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PREHISPANIC PRESENCE, SETTLEMENT PATTERNS AND ECOLOGICAL COMPLEMENTARITY IN THE LOMAS OF THE SAMA VALLEY, TACNA, PERU

PRESENCIA HUMANA, PATRONES DE ASENTAMIENTOS PREHISPÁNICOS Y COMPLEMENTARIEDAD ECOLÓGICA EN LAS LOMAS DEL VALLE DE SAMA, TACNA, PERÚ

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Pedestrian survey of the middle Sama Valley (460-730 masl), Tacna, on the far south coast of Peru has identified 47 archaeological sites dating from the Archaic to the Late Horizon Period. Early hunter-gatherer populations occupied lomas and riparian environments in connection with coastal-highland mobility. The arrival of agropastoralist Cabuza populations in the terminal Middle Horizon foreshadowed Murra's (1972) early Colonial "vertical complementarity" mode. Throughout the late prehispanic period a series of highlander incursions into the valley occurred attracted by the arable valley, lomas pasture, and proximity to the coast, culminating in the installation of Inca imperial infrastructure.

Keywords: Settlement patterns, lomas, south-Andean coast, Archaic Period, Middle Horizon, Late Horizon, verticality.

La prospección pedestre del valle medio de Sama (460-730 msm), Tacna, en el extremo sur del Perú permitió identificar 47 sitios arqueológicos del periodo Arcaico hasta el Horizonte Tardío. Poblaciones de cazadores-recolectores ocuparon lomas y ambientes ribereños probablemente como parte de un patrón de movilidad entre la costa y el altiplano. La llegada de poblaciones agropastoriles Cabuza al final del Horizonte Medio presagió el modo de "complementariedad vertical" (Murra 1972). A partir del periodo Prehispánico Tardío, se inició una serie de incursiones de poblaciones serranas al valle medio de Sama promovido por la presencia de terrenos de cultivo, pasto de lomas, y acceso a recursos marinos, lo cual culminó en la instalación de infraestructura imperial Inca.

Palabras claves: *patrones de asentamiento, lomas, costa surandina, periodo Arcaico, Cabuza, Inca, verticalidad.*

Human mobility along the slopes of the southern Andes has deep antiquity (Mujica 1985; Nuñez and Dillehay 1995). Domestication and social complexity substantially transformed the modes and intensity by which humans exploited the vertically stacked ecological niches (Murra 1972). The most profound shift in land-use occurred with the introduction of agriculture as populations became reliant on irrigable river valleys that could sustain large populations. As a result, some Andean environments (puna, *lomas*, coast) that had supported mobile hunter-gatherer populations for millennia became marginal to complex agricultural societies.

The importance of lomas, zones of seasonal vegetation growth along the hyperarid Pacific coast, for complex agrarian societies during later prehispanic times is evident in early ethnohistorical documents. They inform us that pasture and farming potential of the valleys on the far south coast of Peru attracted highland populations to places such as the Sama valley (modern-day Tacna) (Diez de San Miguel 1964 [1567]; Rostworowski 1981; Vasquez de Espinoza 1959 [1669]). Here, we present pilot data from full-coverage pedestrian survey of the lomas and edge of the middle Sama Valley (460-730 masl) conducted in 2017, a necessary initial step for examining

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long-term changes in land-use patterns at the regional scale. Survey results reveal human presence in the lomas zone of the Sama Valley as early as the Archaic period. Following a possible hiatus of human occupation in this part of the valley during the Formative period, the area saw a substantial influx of highland-affiliated Cabuza populations during the terminal Middle Horizon period, followed by subsequent incursions of altiplano and Inca groups during the late prehispanic period. We argue that settlement location during these times reflect a continued interest in lomas resources among agricultural groups anticipating regional exchange and mobility dynamics of the early Colonial period.

Ecology and Culture History of the Sama Valley

Lomas

Lomas form a distinct ecological niche within the *chala* and *yunga* zones. Here, life depends on a dual water regime of rivers fed by high-elevation snow and rainfall during the austral summer (December-March), and thick coastal fogs (*garúa*, *camanchaca*) (<100 mm) during the austral winter (June-September). The latter saturate the sandy slopes below the Andean foothills (200-800 masl) enabling growth of specially adapted vegetation (Ohga 1992:343). Along the Pacific coast, lomas vary in elevation, extent, and composition of plant communities (Muenchow et al. 2013; Rundel et al. 1991). Plant growth initiated by coastal fogs creates a feedback loop by which the plants provide surface for condensation, contributing to the creation of freshwater pools that attract animals and humans beyond river valleys (Marquet et al. 1998). Andean camelids and cervids are drawn to herbaceaous lomas that coincide seasonally with the highland dry season (Masuda 1985:243).

Lomas attracted animals and humans from the highlands and coasts as early as the Archaic Period (Engel 1973:279). They provided seasonal hunting grounds (Bereford-Jones et al. 2015:205; Patterson and Lanning 1964), and probably sustained small populations year-round on the central and southern Andean coast, provided local available of freshwater (Bereford-Jones et al. 2015:202; Engel 1973:274; Lavalléeet al. 2011).The sensitivity of lomas to paleoclimatic changes in ocean temperature, ENSO and La Niña events during the Middle Preceramic period may even have contributed to plant management and increased sedentism (Beresford-Jones et al. 2015:213).

Archaeological studies of later prehispanic periods pay less attention to lomas as seasonal ecosystems that complement the agricultural regimes of river valleys. In part, this is caused by a bias toward studying valleys and their year-round inhabitants. By the end of the third millennium BC, populations had begun to aggregate in villages along the arable valleys of the southern Andean valleys, engaging in floodplain agriculture (Bawden 1989; Goldstein 2000; Rivera 1995). It is likely that these settlers continued to exploit nearby lomas resources but their footprint would be ephemeral and beyond the archaeological focus. Although some scholars have argued for the gradual disappearance of lomas due to increased aridity over the last millennia (Lanning 1967), this hypothesis has not been substantiated across the region (Craig 1985).

Into the late prehispanic period, lomas were exploited by transhumant pastoralists with formal or informal affiliation to highland states. On the south coast, sites such as Quebrada Honda, Quebrada de la Vaca, and Cahuamarca bear witness to diverse economic activities, including the extraction of seaweed and guano by altiplano populations (Masuda 1985:244; Trimborn 1988:23, 85). Archaeological studies of the Pacific littoral, the river valleys of the western Andes, and the puna emphasize environments that sustained human populations year-round. Understanding how lomas acted as a productive seasonal environment in their own right and as a conduit between other ecosystems before and after the introduction of agriculture promises to address fundamental questions about cultural and ecological complementarity and connectedness in the ancient Andes.

The Sama Valley

Geography and ecology

The Sama Valley is located between the Moquegua and Locumba valleys to the north, and the Caplina and Azapa valleys to the south (Figure 1). The Sama River originates at the Barroso and Pisacani mountain ranges (Department of Tacna, Peru), which include the snowy peaks of El Fraile (5,569 masl), Chupiquina (5,805 masl), and Picasani (5,424 masl). Tributaries of the Sama River traverse the intermontane Tarata valley (3,500–4,500 masl) before descending through a steep and narrow valley to the Andean piedmont (600 masl). Here, the valley opens onto the coastal plain of the Atacama Desert, which the river incises as it meanders toward the coast (Figure 2).

