sogamoso valley the desire to inhabit the best areas for agriculture was less important than other variables, even after the Conquest. People continued to aggregate around Sogamoso and Tibasosa, but in a dispersed pattern, occupying the floodplain between these two places more intensively. Something similar occurred in the Leiva, Fúquene

and Susa valleys (Langebaek 1995, 2001) where Colonial population lived in a dispersed pattern and there were not archaeological indicators of more degree of centrality within the valleys. This behavior is consistent with the new Colonial structure with the political and economic centers of the Eastern Highlands in Tunja and Bogota. Perhaps the most impressive difference is that in the Bogotá Savannah some degree of nucleation still existed, and the dispersed population was less than in the previous period (Boada 2013b). This suggests that the economic forces at play in the Bogotá Savannah during the prehispanic period facilitated the inclusion of the settlement system in the Colonial system but diminished the population.

Exchange activities, the feasting cycle and the tools available certainly expanded during the Colonial period. The Spaniards' arrival diminished the local population through contagious diseases, tribute extraction and abuse by Spanish settlers. Nevertheless, the nature of the changes that occurred during this period was a continuation of trends that began before the Conquest and that were deeply rooted in the prehispanic macro-regional interaction occurring during the Late Muisca period. Sogamoso continued as an important place in the political structure of the Provincia de Tunja, but it was eclipsed in demographic and political terms by Tunja and Bogotá.

4.5 FUTURE DIRECTIONS

Some specific questions arise about the characteristics of prehispanic communities in the Sogamoso valley and the Eastern Highlands. First, the demographic changes inside the survey area were probably strong just after a long period when sedentism, agriculture and pottery were introduced into very small populations mostly dispersed across the landscape. After this, around

the eighth century of the Christian era, population dramatically increased but from this moment all through the Colonial period it seemed that population in the Sogamoso valley was on average very similar. The similarities found between the demographic patterns of the Late Muisca and Colonial periods suggest that regional scale dynamics during these two periods might have exceeded the spatial scale documented within the study area. If this is true, larger study areas will be needed to fully understand the way in which political organization was structured across several valleys of the Eastern Highlands since the Late Muisca period.

Second, the clouds of farmsteads probably provided the basis for modest daily interaction between dispersed populations attracted by the activities conducted at the more nucleated local communities. The clouds of settlement defined in this study were very inclusive, allowing the grouping of farmsteads spread across areas with a maximum of about 2 km across. Usually these kinds of large clusters are not labeled local communities (Peterson and Drennan 2005), but they do seem to correspond to an important level of social interaction. First, the unoccupied areas between them were not very large but they indeed existed. Survey teams documented these spaces without occupation by means of pedestrian survey or shovel tests. Second, the limits between different clouds loosely corresponded with areas near landforms such as rivers, streams, former wetlands, spurs and mountain crests, among others. Third, clouds of settlements showed different human densities. These kinds of patterns suggest that the clouds of farmsteads identified in this study represent a kind of interaction less intensive than that in local communities, but stronger than interaction at the supra-local scale. An ethnographic example from modern socio-political division in Colombia shows a similar pattern of interaction among dispersed farmsteads. The *vereda* is a division within a municipality that aggregates rural population by location. *Veredas* sometimes include small nucleated places like hamlets, but usually they consist of dispersed farmsteads that are socially, politically and economically bonded. The *vereda* is by no means a

rigid territorial unit and it is often divided, dissolved or aggregated with analogous units, mainly for social or economic reasons. The population of these modern communities can vary from less than hundreds up into the thousands of inhabitants. Modern *veredas* also show varied areas, from 1 or 2 km^2 to several hundred km^2. Colonial records do not suggest that the concept of *vereda* was something implemented by Colonial administrators to differentiate local populations, although archaeologists have used the concept of *vereda* as a spatial division related to others used by Spaniards to organize local populations (Boada 2013a; Broadbent 1966). It is possible that the clouds of farmsteads defined to interpret local interaction in the Sogamoso valley loosely correspond with the concept of *veredas*. This suggests that the kind of low-intensity local interaction that happens today between dispersed farmsteads across the countryside of the Eastern Highlands is deeply rooted in the structure of local interaction that occurred in prehispanic times. This is consistent with the arguments presented by Colmenares (1997) and Villate (2001) about the way in which dispersed farmsteads were organized in prehispanic and Colonial times. Therefore a definition of cloud communities as broad and inclusive as that used in this study is required to understand and compare an important dimension of local interaction among prehispanic and Colonial populations. Further research should address the role this kind of communities played in the demographic and socio-political patterns documented in the Eastern Highlands.

Supra-local organization in the social sequence of the Sogamoso valley was a very dynamic process. At the beginning of sedentary occupation supra-local communities did not exist and daily human interaction was focused more locally. The rise of supra-local communities came along with the demographic explosion documented during the Early Muisca period. Three supra-local entities configured in different ways emerged, one of which (Sogamoso) had almost double the demographic weight of the others. Just after the Conquest, during the Late Muisca period, the

number of supra-local communities was reduced to two entities with similar demographic characteristics but with different degrees of nucleation. Finally, during the Colonial period, the patterns of regional interaction that started during the Late Muisca period were apparently intensified rather than disrupted by the presence of the Spanish endeavor. This evidence suggested that the polity centered in the Sogamoso valley during prehispanic times was demographically smaller and less important than it appears in interpretations based on the historic accounts. Conquest accounts never described Sogamoso as demographically large or economically important. The polity centered in Sogamoso was described simply as important because it centered on a pilgrimage temple. It was never compared with Tunja or Bogotá in terms of their populations or the activities around which they were structured. The evidence collected in the Sogamoso valley did indeed suggest that a supra-local community was centered during the Early Muisca and Late Muisca periods around a central place located where the Temple of the Sun was supposedly located. Nevertheless, this supra-local entity was not the only one created during the prehispanic period in the valley and it seems only during the Early Muisca period to be demographically somewhat larger than the other supra-local communities identified. This evidence suggests that the Spaniards classified as important prehispanic communities that were demographically different and also based on different kinds of centralized supra-local interaction. This differentiation needs to be taken into account before attempting further comparisons with the ethnohistoric accounts.