Bordered by steep sandy slopes, the 1-2 km-wide floodplain of the middle Sama River supports a riparian ecosystem that facilitates year-round agriculture (Marquet et al. 1998:598). Modern irrigation technology has expanded the valley's agricultural boundaries onto the desert plain above the valley. In the middle Sama Valley (400-600 masl), the river flows along the left valley margin, so that most of the arable flood plain is located to the right of the river. In some

areas, annual floods have eroded the lower edges of the border slopes exposing strata of rocks and sediments deposited by earlier floods. The modern canal line lays ca. 7 m above the river along the right side of the valley. During the austral winter, the gently sloping desert plain between 400 and 700 masl becomes verdant with herbaceous lomas covering an area of almost 200 km^2. Between 400 and 280 masl, river flow volume decreases due to agricultural use and evaporation, and cultivation focuses on cane and cotton. Below this elevation, valley topography and water flow make agriculture undesirable. Potable water presents itself exclusively as river water; in addition, freshwater springs fed by a high groundwater table form small patches of wetlands along the valley bottom.

Fifty kilometers downriver from where the Sama River emerges from the Andean foothills it drains into the Pacific Ocean. The Pacific littoral with its cold-water upwelling of the Humboldt Current offers perennial marine resources such as fish, shellfish, marine mammals, seaweed, guano, and coastal bird species. The scarcity of freshwater is the only limiting factor for sustaining sizable populations in this area. The mouth of the Sama River is constricted by the Morro de Sama, the southern tip of the coastal mountain range that abruptly rises from the Pacific littoral between Acari and Sama. In the valleys north of Sama, this topography limits lomas to the littoral zone; in Sama the absence of coastal mountains allows fogs to penetrate the desert plain to the Andean piedmont unobstructed creating an expansive lomas zone.

Archaeological research in Sama

Previous archaeological research bookends the prehispanic human occupation of the valley. Lavallée's excavations at the Archaic-period site of Quebrada de los Burros (QLB) (<100 masl) (Figure 2), 20 km

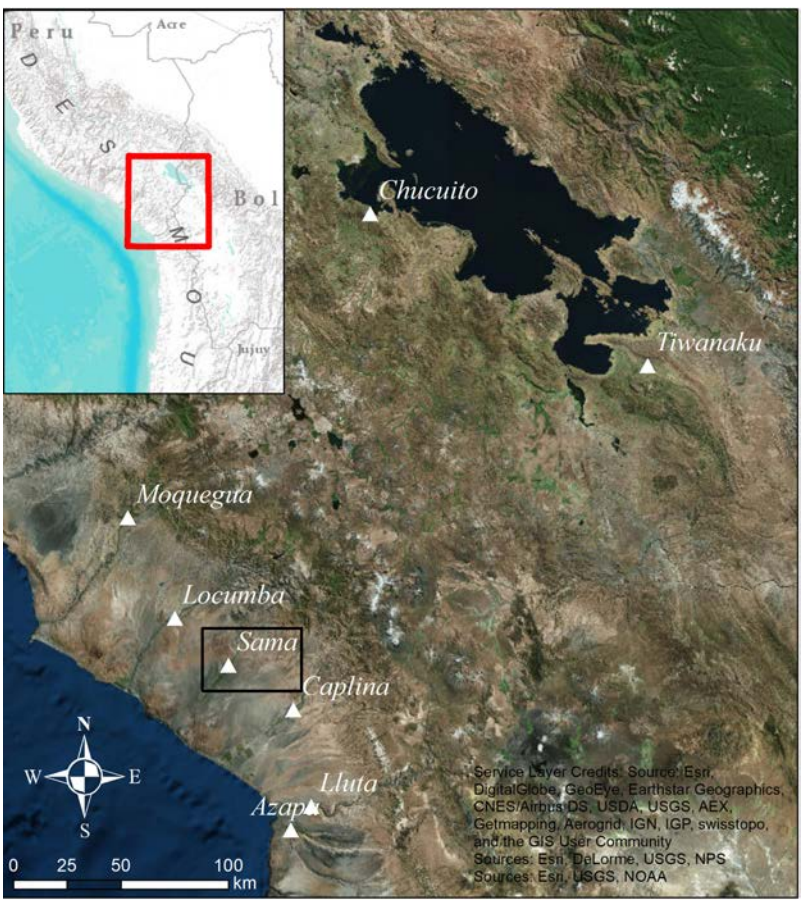

Figure 1. Regional map of the southern Andes.

Mapa regional del sur de los Andes.

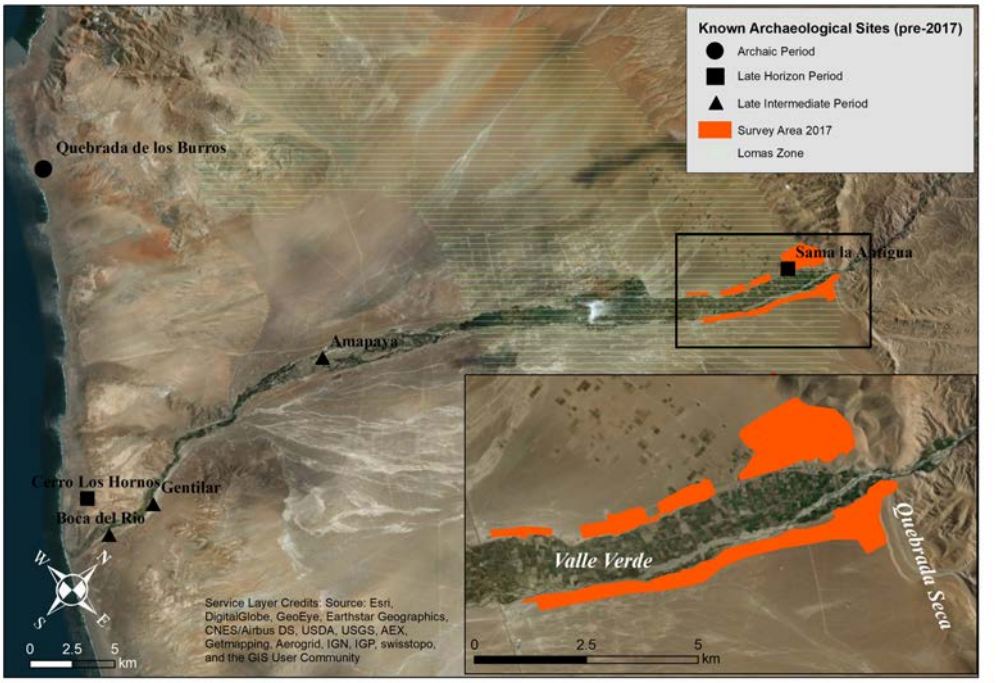

Figure 2. Map of the middle Sama Valley showing the extent of the lomas zone, archaeological survey limits, and archaeological sites known prior to 2017.

Mapa del valle medio de Sama indicando zona de lomas, límites de prospección arqueológica y sitios arqueológicos, conocidos antes de 2017.

north of the mouth of the Sama River, documented early occupations of coastal dwellers like those found on the Peruvian far south coast and the Norte de Chile (Bawden 1989; Keefer et al. 1998; Sandweiss et al. 1998; Standen et al. 2004). During periods of increased humidity and decreased ENSO activity in the Early (ca. 9600-8600 cal. BP) and Middle Holocene (ca. 7400-6800 cal. BP), freshwater springs and the Pacific Ocean attracted seasonal and possibly even year-round human occupations to QLB (Lavallée et al. 2011:342). Lithic tools made from local chert and quartzite were used to exploit marine and terrestrial resources (Lavallée et al. 1999:409). Small but ubiquitous amounts of camelid and cervid remains and carbonized edible and medicinal plants in the QLB middens led Lavallée and colleagues to argue that coastal dwellers had access to *lomas* resources, diminishing the need for mobility beyond the immediate area (Lavallée et al. 2011:347).

Sporadic survey and test excavations in the lower Sama Valley by Vescelius (1960) and Trimborn (1975, 1977, 1981) report mortuary sites tentatively dated to the Formative and late prehispanic periods. At the lower valley site of Amapaya, Trimborn excavated a burial accompanied by a Gentilar-style vessel; a nearby *quincha* structure from the same site yielded a date from the first millennium BC (Trimborn1975:480). Explorations of the Sitajara region in the intermontane Tarata valley (3,000 masl) indicate a sizeable occupation of the upper Sama valley during the Late Intermediate Period (Gordillo 1996). Small residential highland sites in defensive locations conform to regional patterns of political fragmentation and a return to village life following the collapse of the Tiwanaku state (Gordillo 1996:104). Local ceramic styles are reminiscent of coastal styles like Gentilar and Pocoma (Gordillo 1996:108), although ethnohistorical accounts of the colonization of the Sama Valley by the altiplano Lupaqa and Pacajes kingdoms led Gordillo (1996:108) to propose that highland influence was also significant.

The Inca occupation of the valley centered at the site of Sama la Antigua (or Sama Grande; 570 masl) near the opening of the middle valley (Covey 2000). Trimborn mapped the site architecture and conducted test excavations (Trimborn 1977, 1981). Inca Imperial and altiplano style (Pacajes, Saxamar, Chilpe) ceramic assemblages from Sama la Antigua suggest a multicultural occupation (Trimborn 1981). Late Tiwanaku-style (Loreto Viejo style) sherds recovered near Sama la Antigua suggested to Trimborn the presence of highland populations in Sama as early as the Middle Horizon (Trimborn 1981:19). On the Pacific coast, the Inca site of Cerro Los Hornos may have administered ceramic production and marine resources extraction (Vela 2004). Another small Inca site, Qhile, in the Susapaya region (3,200 masl) indicates Inca control extending the length of the Sama valley (Williams et al. 2009:628).

Perhaps the most compelling reason for expanding our archaeological understanding of the Sama Valley is the Colonial-period *visita* of Garci Diez de San Miguel to Chucuito in 1567. Diez de San Miguel mentions Lupaqa *mitimaes* in Sama, Moquegua, and Arequipa (1964 [1567]:F.7v.17). In Sama, *mitimaes* numbered between 200 and 380 heads of household from the upper and lower moieties of the Lupaqa kingdom (1964[1567]:F.31v. 66). Like the *mitimaes* in Moquegua and Arequipa that settled at higher elevations (>1,300 masl), yungas in the middle Sama Valley cultivated maize and cotton. Unique to Sama were the intensive cultivation of *ají* peppers, the availability of lomas pasture, and the proximity to guano, which was procured by camelid caravans travelling 8 to 9 *leguas* (circa 40 km, or the distance from Sama la Antigua to the coast) (1964 [1567]:F.61v. 126). These goods were transported to the highlands in exchange for meat (*charqui*), wool, and clothing. Diez de San Miguel reports local informants praising the richness of the agricultural terrains of the Sama Valley (1964 [1567]:F.63r.128), although informants also stated that the salty river waters made the valley unsuitable for fruit cultivation (Diez de San Miguel 1964 [1567]:F.61v.126).

Previous archaeological research in Sama hints at the importance of the valley for addressing questions related to the culture history and ecology of the western valleys of the southern Andes. Archaic occupations of the highlands, coastal littoral, and lomas to the north and south of Sama have been studied extensively over the last half century, finding evidence of year-round human presence in diverse ecological niches, reliance on local resources, complex mobility patterns, and long-distance exchange (e.g., Aldenderfer 1989; Bawden 1989; Capriles et al. 2011; Lavallée et al. 2012; Owen 1993; Sandweiss et al. 1998; Standen et al. 2004). In Sama, the riparian valley ecosystem is confined by lomas that border the Andean foothills, creating unique ecological conditions with a high potential for attracting mobile hunter-gatherer populations seasonally or even year-round. Regional archaeological survey has the potential for identifying early human presence in this key location between the better-understood highlands and coast. Does Archaic period evidence in the Sama Valley suggest an intensive occupation of the area in general, and of the lomas or riparian environments specifically?

The Sama Valley is also of interest for understanding the timing and scale of altiplano populations moving into the lower valleys in the later prehispanic periods. Current models propose two waves of highland populations dispersing into and across the region during the 7th and 12th centuries AD in relation to the rise and collapse of the Tiwanaku state, respectively (Goldstein 2005; Korpisaari et al. 2014; Owen 2005; Sutter 2005). Archaeological evidence from the Osmore drainage has been instrumental for shaping the current narrative, drawing on valley-wide changes in settlement patterns, household and mortuary excavation, ceramic styles, and biological affinity (Goldstein 2005; Goldstein and Owen 2001; Owen 1993, 2005; Sutter and Sharratt 2010). The Azapa Valley in northern Chile is the only other location, to date, that has significantly contributed to understanding the second diaspora associated with the Tiwanaku state (e.g., Goldstein 1996; Rivera 1985; Rothhammer and Santoro 2001; Uribe and Agüero 2001); unfortunately, there the evidence is largely limited to evidence from mortuary contexts. Did Sama's agricultural lands and seasonal lomas located between the Osmore and Azapa valleys attract Tiwanaku-affiliated highland populations during the Middle Horizon, or did Tiwanaku-derived groups populate the area in the wake of Tiwanaku state collapse (Owen 2005)?

Lastly, the site of Sama la Antigua has been identified as an Inca administrative center that housed Lupaqa *mitimaes* (Covey 2000; Trimborn 1981). Archaeological survey presents a necessary first step to understanding the influence of different highland polities in the region beyond Sama la Antigua. What was the scale of altiplano and Inca occupation of the Sama Valley during the late prehispanic period? What other evidence exists of imperial investments in the region? How does the LIP highland occupation compare to earlier periods in terms of site location? Regional survey of the middle Sama Valley can address some of these questions with the potential for highlighting future topics of importance for the region.

Survey Methodology

In June and July 2017, our team conducted full-coverage pedestrian survey of an 8 km-long corridor along the left and right margins of the middle Sama Valley between 430 and 730 masl (Figure 2). Nearest the foothills, the survey zone was 1 km wide but was narrowed to 300 m farther downriver where modern agricultural and residential use of the desert plains inhibited access and visibility. Survey focused on the desert plain (ca. 30 m above river level) but included the sandy slopes above the modern canal line. In total, the survey covered an area of 7.7 km^2 by walking 8 m-wide serpentine transects. Visibility was almost 100% due to the absence of plant cover, except for modern roads, urbanized zones, and fields under cultivation.

We piece-plotted and collected diagnostic ceramic and lithic artifacts and recorded presence of non-diagnostic materials to define site boundaries and determine site chronology. Artifacts, architecture, and other relevant features were photographed and mapped using handheld Garmin eTrex 20x GPS. Artifacts

were cleaned, photographed, counted, and weighed. Preliminary analysis of lithic forms and raw material, and ceramic forms and styles were conducted, as well. Ceramic styles were identified using published references for the southern Andean valleys (Goldstein 1985; Gordillo 1997; Romero Guevara 2002; Uribe 1999; Uribe et al. 2007).

Site boundaries were mapped in ArcGIS based on density and dispersal of archaeological surface remains. Descriptions of sites include surface architecture, relative location to landscape features, and the presence of lithic or ceramic artifacts in isolation or as concentrations. Temporal affiliations were assigned based on diagnostic ceramic and lithic artifacts (Table 1). Aceramic sites were dated based on lithic styles. In the absence of ceramic or lithic artifacts, sites were categorized as having "no surface artifacts" and putatively dated as preceramic.

Pedestrian survey provides broad-scale regional data of human presence and settlement patterns in the form of visible surface features and artifacts. Such an approach to the study of the past has inherent limitations and biases. Conclusions about chronology and spatial distribution of past human activities are by necessity tentative and require further testing through excavation and absolute dating, especially in the Sama Valley where local ceramic typologies are only now being established. Despite outstanding surface visibility in most of the survey area, logistical limitations of project personnel, time constraints, and an intensive survey methodology entail some drawbacks. The Sama lomas cover an area of ca. 200 km^2 of which we surveyed only 4% (ca. 8 km^2). The selection of survey area near the valley introduces a bias in favor of agricultural settlements and at the expense of evidence for hunting or pastoralism (e.g., corrals, windbreakers) farther from the valley. Nevertheless, the only source of potable water in this region is the Sama River, forcing humans and animals to stay near the valley. A notable drop in artifact densities only 100 m beyond the valley rim within our 300 m-wide survey corridor approximates artifact densities beyond the more densely occupied valley margins. Our preliminary data informs strategies for future survey on the desert plains, for which an intensive full-coverage pedestrian survey seems unsuitable given the anticipated costs and benefits.