Instead of leading to general concluding remarks, comparison of the patterns of prehispanic and Colonial interaction in the Eastern Highlands raised several new questions that need to be addressed. One of the first questions raised about sedentary occupation in the Eastern Highlands is how initial population levels could affect the social organization of early sedentary communities. Herrera populations settled more densely in the Bogotá Savannah than in other areas of the

Eastern Highlands, and this difference seems very important later in the social sequence. The Early Muisca period showed a population expansion across the Eastern Highlands of roughly similar magnitude in all settlement pattern studies. This expansion in the Bogotá Savannah, however, resulted in larger Early Muisca populations than in any other documented region. It is possible that the population increase in the Bogotá Savannah during the Early Muisca period was in part produced by the larger population that had been there since the beginning of sedentary occupation. If pre-sedentary occupation of the Eastern Highlands was denser in the Bogotá Savannah, then a scenario can be imagined in which subsequent populations decided to settle in regions where earlier mobile groups were already familiar with, in an orderly process of adaptive decision-making, settling more intensively in the regions that they knew better. It will be useful to explore further the strength and nature of the impact of pre-sedentary population levels on the development and structure of subsequent sedentary human communities.

Some degree of inequalities among prehispanic populations in the Eastern Highlands probably existed since at least the beginning of the sedentary sequence. Inequalities within local communities and between households and individuals probably existed, but they were less conspicuous than the inequalities between different types of settlements. The expression of these inequalities was usually related to access to objects used in communal activities such as ceremonies or feasting. In any case inequalities seem weak and did not increase much with time. The settlement patterns also suggest that elites could have restricted to themselves the possibility of living close to socially important places, such as large cemeteries or other areas for communal activities. Further comparison should attempt to establish whether the pace of increase in inequalities is directly related with the size of the population and the number of social restrictions in the system.

It seems that a combination of different attributes during the prehispanic occupation produced different social outputs in Colonial times. A stronger level of centralization and a more important role of economic forces driving human interaction were documented in the Bogotá Savannah. The settlement data for the Colonial period suggests that the new Colonial structure was especially disruptive for the population in the Bogotá Savannah, reducing its numbers. Nevertheless, the settlement system documented there continued and was probably intensified. On the contrary, in the areas in which dispersed settlement patterns combined with stronger social and religious forces centralizing social interaction, the Colonial structure provoked an intensification of dispersed settlement and an increase in population size. This suggests that system survivability and population survivability are two different attributes of early complex societies and further research should explore whether they usually occur together or not in hierarchical societies with low population levels.

Perhaps one of the most remarkable features of the prehistoric and Colonial sedentary communities documented in the Eastern Highlands is their small demographic scale. Despite the fact that all the trajectories documented never showed population estimates above the low tens of thousands, every single one of them at some point in the sequence had archaeological indicators of: a) hierarchical structure, b) some degree of inequality and c) some kind of social, economic or technological innovation. The way these features came together in each of the trajectories was rather different from what is usually expected in communities with larger populations. For example, it has been argued that a dispersed, agrarian mode of settlement was adopted in response to high regional population levels (Berrey 2014; Stone 1993), but this kind of settlement pattern was documented in the Eastern Highlands in a demographic setting that hardly suggests high populations. This observation indicates that human communities with low regional populations organized under hierarchical principles share some characteristics with

human hierarchical groups with high population levels, even though different attributes of these type of societies do not necessarily have the same relationships. The patterns of interaction that emerged in the Eastern Highlands during the prehispanic and Colonial occupation suggest that the structure of hierarchical societies with low population levels do not follow linear principles and are not best explained by unique factors. Further research should attempt to identify the degree to which hierarchical societies with low and high population levels diverge.

APPENDIX

ACCESS TO THE ONLINE DATASET

The complete regional dataset for the Sogamoso valley is available electronically in the Comparative Archaeology Database provided by the Center for Comparative Archaeology at the University of Pittsburgh. This dataset contains both quantitative and spatial information on the individual collection lots that were documented during regional survey, a map of the soil zones that were used in the analyses, along with settlement maps for each phase of prehispanic occupation, which are available in a variety of formats. These data can be downloaded at:

www.cadb.pitt.edu

General questions regarding the database and its contents can be sent to:

cadb@pitt.edu

For specific questions regarding the Sogamoso valley data, please contact the author directly:

sdf20@pitt.edu

BIBLIOGRAPHY

Aceituno, Francisco and Sneider Rojas

2012 Del paleoindio al formativo: 10.000 años para la historia de la tecnología lítica en Colombia. *Boletín de Antropología. Universidad de Antioquía* 26(43):124-156.