The exclusion of the valley bottom from the survey zone introduces another bias against floodplain occupations. The continuous agricultural use of this terrain since prehispanic times implies the destruction of surface features and dislocation of artifacts, especially near the riverbed where yearly flooding removes topsoils. Modern urbanization in the valley exacerbates these effects. Landscape photographs from the 1960s show that efforts to expand arable terrains have cut back the bluff slopes likely destroying sites near the floodplain. Acknowledging the limitations and biases associated with our survey area in and beyond the river valley, our study focuses on less impacted areas of the valley to identify and conserve sites, many of which are under the imminent threat of destruction from urban and agrarian development.

Results

The 47 archaeological sites we identified in the middle Sama Valley covered almost one third of the survey area (2.33 km^2 of 7.7 km^2) (Figure 3, Table 1). Only three sites are located just above the canal line close to the floodplain (S-41, S-42, S-47). All others cluster along the margins of the desert bluff and the slopes of the Andean foothills. There is a marked scarcity of sites below 480 masl on both valley margins. Sites located on the left valley marginare more numerous (n=31/47) than on the right valley margin (n=16/47); they are also significantly smaller on average (24753 m^2) than sites on the right valley margin (97896 m^2) (two-tailed t-test p-value=.01). We present settlement pattern results for each period, followed by a discussion that interprets human presence in the valley in regard to ecology and land-use patterns.

Archaic Period

Survey identified 16 sites with substantial Archaic-period components, of which six dated exclusively to the Archaic period (Figure 4). The sixteen sites covered an area of 0.97 km^2 (including 0.06 km^2 of exclusively Archaic sites) and are located at 530 to 735 masl near the foothills. Many of these sites occupy bluff edges and hilltops that offer expansive views of the lomas zone and the valley bottom. The sites ranged from small dense dispersions of lithic debitage (S-9, S-16) to extensive sites littered with lithic debitage, cores, preforms and broken tools that indicate expedient production likely taking place over extended periods (S-2, S-3, S-6, S-13, S-15). Site S-15, one of the exclusively Archaic sites, featured low semi-circular stone structures whose location and orientation suggests them to be windbreakers (Figure 5a). Areas between sites are covered by small low-density scatters of lithic debitage and isolated artifacts throughout a 300 m-wide zone that parallels the foothills. Proximity analysis using the Near tool in ArcGIS shows that calculated centroids of sites with substantial Archaic-period occupations are located a mean distance of 415 m from the valley bottom.

Fifteen additional sites registered during our survey had minor Archaic-period components, mainly projectile points that were probably dropped in transit or displaced by prey animals. These sites are located at

Table 1. Attributes of archaeological sites registered in 2017 survey (dark grey: >40% of sample; light grey: <40% of sample; black: tentative assignation; *: contains Inca Polychrome ceramics; +: contains Gentilar ceramics).

*Atributos de los sitios arqueológicos registrados en la prospección de 2017 (gris oscuro: >40% de muestra; gris claro: <40% de muestra; negro: asignación tentativa; *: con cerámica Inca Policromo; +: con cerámica Gentilar).*

Site Number	Elevation (masl)	Area (m^2)	Valley Margin	Archaic Period	Formative Period	Middle Horizon Period	terminal Middle Horizon Period	early Late Intermediate Period	late Late Intermediate Period	Late Horizon Period	Description
S-1 (Sama la Antigua)	578	297113	Right							*	monumental adobe/stone architecture, burials, domestic component
S-2	735	125186	Right					+			dense hilltop lithic scatter with minor ceramic components
S-3	601	14203	Right					+			dense lithic scatter with minor ceramic components
S-4	625	24489	Right								lithic scatter
S-5	649	225038	Right								lithic scatter with minor ceramic components
S-6	595	13308	Right					+			dense lithic scatter with minor ceramic components
S-7	604	27482	Right								light ceramic scatter
S-8	598	113614	Right								ceramic scatter
S-9	591	1617	Right								dense lithic scatter
S-10	582	6245	Right								light lithic scatter
S-11	596	31058	Right								lithic scatter with minor ceramic components
S-12	592	8094	Left					+			ceramic scatter, terraces, minor lithic scatter
S-13	570	82210	Left								stone architecture, ceramic and lithic scatters
S-14	607	21760	Left								stone architecture, ceramic scatters
S-15	621	28476	Left								stone windbreakers, dense lithic scatter
S-16	590	669	Left								dense lithic scatter
S-17	605	30889	Left								dense lithic scatter, minor ceramic component
S-18	572	9124	Left								stone architecture, minor ceramic scatter
S-19	570	615	Left								ceramic scatter
S-20	571	33215	Left								stone architecture, minor ceramic scatter
S-21	582	2887	Left								ceramic scatter
S-22	587	6660	Left								ceramic scatter
S-23	595	10777	Left								ceramic scatter
S-24	601	1756	Left								stone architecture, no surface materials
S-25	584	5325	Left								stone architecture, ceramic scatter
S-26	586	137	Left								dense lithic scatter
S-27	591	95	Left								ceramic scatter
S-28	573	52440	Left							*	ceramic scatter, minor lithic component
S-30	565	24351	Left								ceramic scatter, minor lithic component
S-31	554	87855	Left								ceramic scatter, minor lithic component
S-32	537	639	Left								ceramic scatter
S-33	540	40526	Left								ceramic scatter, minor lithic component
S-34	528	84247	Left							*	ceramic scatter, minor lithic component, road segment
S-35	509	46401	Left								stone architecture, ceramic scatter
S-36	494	89126	Left							*	ceramic scatter, road segment
S-37	478	2675	Left								stone architecture
S-38	488	1683	Left							*	stone architecture, ceramic scatter

Continue Table 1.

S-39	490	1722	Left								ceramic scatter
S-40	436	38461	Left								ceramic scatter
S-41	495	40398	Left								stone architecture, ceramic scatter, burials
S-42	480	8819	Left								ceramic scatter
S-43	537	55956	Right					+			ceramic scatter
S-44	525	272204	Right								ceramic and lithic scatter
S-45 (Los Batanes)	510	253974	Right					+			stone architecture, tombs, ceramic and lithic scatters, perimeter wall
Poquera)	486	101806	Right								perimeter wall, architecture, minor ceramic scatter
S-47	504	3042	Right								burials
S-48	592	5303	Left								stone architecture, no surface materials

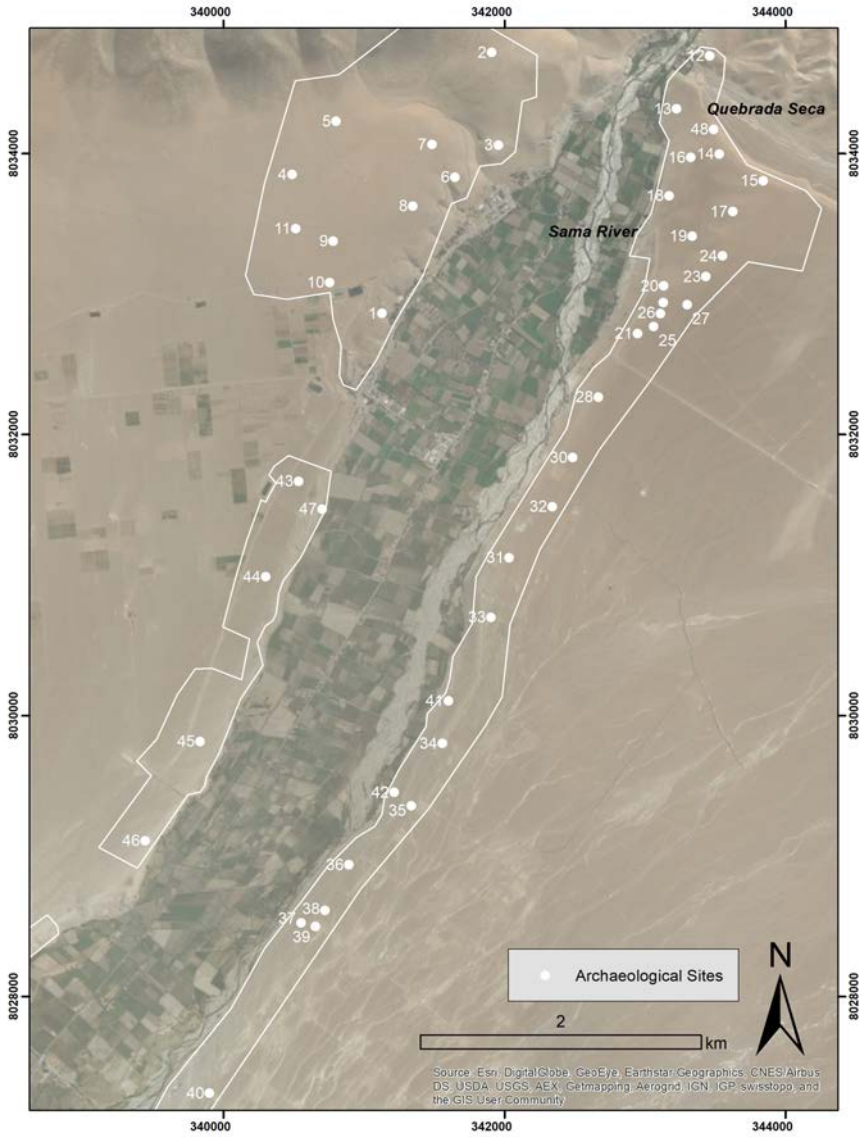

Figure 3. Location of archaeological sites registered in the 2017 survey.

Ubicación de sitios arqueológicos registrados en la prospección de 2017.

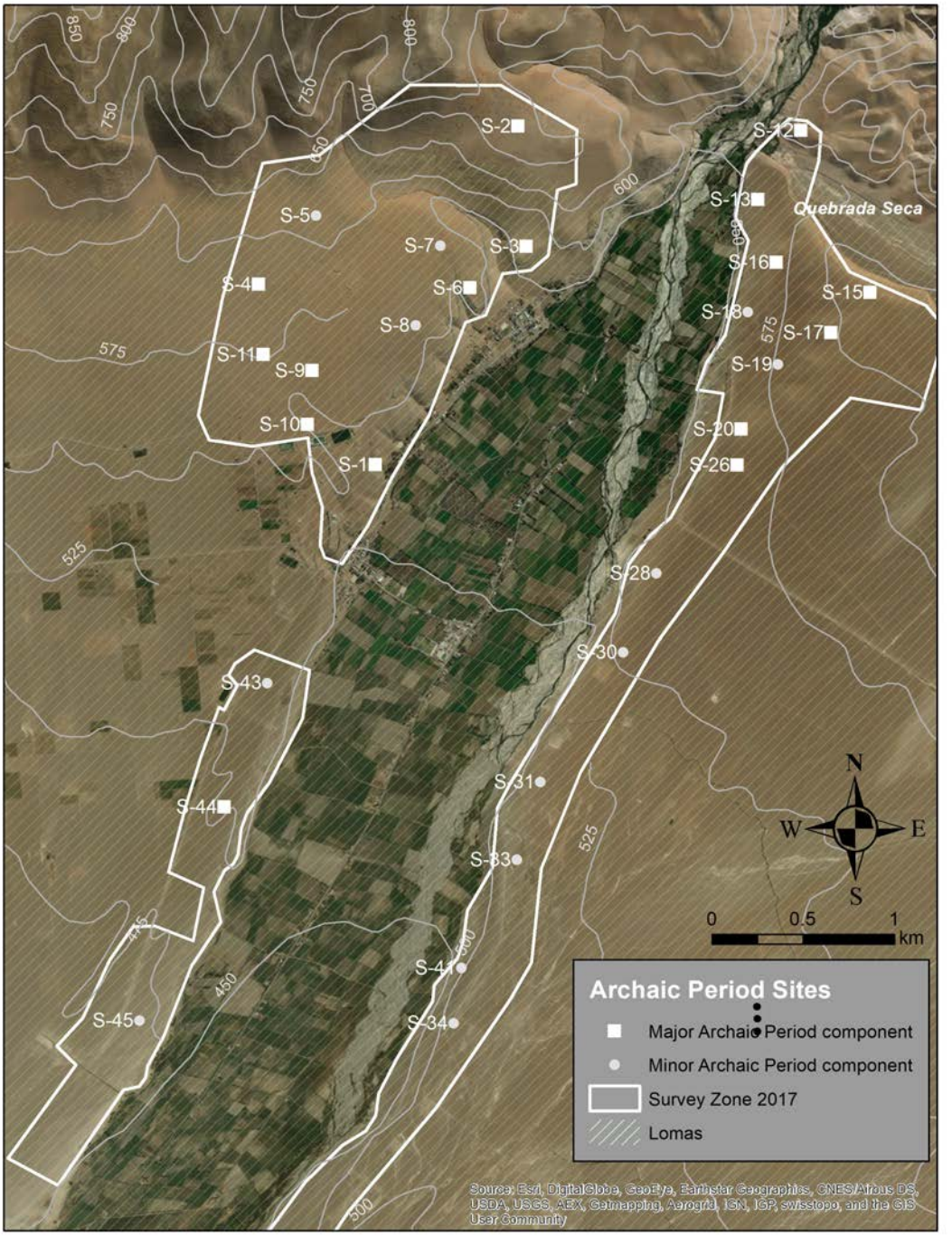

Figure 4. Location of Archaic period sites in the middle Sama Valley.

Ubicación de sitios del periodo Arcaico en el valle medio de Sama.

a lower mean elevation (561 masl) than sites with major Archaic period occupations (598 masl) and were not found above 650 masl. Two additional ceramic sites with stone architecture but without surface materials are putatively assigned to the Archaic period. They feature semi-circular structures between 4 and 7 meters in diameter built from one course of large rocks (S-24), and a rectangular space (20m x 11m) with entrances on its short sides that align east-west (S-48) (Figure 5b).

Archaic-period lithic artifacts recovered during survey conform to types reported throughout the southern Andes. Projectile points found throughout the survey zones display the characteristic sizes and shapes associated with human occupations of the highlands and coast during the early, middle, and late Archaic (Figure 6a-h) (Capriles et al. 2011; Galarce and Santander 2013; Klink and Aldenderfer 2005; Lavallée et al. 2012; Nuñez 1981). Lithic artifacts were manufactured from locally available cherts, rhyolite, and limestone, as well as non-local andesites. A fragment of a fishhook weight similar to artifacts found at QLB was recovered at site S-4 on the lower slopes of the foothills 800 m from the valley margin (Figure 6i). It was the only such object in the Archaic-period assemblage.

Formative Period

One site, S-41, putatively dated to the Formative Period was recorded along the left bank of the river just above the canal line. This multi-component site has two subterranean burials that were exposed during modern excavations. The burials were unlined pits covered with matted plant materials (reeds, grasses). No ceramics or other materials usable for relative dating were visible in the burials, and our chronological assignation is tentatively based on formal similarities to Alto Ramírez burials in the Azapa Valley and differences from later period mortuary patterns in the region (Goldstein 2000; Muñoz 1987). Site S-41 also featured stone wall foundations along the lower slopes of the bluff. A few non-diagnostic sherds found on the surface preclude dating of this sector pending future excavation and absolute dating.