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ca. 1658 Contaduría 1346A, número 5. Cuentas hechas por Don Francisco de Vargas y Figueroa del partido de Sogamoso para cinco tercios desde navidad de 1656 hasta navidad de 1658. In *Contaduría*. Archivo General de Indias, Sevilla.

ca. 1671-1749 Contaduría 1553. Cuenta de tributos de Sogamoso. In *Contaduría*. Archivo General de Indias Sevilla.

Aguado, Fray Pedro

[1581] (1956) *Recopiliación historial, volumen I*. Empresa Nacional de Publicaciones, Bogotá.

Anderson, David G.

1994 *The Savannah River Chiefdoms: Political Change in the Late Prehistoric Southeast*. University of Alabama Press, Tuscaloosa.

Anonymous

n.d. Epitome de la conquista del nuevo reino de granada. Archivo Histórico Nacional, Madrid.

Archila, Sonia

1986a Investigación arqueológica en el noroccidente de Boyacá. BA thesis, Departamento de Antropología, Universidad de los Andes, Bogotá.

1986b Nuevo aporte cronológico para el área Muisca. *Boletín de Arqueología Fundación de Investigaciones Arqueológicas Nacionales* Año 1 No 2:35-38.

Argüello García, Pedro María

2015 Subsistence Economy and Chiefdom Emergence in the Muisca Area. A Study of the Valle de Tena. PhD Dissertation, Anthropology, University of Pittsburgh, Pittsburgh.

Aristizabal, Lucero

2016 Alimentación y sociedad. Paleodieta de una población muisca de la sabana de Bogotá, el caso de Tibanica – Soacha. Disertación Doctoral, Departamento de Antropología, Universidad de los Andes, Bogotá.

Bandy, Matthew S. and Jake R. Fox (editors)

2010 *Becoming Villagers: Comparing Early Village Societies*. University of Arizona Press, Tucson.

Becerra, Miguel

1994 Études petrographiques des matériaux céramiques de "Duitama-Tocogua", Haut Plateau de Boyacá en Colombia, Crap, Université de Paris-I, Pantheéon Sorbonne, Paris.

1995 Études morphologiques et traceologiques des micro pointes de quartz de 'Duitama-Tocogua', Crap, Université de Paris-I, Panthéon Sorbonne, Paris.

1998 *Investigaciones geo-arqueológicas y paleoambientales en la región de Duitama-Tocogua, altiplano de Boyacá. Universidad Pedagógica y Tecnológica de Colombia, UPTC. Proyecto PhD*.

Beltrán-Beltrán, Lina Constanza

2008 Patrimonio industrial colombiano: la definición de paisajes productivos en la Sabana de Bogotá 21(1):26-43.

Berrey, Charles A.

2014 Organization and Growth among Early Complex Societies in Central Pacific Panama. PhD Dissertation, Department of Anthropology, University of Pittsburgh, Pittsburgh.

Blanton, Richard E., Gary M. Feinman, Stephen A. Kowalewski and Peter N. Peregrine

1996 A Dual-Processual Theory for the Evolution of Mesoamerican Civilization. *Current Anthropology* 37(1):1-14.

Blanton, Richard E., Stephen A. Kowalewski, Gary M. Feinman and Jill Appel

1982 *Monte Albán's Hinterland, Part I: The Prehispanic Settlement Patterns of the Central and Southern Parts of the Valley of Oaxaca, Mexico.* Memoirs of the Museum of Anthropology. University of Michigan, Ann Arbor.

Boada, Ana María

2000 Variabilidad Mortuoria y Organización Social Prehispánica en el Sur de la Sabana de Bogotá. In *Sociedades Complejas en la Sabana de Bogotá Siglos VIII al XVI D.C.*, edited by M. Therrien and B. Enciso, pp. 21-58. Instituto Colombiano de Antropología e Historia, Bogotá.

2006 *Patrones de asentamiento regional y sistemas de agricultura intensiva en Cota y Suba, Sabana de Bogotá (Colombia)*. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Bogotá.

2007 *The Evolution of Social Hierarchy in a Muisca Chiefdom of the Northern Andes of Colombia*. Memoirs in Latin American Archaeology 17. University of Pittsburgh and Instituto Colombiano de Antropología e Historia, Pittsburgh.

2013a From Small Household Clusters to the Central Place of the Bogotá Chiefdom, Colombia. In *Multiscalar Approaches to Studying Social Organization and Change in the Isthmo-Colombian Area*, edited by S. D. Palumbo, A. M. Boada, W. A. Locascio and A. Menzies, pp. 39-70. University of Pittsburgh, Universidad de los Andes and Universidad de Costa Rica, Pittsburgh.

2013b Informe de avance del reconocimiento regional sistemático en la sabana de Bogotá, Colombia. *Boletín de Arqueología, Fundación de Investigaciones Arqueológicas Nacionales* 24:5-47.

Boone, James L.

1992 Competition, Conflict, and the Development of Hierarchies. In *Evolutionary Ecology and Human Behavior*, edited by E. A. Smith and B. Winterhalder, pp. 301-337. Aldine de Gruyter, Hawthorne, New York.

Botiva, Álvaro

1989 La altiplanicie Cundiboyacense. In *Colombia prehispánica: regiones arqueológicas*, edited by A. Botiva, G. Cadavid, L. F. Herrera, A. M. Groot and S. Mora, pp. 77–115. COLCULTURA–Instituto Colombiano de Antropología, Bogotá.