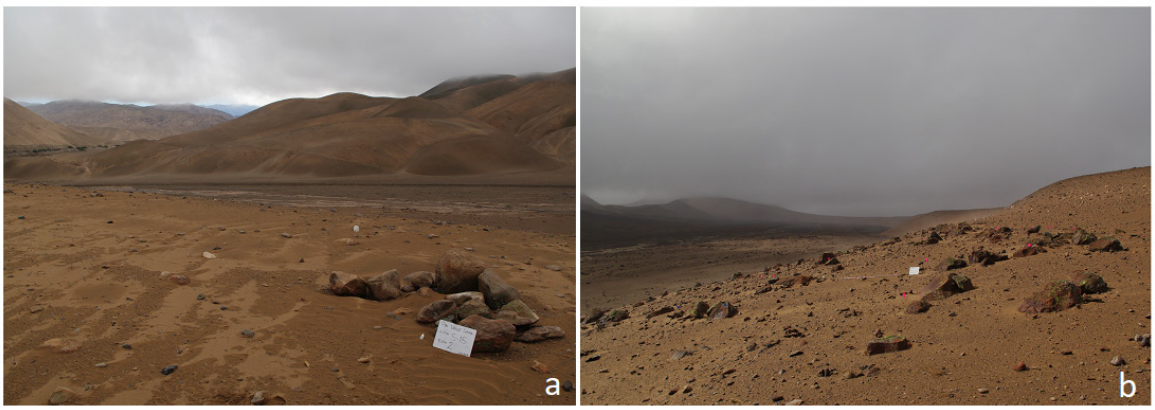

Figure 5. (a) Small stone structure (possible windbreaker) at site S-15 overlooking Quebrada Seca; (b) aceramic stone-lined space at site S-48 (photos: SB).

(a) Pequeña estructura de piedras (posible paraviento) en el sitio S-15 con vistas a Quebrada Seca; (b) espacio delimitado por piedras en sitio S-48 (fotos: SB).

Terminal Middle Horizon and early Late Intermediate Period

The quantity of Tiwanaku-style artifacts found in the middle Sama Valley is negligible compared to that of later Cabuza, Gentilar, Pocoma, and San Miguel assemblages. This indicates that substantial human occupation of the middle Sama Valley did not occur until the terminal Middle Horizon-early Late Intermediate Period transition, a development similar to processes occurring in the Osmore and Azapa valleys (Owen 1993; Umire and Miranda 2001; Uribe 1999). Characteristic black/white-on-red ceramic designs featuring step/stair and wavy line motifs, volutes, and other geometric patterns signal continuity from highland Middle Horizon ceramic styles and persisted into the 13th and possibly even the 15th century AD (Berenguer et al. 1987; Korpisaari et al. 2014:422).

Only three sites featured Tiwanaku-style ceramic sherds (n=13) resembling the Chen Chen substyle (8th-10th century AD) of Moquegua (Goldstein 1985) (Figure 7a). The three sites are located at similar elevations (Table 1, Figure 8). At sites S-44 and S-45, Tiwanaku-style ceramics constitute minor components of a predominantly Cabuza-style assemblage. At nine of fifteen sites with Cabuza-style ceramics, this style

Figure 6. (a-c) Early Archaic projectile points; (d-e) Middle Archaic projectile points; (f-h) Late Archaic projectile points; (i) Archaic fishhook weight (photos: AR).

(a-c) Puntas Arcaico Temprano; (d-e) puntas Arcaico Medio; (f-h) puntas Arcaico Tardío; (i) pesa de pesca (fotos: AR).

comprises more than two-thirds of the diagnostic ceramic assemblage (Figure 7b). Exposed midden deposits at Cabuza sites contain camelid remains and marine mollusks. At the remaining six sites, Cabuza-style sherds are less frequent than other stylistic components and suggest a short-lived or transient occupation, or indirect acquisition through trade.

Cabuza sites are situated near the bluff edge on both sides of the valley. Only three sites (S-8, S-28, S-30) are located near the foothills above 550 masl; the others occupy the central sector of the middle valley. The mean distance of Cabuza site centroids from the valley is 246 m. Cabuza site sizes form three groups: >25 ha (n=2), ~10 ha (n=2), and <5 ha (n=5) (Table 1). Site area estimates are derived from surface material dispersion, yet at sites S-45 and S-46 settlement area as defined by enclosed architecture corresponds to only approximately half of the area covered by surface materials (S-45: 145350/253974 m^2; S-46: 53068/101806 m^2)[1]. Although lack of surface architecture at most Cabuza-style sites prevents us from conducting similar calculations elsewhere, these examples signal a need for caution in the reliability of area estimates from surface material dispersions for other sites, such as S-44 (27 ha) where no architecture was observed due to heavy disturbance from modern plowing.

The best-preserved Cabuza settlement, Los Batanes (S-45), is located on the right river margin (510 masl). Los Batanes is a multi-component site complex enclosed by a wall on three sides with entrances on the west and north sides; to the east the side is bounded by the bluff edge. It features multi-room compounds built from stone, adobe, and gypsum around large orthogonal patios. The wind-deflated surface also bears traces of wattle-and-daub (*quincha*) wall foundations, and circular depressions suggestive of mortuary features. Chrysocolla pieces and white chert projective points abound within and beyond the walled areas of Los Batanes.

Located downriver from sites S-44 and Los Batanes, Alto Poquera (S-46) forms the fourth largest Cabuza settlement. The site is defined by a paucity of surface materials, and traces of wattle-and-daub (*quincha*) wall foundations that form orthogonal rooms and patios (Figure 7c). A heavily disturbed wall encloses parts of