Broadbent, Silvia

1966 The Site of Chibcha, Bogotá. *Ñawpa Pacha* 4:1-14.

1970 Reconocimiento arqueológico de la laguna "La Herrera". *Revista Colombiana de Antropología* XV:171-213.

1987 The Chibcha Raised-Field System in the Sabana de Bogotá, Colombia: Further Investigations. In *Pre-Hispanic Agricultural Fields in the Andean Region*, edited by W. M. Denevan, K. Mathewson and G. W. Knapp, pp. 425-442. BAR International series, Oxford.

Cardale de Schrimpff, Marianne

1981a *Las salinas de Zipaquirá, su explotación indígena*. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Bogotá.

1981b Ocupaciones humanas en el altiplano cundiboyacense: la etapa cerámica vista desde Zipaquirá. *Boletín Museo del Oro* (12):1-20.

Castillo, Neila

1984 *Arqueología de Tunja*. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Bogotá.

Cifuentes, Arturo and Leonardo Moreno

1987 Proyecto de rescate arqueológico de la avenida Villavicencio: barrio Candelaria la Nueva, Bogotá. ICANH, Bogotá.

Clark, John E. and Michael Blake

1994 The Power of Prestige Competitive generosity and the emergence of Rank Societies in Lowland Mesoamerica. In *Factional Competition and Political Development in the New World*, edited by E. M. Brumfiel and J. W. Fox, pp. 17-30. Cambridge University Press, Cambridge.

Colmenares, German

1997 *La Provincia de Tunja en el Nuevo Reino de Granada: ensayo de historia social 1539-1800*. Germán Colmenares obra completa. T M Editores, Bogotá.

Correa Rubio, François

2004 *El Sol del poder: simbología y política entre los Muiscas del norte de los Andes*. Universidad Nacional de Colombia, Bogotá.

Correal, Gonzalo

1990a *Aguazuque. Evidencia de cazadores, recolectores y plantadores en la altiplanicie de la cordillera oriental*. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Bogotá.

1990b Evidencias culturales durante el Pleistoceno y Holoceno en Colombia. *Revista de Arqueología Americana* 1 (enero-junio):69-71, 73-89.

Correal, Gonzalo and Thomas Van der Hammen

1977 *Investigaciones arqueológicas en los abrigos rocosos del Tequedama: 12000 años de historia del hombre y su medio ambiente en la altiplanicie de Bogotá*. Fondo de Promoción de la Cultura del Banco Popular, Bogotá.

Cuéllar, Andrea M.

2009 *The Quijos Chiefdoms: Social Change and Agriculture in the Eastern Andes of Ecuador*. University of Pittsburgh Memoirs in Latin American Archaeology 20. University of Pittsburgh, Pittsburgh.

Cuéllar, Mayra Constanza

2010 Ocupación humana y paisajes culturales en el Valle del Río Tota durante el periodo prehispánico y parte del periodo colonial (1560-1777). Magister thesis, Departamento de Antropología, Universidad de los Andes, Bogotá.

Chifeng, International Collaborative Archaeological Research Project

2003 *Regional Archaeology in Eastern Inner Mongolia: A Methodological Exploration*. Science Press, Beijing.

2011 *Settlement Patterns in the Chifeng Region*. Center for Comparative Archaeology, University of Pittsburgh, Pittsburgh.

de Piedrahita, Lucas Fernández

1688 *Historia general de las conqvistas del Nvevo Reyno de Granada*. J.B. Verdussen.

Delgado Burbano, Miguel Eduardo

2012 Mid and Late Holocene population changes at the Sabana de Bogotá (Northern South America) inferred from skeletal morphology and radiocarbon chronology. *Quaternary International* 256(0):2-11.

Department of Agriculture

1961 *Land-Capability Classification. Agriculture Handbook No. 210*. Department of Agriculture, Washington.

Dietler, Michael and Brian Hayden

2010 *Feasts: Archaeological and Ethnographic Pespectives on Food, Politics, and Power*. University of Alabama Press.

Drennan, Robert D.

1985 Archaeological Survey and Excavation. In *Regional Archaeology in the Valle de la Plata, Colombia: A Preliminary Report on the 1984 Season of the Proyecto Arqueológico Valle de la Plata*, edited by R. Drennan. Research Reports in Archaeology. Museum of Anthropology, University of Michigan, Ann Arbor.

1988 Household Location and Compact Versus Dispersed Settlement in Prehispanic Mesoamerica. In *Household and Community in the Mesoamerican Past*, edited by R. R. Wilk and W. Ashmore, pp. 273-293. University of New Mexico Press, Albuquerque.

2000 *Las sociedades prehispánicas del alto Magdalena*. Instituto Colombiano de Antropología e Historia, Bogotá.

2006 Field methods and Data Base. In *Prehispanic Chiefdoms in the Valle de la Plata, Volume 5: Regional Settlement Patterns*, edited by R. D. Drennan, pp. 13-28. Memoirs in Latin American Archaeology 16. University of Pittsburgh, Universidad de los Andes, Pittsburgh, Bogotá.

Drennan, Robert D. and Christian E. Peterson

2004 Comparing Archaeological Settlement Systems with Rank-Size Graphs: A Measure of Shape and Statistical Confidence. *Journal of Archaeological Science* 31(5):533-549.

2008 Centralized Communities, Population, and Social Complexity After Sedentarization. In *The Neolithic Demographic Transition and its Consequences*, edited by J. P. Bocquet-Appel and O. Bar-Yosef, pp. 359-386. Springer.