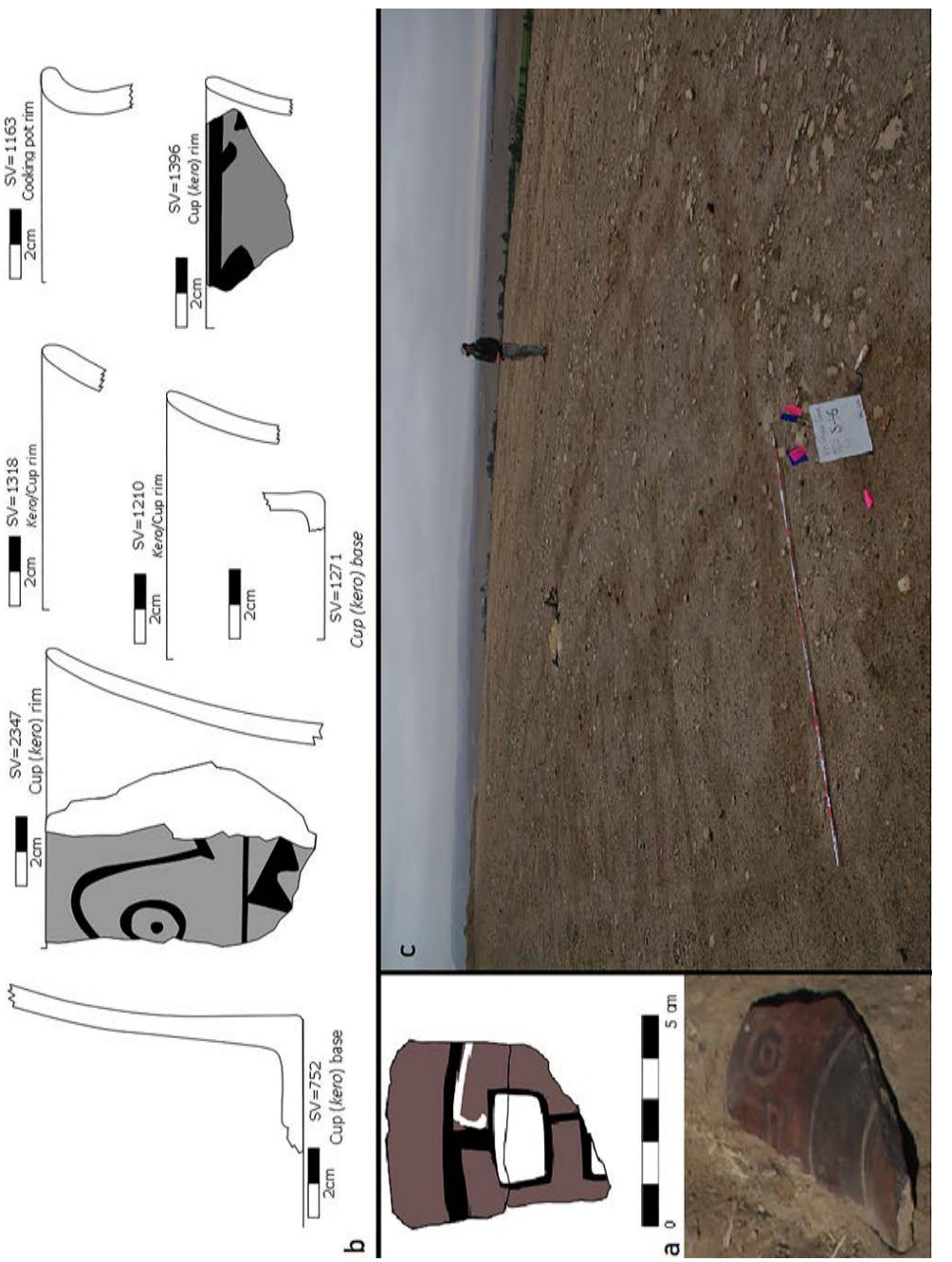

Figure 7. (a) Tiwanaku-style/Chen Chen style sherds; (b) Cabuza-style ceramic sherds; (c) orthogonal layout of quincha wall foundations at Alto Poquera (S-46) (drawings: SB; photo: AR).

(a) Testos estilo Tiwanaku/Chen Chen; (b) cerámica estilo Cabuza; (c) planos ortogonales de trincheras de quincha en Alto Poquera (S-46) (dibujos: SB; fotos: AR).

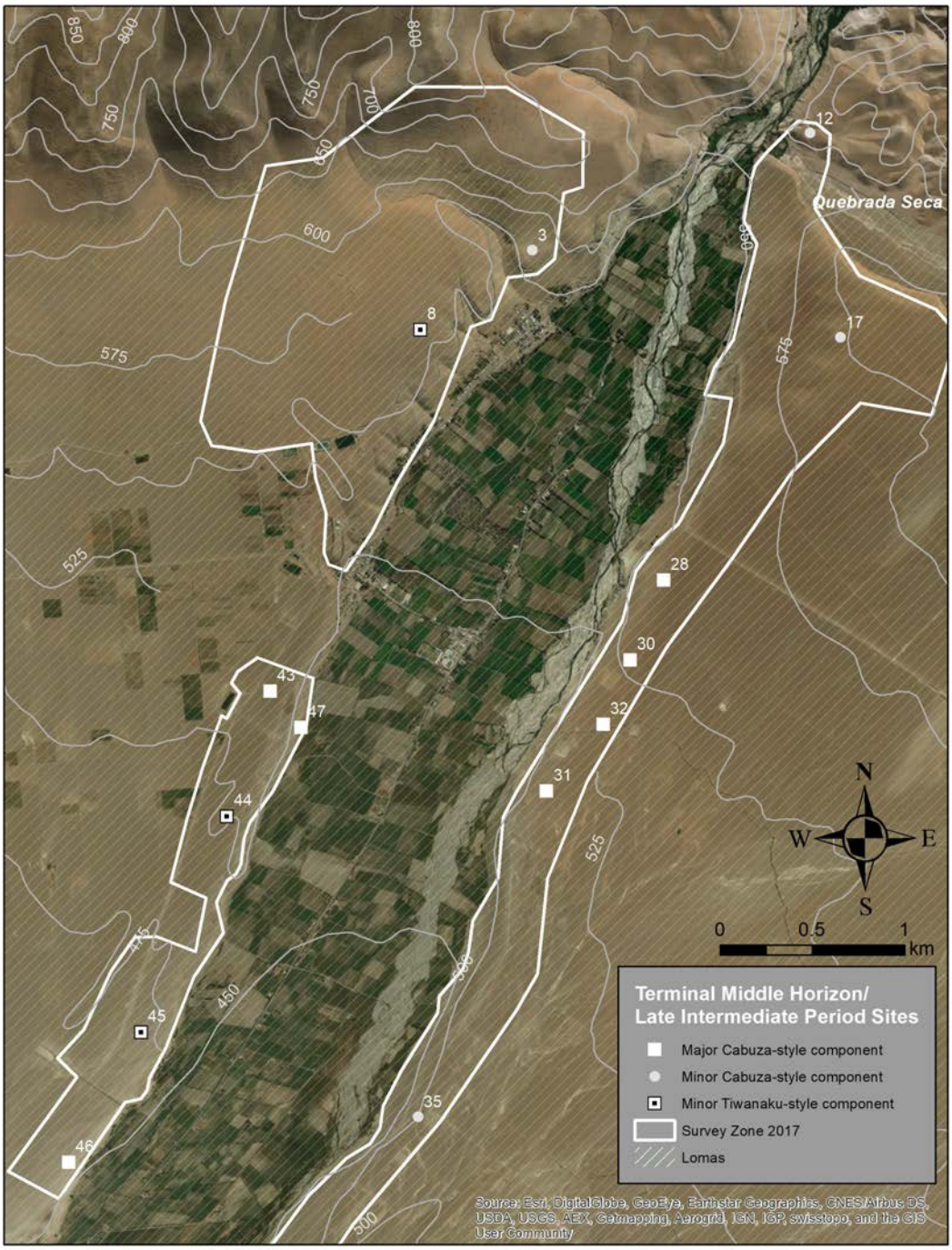

Figure 8. Location of Terminal Middle Horizon/early LIP sites in the middle Sama Valley (dots mark presence of Tiwanaku-style ceramics).

Ubicación de sitios Horizonte Medio terminal/PIT temprano en el valle medio de Sama (puntos indican presencia de cerámica estilo Tiwanaku).

the area with traces of foundations. The discovery of a Cabuza cemetery (site S-47) above the canal line below site S-44 suggests that more Cabuza mortuary sites may be located near the valley bottom and have remained intact under bluff slope colluvium.

Small quantities of Gentilar-style and San Miguel-style ceramics at piedmont sites (S-2, S-3, S-6, S-12) indicate that better views, more defensible locations, or access to different ecological niches were of interest to other, non-Cabuza occupants of the valley. Overall, eight sites in the middle Sama Valley present evidence of non-Cabuza-style ceramic styles during this period (Table 1). These assemblages are not frequent enough to reflect large-scale cultural or ethnic diversity among the valley's permanent residents during this time. Nonetheless, coastal or intermontane groups may have sought seasonal access to piedmont or lomas resources.

Later LIP and Late Horizon

The chronological boundary between the later LIP and Late Horizon is blurred by the persistence of highland black-on-red styles (Chilpe, Saxamar) as Inca ceramic styles were introduced into the south-central Andes (Dauelsberg 1972; Uribe et al. 2007). Black-on-white and black-on-red Inca-Colla (or Inca-Altiplano) and Inca Polychrome styles are more clearly associated with the Late Horizon (Julien 1983; Pärssinen and Siiriänen 1997).