Drennan, Robert D., Christian E. Peterson and Jake R. Fox

2010 Degrees and Kinds of Inequality. In *Pathways to Power: New Perspectives on the Emergence of Social Inequality*, edited by T. D. Price and G. M. Feinman, pp. 45–76. Fundamental Issues in Archaeology. Springer, New York.

Drennan, Robert D., Mingyu Teng, Christian E. Peterson, Gideon Shelach, Gregory G. Indrisano, Yanping Zhu, Katheryn M. Linduff, Zhizhong Guo and Manuel A Román-Lacayo

2003 Methods for Archaeological Settlement Study. In *Regional Archaeology in Eastern Inner Mongolia: A Methodological Exploration*, edited by C. I. C. A. R. Project, pp. 122-151. Science Press, Beijing.

Drennan, Robert D. and Carlos Alberto Uribe (editors)

1987 *Chiefdoms in the Americas*. University Press of America, Lanham, MD.

Dunnell, Robert C and William S Dancey

1983 The Siteless Survey: A Regional Scale Data Collection Strategy. *Advances in Archaeological Method and Theory* 6:267-287.

Enciso, Braida

1989 Arqueología en el área urbana de Bogotá. *Boletín de Arqueología Fundación de Investigaciones Arqueológicas Nacionales* Año 4 (2)(7):25 – 32.

1990 Arqueología de rescate en el barrio Las Delicias. *Revista Colombiana de Antropología* 28:155-160.

1993a *Desalojo de los Muiscas de Tunjuelo, sur de Santafé, Nuevo Reino de Granada: siglo XVII.* Instituto Colombiano de Antropología.

1993b El ocaso del sol de los venados. Arqueología de rescate en la Sabana de Bogotá. *Revista Colombiana de Antropología* 30:149–182.

1995a El tejido: vestigios arqueológicos de una antigua tradición. *Revista Colombiana de Antropología y Arqueología* 11:143–186.

1995b *Ruinas de un poblado Muisca en el Valle del Río Tunjuelito. Urbanización Nueva Fábrica, antes Industrial Las Delicias.* . Insituto Colombiano de Antropología.

1996 Fauna asociada a tres asentamientos Muiscas de la Sabana de Bogotá. Siglos VIII al XIV d.C. In *Bioantropología de la Sabana de Bogotá*, edited by B. Enciso and M. Therrien, pp. 40–58. Instituto Colombiano de Antropología–Colcultura, Bogotá.

Escallón, María Fernanda

2005 *Decoración, cronología y territorio: un estudio comparativo de la cerámica Herrera del altiplano cundiboyacense*. Universidad de Los Andes, Facultad de Ciencias Sociales, Departamento de Antropología.

Fajardo Bernal, Sebastián

2011 *Jerarquía social de una comunidad en el valle de Leiva: Unidades domésticas y agencia entre los siglos XI y XVII*. Informes Arqueológicos 6. Instituto Colombiano de Antropología e Historia, Bogotá.

Falchetti, Ana María

1975 *Arqueología de Sutamarchán, Boyacá*. Biblioteca Banco Popular, Bogotá.

Falchetti, Ana María and Clemencia Plazas

1973 *El territorio de los Muiscas a la llegada de los españoles*. Cuadernos de Antropología. Universidad de los Andes, Bogotá.

Feinman, Gary M. and Jill Neitzel

1984 Too Many Types: An Overview of Sedentary Prestate Societies in the Americas. *Advances in Archaeological Method and Theory* 7:39–102.

Feinman, Gary M. and Linda M. Nicholas

2012 Compact versus Dispersed Settlement in Pre-Hispanic Mesoamerica. In *The Neighborhood as a Social and Spatial Unit in Mesoamerican Cities*, edited by C. Arnauld, L. R. Manzanilla and M. E. Smith, pp. 132-155. University of Arizona Press, Tucson.

Feinman, Gary M., Steadman Upham and Kent G. Lightfoot

1981 The Production Step Measure: An Ordinal Index of Labor Input Ceramic Manufacture. *American Antiquity* 46(4):871-884.

Flórez, Franz

1998 *Informe sobre el hallazgo de vestigios de "un grupo cultural prehispánico anterior a los muiscas" en inmediaciones del municipio de Iza (Boyacá)*. Instituto Colombiano de Antropología.

Flórez, Franz and Carl Henrik Langebaek

1998 Arqueología de rescate en Iza, Boyacá (Avance de investigación). *Revista de Antropología Universidad de los Andes* 10(1):184-185.

Francis, Michel

2005 Población, enfermedad y cambio demográfico, 1537-1636. Demografía Histórica de Tunja: una mirada crítica. In *Muiscas: Representaciones, cartografías y etnopolíticas de la memoria*, edited by A. M. Gómez, pp. 74-151. Pontificia Universidad Javeriana, Bogotá D.C.

Friede, Juan

1965 Algunas consideraciones sobre la evolución demográfica en la Provincia de Tunja. *Anuario Colombiano de Historia Social y de la Cultura* 2(3):12-13.

Gamboa, Jorge Augusto

2004 La encomienda y las sociedades indígenas del Nuevo Reino de Granada: El caso de la provincia de Pamplona (1549-1650). *Revista de Indias* LXIV(232):749-770.

2013 *El cacicazgo muisca en los años posteriores a la conquista: Del sihipkua al cacique colonial, 1537-1575. Segunda Edición*. Instituto Colombiano de Antropología e Historia.

Garavito, Diana

2007 Interacción cultural prehispánica en el Valle del Tundama y Sugamuxi. Una mirada desde los albores del saber tecnológico alfarero. Bachelor thesis, Departamento de Antropología, Universidad Nacional de Colombia, Bogotá.

Gilman, Antonio

1987 Unequal Development in Copper Age Iberia. In *Specialization, Exchange and Complex Societies*, edited by E. M. Brumfiel and T. K. Earle, pp. 22-29. Cambridge University Press, Cambridge.

2001 Assesing Political Development in Copper and Bronze Age Southeast Spain. In *From Leaders to Rulers*, edited by J. Haas, pp. 59-81. Fundamental Issues in Archaeology. Kluwer Academic/Plenum Publishers, New York.

Gómez, Andrea, Juan Carlos Berrio, Henry Hooghiemstra, Miguel Becerra and Rob Marchant

2007 A Holocene pollen record of vegetation change and human impact from Pantano de Vargas, an intra-Andean basin of Duitama, Colombia. *Review of palaeobotany and palynology* 145(1):143-157.

Groot, Ana Maria

1992 *Checua:una secuencia cultural entre 8500 y 3000 años antes del presente (municipio de Nemocón)*. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Bogotá.

Gutierrez, Sylvia de and Lieselotte de Garcia

1985 *Proyecto de arqueología de rescate, Funza III*. Instituto Colombiano de Antropologia e Historia.

Haller, Mikael J.

2008 *Asiento Viejo and the Development of the Rio Parita Chiefdom, Panama*. University of Pittsburgh Memoirs in Latin American Archaeology 19. University of Pittsburgh, Pittsburgh.

Hayden, Brian

2001 Richman, Poorman, Beggarman, Chief: The Dynamics of Social Inequality. In *Archaeology at the Millennium: A Sourcebook*, edited by G. M. Feinman and T. D. Price, pp. 231–272. Springer, New York.

Henderson, Hope

in press La formación de comunidades cacicales y la desigualdad política: retos para comprender el cambio social. Universidad Nacional de Colombia, Bogota.

Henderson, Hope and Nicholas Ostler

2005 Muisca Settlement Organization and Chiefly Authority at Suta, Valle de Leyva, Colombia: A Critical Appraisal of Native Concepts of House for Studies of Complex Societies. *Journal of Anthropological Archaeology* 24:148–178.

Hernández de Alba, Gregorio

1937 El Templo del Sol de Goranchacha. *Revista de Indias* 2:10-18.

Herrera, Marta

1998 Ordenamiento espacial de los pueblos de indios. Dominación y resistencia en la sociedad colonial. *Fronteras* 2(2):93-128.

IGAC-UPTC

1980 *Estudio General de suelos de los municipios de Aquitania, Cuitiva, Firavitoba, Iza, Mongui, Nobsa, Sogamoso, Tibasosa, Topaga y Tota (Departamento de Boyacá)*. Instituto Geográfico Agustín Codazzi - Subdirección Agrícola.

2005 *Estudio general de suelos y zonificación de tierras del departamento de Boyacá* Tomo I. Instituto Geográfico Agustín Codazzi, Bogota D.C.

Jaramillo, Luis G

2015 *Sopó en contexto: Estudio arqueológico y documental sobre el poblamiento de la cuenca del río teusacá. vol. 1*. Universidad de los Andes, Bogotá.

Johnson, Allen W. and Timothy K. Earle

2000 *The Evolution of Human Societies: From Foraging Group to Agrarian State*. Stanford University Press, Stanford.

Kennett, Douglas, Atholl Anderson and Bruce Winterhalder

2006a Demographic Expansion, Despotism, and the Colonisation of East and South Polynesia. In *Islands of Inquiry: Colonisation, Seafaring and the Archaeology of Maritime Landscapes*, edited by G. Clark, F. Leach and S. O'Connor, pp. 87-96. Australia National University Press, Canberra.

2006b The Ideal Free Distribution, Food Production, and the Colonization of Oceania. In *Behavioral Ecology and the Transition to Agriculture*, edited by D. Kennett and B. Winterhalder, pp. 265-288. Origins of Human Behavior and Culture. University of California Press, Berkeley.

Kennett, Douglas, Bruce Winterhalder, Jacob Bartuff and Jon M. Erlandson

2009 An Ecological Model for the Emergence of Institutionalized Social Hierarchies on California's Northern Channel Islands. In *Pattern and Process in Cultural Evolution*, edited by S. Shennan, pp. 297-314. University of California Press, Berkeley.

Kowalewski, Stephen A., Gary M. Feinman, Laura Finsten, Richard E. Blanton and Linda M. Nicholas

1989 *Monte Albán's Hinterland, Part 2: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlán, the Valley of Oaxaca, Mexico*. Memoirs of the Museum of Anthropology 23. University of Michigan, Ann Arbor.

Kruschek, Michael H.

2003 The Evolution of the Bogotá Chiefdom: A Household View. PhD dissertation, Department of Anthropology, University of Pittsburgh, Pittsburgh.

Langebaek, Carl Henrik

1987 *Mercados, poblamiento e integración étnica entre los Muiscas, siglo XVI*. Banco de República, Bogotá.

1991 Highland Center and Foothill Periphery in 16th-century Eastern Colombia. *Research in Economic Anthropology* 13:325–339.

1995 *Regional Archaeology in the Muisca Territory: A Study of the Fúquene and Susa Valleys*. University of Pittsburgh Memoirs in Latin American Archaeology 9. University of Pittsburgh and Universidad de los Andes, Pittsburgh.

2001 *Arqueología regional en el valle de Leiva: Procesos de ocupación humana en una región de los Andes orientales de Colombia*. Informes Arqueológicos 2. Instituto Colombiano de Antropologia e Historia, Bogotá.

2005 Fiestas y caciques Muiscas en el Infiernito, Colombia: Un análisis de la relación entre festejos y organización política. *Boletín de Arqueología PUCP* 9:205-295.

2008 Dos teorías sobre el poder político entre los Muiscas: un debate a favor del diálogo. In *Los Muiscas en los siglos XVI y XVII: Miradas desde la arqueología, la antropología y la historia*, edited by J. A. Gamboa, pp. 64-93. Ediciones Uniandes, Bogotá.

Leguizamón, Laura Paloma

2012 Explorando la noción de "casa" en los contextos domésticos y funerarios en la Sabana de Bogotá entre los siglos VIII y XIII d. C. Magister Thesis, Departamento de Antropología, Universidad Nacional de Colombia, Bogotá.

Martín, Alexander J.

2010 The Domestic Economy and its Implications for Social Complexity: Spondylus Craft Production in Coastal Ecuador. *Research in Economic Anthropology* 30:111-155.

Mingarro Arnandis, Mariangeles

2004 *Tributo y familia en nueva Granada: la provincia de Tunja en los siglos XVII y XVIII*. Publicacions de la Universitat Jaume I.

Mojica, Lucila and Jorge Mariño

2013 Estado de la exploración y posibilidades de gas asociado al carbón (GAC) en Boyacá (Colombia). *Boletin de Geología* 35:31-43.

Nieuwenhuis, Channan José

2002 *Traces on Tropical Tools: A Functional Study of Chert Artefacts from Preceramic Sites in Colombia*. Faculty of Archaeology, University of Leiden.

Pearson, George A.

2004 Pan-American Paleoindian Dispersals and the Origins of Fishtail Projectile Points as Seen through the Lithic Raw-Material Reduction Strategies and Tool-Manufacturing Techniques at the Guardiría Site, Turrialba Valley, Costa Rica. In *The American Continents. A Multidisciplinary Approach to Human Biogeography*, edited by M. Barton, G. Clark, D. R. Yesner and G. A. Pearson, pp. 85-102. The University of Arizona Press, Tucson.

Peña, German

1991 *Exploraciones arqueológicas en la cuenca media del río Bogotá*. Fundación de Investigaciones Arqueológicas Nacionales, Bogotá.

2013 *Pescadores de los raudales del río Magdalena durante el período formativo tardío (siglos V al I a.C)* Universidad Nacional de Colombia, Bogotá.

Peterson, Christian E. and Robert D. Drennan

2005 Communities, Settlements, Sites, and Surveys: Regional-scale Analysis of Prehistoric Human Interaction. *American Antiquity* 70:5-30.

Pradilla, Helena, Germán Villate and Francisco Ortiz

1992 Arqueología del cercado grande de los santuarios. *Boletín del Museo del Oro* 32-33:21-147.

Pradilla, Helena, Germán Villate, Luis Wiesner and Francisco Ortiz

1991 *Estudio arqueológico de la UPTC: informe de investigación*. Universidad Pedagógica y Tecnológica de Colombia.

Price, T. Douglas and Gary M. Feinman (editors)

2010 *Pathways to Power: New Perspectives on the Emergence of Social Inequality*. Springer, New York.

Ramírez, Luisa Verónica

2009 Desigualdad social en las poblaciones prehispánicas. Estudio de las evidencias arqueológicas de un cementerio muisca en Usme, localidad 5 de Bogotá. Magister Thesis, Departamento de Antropología, Universidad Nacional de Colombia, Bogotá.

Rausch, Jane

1994 *Una Frontera de la Sabana Tropical. Los Llanos de Colombia 1534-1831*. Banco de la República, Bogotá.

Reichel Dolmatoff, Gerardo

1943 Apuntes arqueológicos de Soacha. *Revista del Instituto Etnológico Nacional* 1:15–25.

Rodríguez, José Vicente

2007 La diversidad poblacional de Colombia en el tiempo y el espacio: Estudio craneométrico. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 31(120):321-346.

2011 *Los Chibchas: Hijos del sol, la Luna y los Andes*. Universidad Nacional de Colombia, Facultad de Ciencias Humanas, Departamento de Antropología, Bogotá.

Rodríguez, Julio

2009 Ideología y liderazgo político en la periferia: Una perspectiva desde el cacicazgo de Suta. Valle de Leyva siglos XIII y XVI. Master Thesis, Departamento de Antropología, Universidad Nacional de Colombia, Bogotá.

Rodríguez Ramírez, Camilo

1999 *La filiación cultural entre los períodos Herrera y Muisca: el caso del cementerio precolombino de San Lorenzo Bajo, Duitama, Boyacá*. Consorcio Montecz-Conequipos.

Rojas, Edwin, Blanca Arce, Andrés Peña, Francisco Boshell and Miguel Ayarza

2010 Cuantificación e interpolación de tendencials locales de temperatura y precipitación en zonas alto andinas de Cundinamarca y Boyacá (Colombia). *Revista Corpoica - Ciencia y Tecnología Agropecuaria* 11(2):173-182.

Romano, Francisco

2002 *¿Y usted con quién se casa? San Carlos: Documentando 2.500 años de organización social en una comunidad central de la sabana de Bogotá (Funza, Cundinamarca).* Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República, Bogotá.

2003 San Carlos: Documentando trayectorias evolutivas de la organización social de unidades domésticas en un cacicazgo de la Sabana de Bogotá (Funza, Cundinamarca). *Boletín de Arqueología Fundación de Investigaciones Arqueológicas Nacionales* 18:3–51.

Salamanca, Maria Fernanda

2001 Tiguasú, el caso de un asentamiento herrera-muisca temprano en el valle de Leiva. In *Arqueología regional en el valle de Leiva: Procesos de ocupación humana en una región de los Andes orientales de Colombia*, edited by C. H. Langebaek, pp. 60-68. Informes arqueológicos. vol. 6. Instituto Colombiano de Antropología e Historia, Bogotá.

Salge, Manuel

2005 Festejos muiscas en El Infiernito, valle de Leyva. La consolidación del poder social. Magister Thesis, Departamento de Antropologia, Universidad de los Andes, Bogota.

2007 *Festejos muiscas en El Infiernito, valle de Leyva: Consolidación del poder social*. Departamento de Antropología, Universidad de Los Andes, Bogotá.

Sanders, William T., Jeffrey R. Parsons and Robert S. Santley

1979 *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization*. Academic Press, New York.

Silva Celis, Eliécer

1945a Investigaciones arqueológicas en Sogamoso. *Boletín de Arqueología* 1(2 mar-abr):93-112.

1945b Investigaciones arqueológicas en Sogamoso. *Boletín de Arqueología* 1(6 nov-dic):467-491.

1945c Investigaciones arqueológicas en Sogamoso. *Boletín de Arqueología* 1(4 julio agosto):283-298.

1945d Investigaciones Arqueológicas en Sogamoso. *Boletín de Arqueología* 1(Febrero):36-44.

1981 Investigaciones Arqueológicas en Villa de Leiva. *Boletín del Museo del Oro* Año 4 Enero–Abril:1–18.

1983 Descubrimiento Arqueológico en Villa de Leiva. *Boletín de Antropología* 5(17–19 t1):235–250.

1986 Las Ruinas de los Observatorios Astronómicos Precolombinos Muiscas. In *Villa de Leiva: Huella de los Siglos*, edited by F. Restrepo, pp. 49–57. Sandri y Cía Editores, Croydon, Bogotá.

Simón, Fray Pedro

[1626] 1981 *Noticias historiales de las conquistas de tierra firme en las Indias Occidentales* Vol. 1. 6 vols. Biblioteca Banco Popular, Bogotá.

Smith, Eric Alden and Jung-Kyoo Choi

2007 The Emergence of Inequality in Small-Scale Societies: Simple Scenarios and Agent-Based Simulations. In *The Model-Based Archaeology of Socionatural Systems*, edited by T. A. Kholer and S. E. Van der Leeuw, pp. 105-119. School for Advanced Research Press, Santa Fe, NM.

Smith, Michael E. (editor)

2011 *The Comparative Archaeology of Complex Societies*. Cambridge University Press, Cambridge.

Sotomayor, María Lucía

2004 *Cofradías, caciques y mayordomos: Reconstrucción social y reorganización política en los pueblos de indios, siglo XVIII*. Colección Cuadernos Coloniales XII. Instituto Colombiano de Antropología e Historia, Bogotá.

Steponaitis, Vincas. P

1978 Location Theory and Complex Chiefdoms: A Mississippian Example. In *Mississippian Settlement Patterns*, edited by B. D. Smith, pp. 417-453. Academic Press, New York.

Stone, Glenn Davis

1993 Agrarian Settlement and the Spatial Disposition of Labor. In *Spatial Boundaries and Social Dynamics: Case Studies from Food-Producing Societies*, edited by A. Holl and T. E. Levy, pp. 25-38. Internationational Monographs in Prehistory, Ann Arbor.

Therrien, Mónika, Jimena Lobo Guerrero and Elena Uprimmy

2002 *Catálogo de cerámica colonial y republicana de la Nueva Granada: producción local y materiales foráneos (Costa Caribe, Altiplano Cundiboyacense-Colombia)*. Fundación de Investigaciones Arqueológicas Nacionales, Banco de la República,, Bogotá.

Tovar, Hermes

1988 *No hay caciques ni señores*. Sendai, Barcelona.

Underhill, Anne P., Gary M. Feinman, Linda M. Nicholas, Hui Fang, Fengshi Luan, Haiguang Yu and Fengshu Cai

2008 Changes in Regional Settlement Patterns and the Development of Complex Societies in Southeastern Shandong, China. *Journal of Anthropological Archaeology* 27(1):1-29.

Villamarin, Juan A.

1972 Encomenderos and Indians in the Formation of Colonial Society in the Sabana de Bogotá, Colombia--1537 to 1740. (Volumes I and II). PhD dissertation, Brandeis University, Ann Arbor.

Villate, Germán

2001 *Tunja prehispánica. Estudio documental del asentamiento indígena de Tunja*. Universidad Pedagógica y Tecnológica de Colombia–Colciencias, Tunja.

Wright, Henry T.

1984 Prestate Political Formations. In *On the Evolution of Complex Societies, Essays in Honor of Harry Hoijer*, edited by T. K. Earle, pp. 41-77. Undena Press, Malibu, CA.