Sixteen sites feature highland black-on-red ceramics, including fourteen sites where this style dominated the ceramic assemblage (Figure 9a, b). Situated between 490 and 650 masl, late LIP populations continued to occupy areas below the foothills along the right margin of the valley, and downriver along the desert bluff of the left margin with an average distance of 410 m from the valley bottom (Figure 10). Only five sites also have ceramic evidence from the previous period (S-2, S-6, S-34, S-35, S-43). Sites with black-on-red ceramics have low sherd densities and low frequencies of decorated wares. Excavation and radiocarbon dating at these sites will be instrumental for establishing utilitarian ceramic typologies.

Of the 21 sites with Late Horizon ceramic components, twelve contained only Inca-altiplano ceramics (Table 1). Inca Polychrome ceramics were only found at Sama la Antigua and along the central left margin of the valley (Figure 9c). Late Horizon sites have a slightly lower mean elevation (555 masl) than late LIP sites (568 masl) but are characterized by similarly diffuse low-density sherd scatters. By far the largest Late Horizon site, Sama La Antigua, also features Chilpe and Inca-Pacajes ceramics. Across the valley, three smaller contemporaneous sites with Inca wares dispersed over five kilometers less than 150 m from the edge of the desert terrace. Sites with Inca materials and architecture are located an average distance of 262 m from the valley bottom.

Architecture at sites S-13 and S-25 indicates a more formal affiliation with the Inca occupation of the middle Sama Valley. Site S-13 sits at the confluence of the Sama River and Quebrada Seca (Figure 10). It features a large rectangular stone enclosure and an adjacent orthogonal stone structure whose layout resembles Structure 3 at Sama la Antigua (Figure 11a). A similar structure was also registered at site S-25 together with the foundations of a round stone structure atop a low platform and a small rectangular building (Figure 11b).

Prehispanic Roads

Prehispanic road sections were discovered in the middle valley (Figure 10). North of Sama la Antigua, a 950m-long stretch of road was identified (650 masl). The rock-lined road is 3m-wide and parallels the foothills (Figure 11c). Satellite imagery shows it continuing in westward direction for 5 km before turning north into the Andean foothills. Two more road segments (170 m long and 2 m wide; 490 m long and 2.5 m wide) on the left valley margin are oriented southwest-to-northeast; they follow the course of the river not far from the desert terrace margin crossing sites S-34 and S-36. From their direction it can be deduced that this road connected sites with Inca-style ceramic materials and architecture (S-13 and S-25).

Discussion

The geography and ecology of the middle Sama Valley uniquely shape its prehispanic occupation compared to neighboring valleys. The growth of lomas up to 40 km from the Pacific coast contrasts with lomas on the south and central coast littoral where they sustained pre-agricultural populations (Beresford-Jones et al. 2015; Engel 1973). Pedestrian survey of the middle Sama Valley shows Archaic-period sites and materials concentrating along the Andean piedmont above 550 masl. The piedmont hill slopes aid plant growth and fresh water accumulation and provide refuge to animals. Elevated places housing windbreakers, campsites, and expedient tool production sites provided Archaic hunter-gatherers with ideal vantage points. The wide expanse of the flat desert terrace below 600 masl provides no such advantage.

Archaic-period lithic tools were crafted from highland and lowland raw materials. Natural outcrops of silex and rhyolite on the desert terrace of the middle Sama Valley provide local raw materials, as do water-borne cobbles transported from higher elevations by the river. We should take into consideration that the

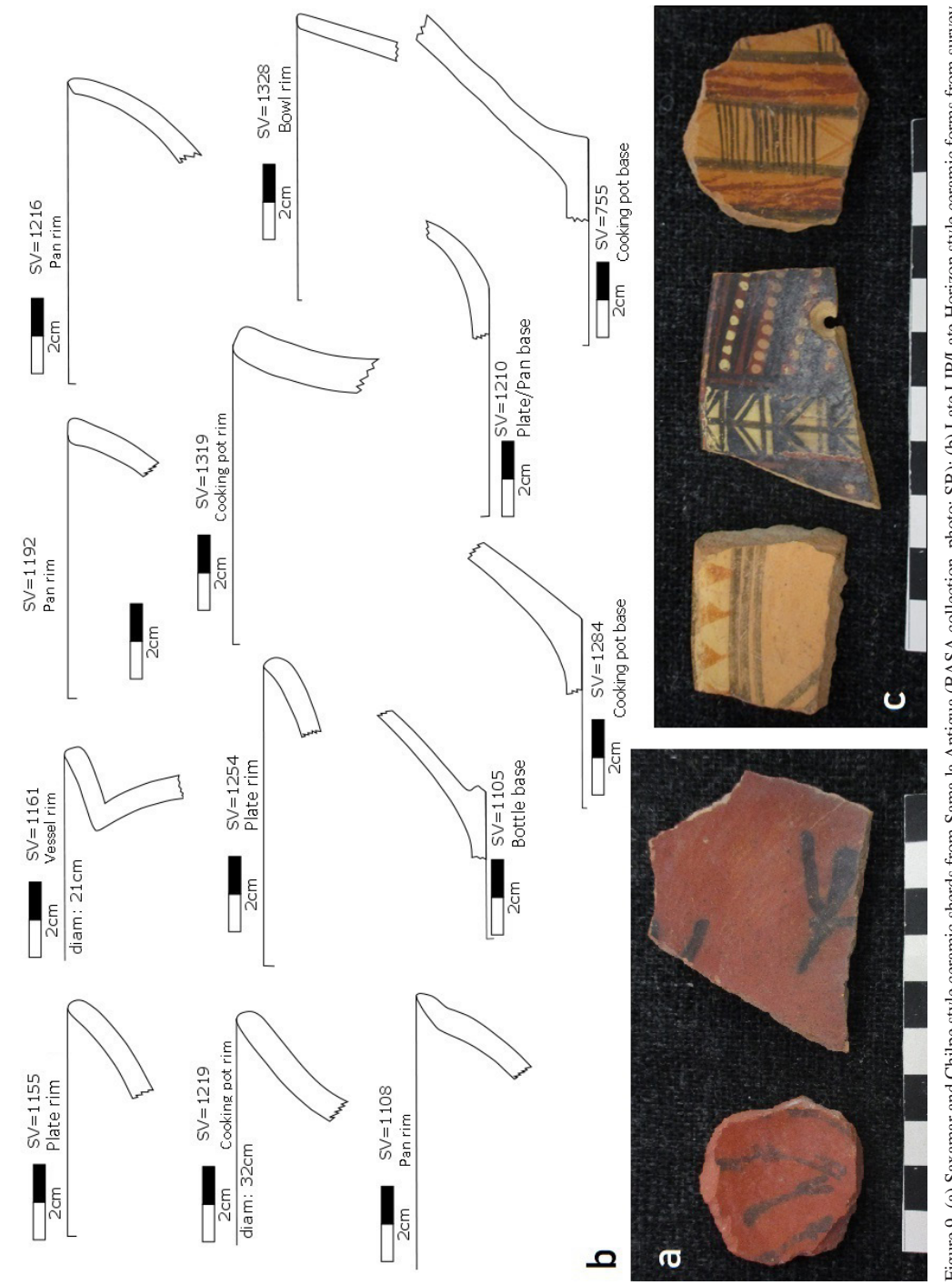

Figure 9. (a) Saxamar and Chilpe style ceramic sherds from Sama la Antigua (BASA collection, photo: SB); (b) Late LIP/Late Horizon style ceramic forms from survey (drawing: SB); (c) Inca Polychrome ceramic sherds from Sama la Antigua (BASA collection, photo: SB).

(a) Cerámica Saxamar y Chilpe de Sama la Antigua (Colección BASA, foto: SB); (b) cerámica Período Intermedio Tardío/Horizonte Tardío (dibujo: SB); (c) cerámica Inca Policromo, Sama la Antigua (Colección BASA, foto: SB).

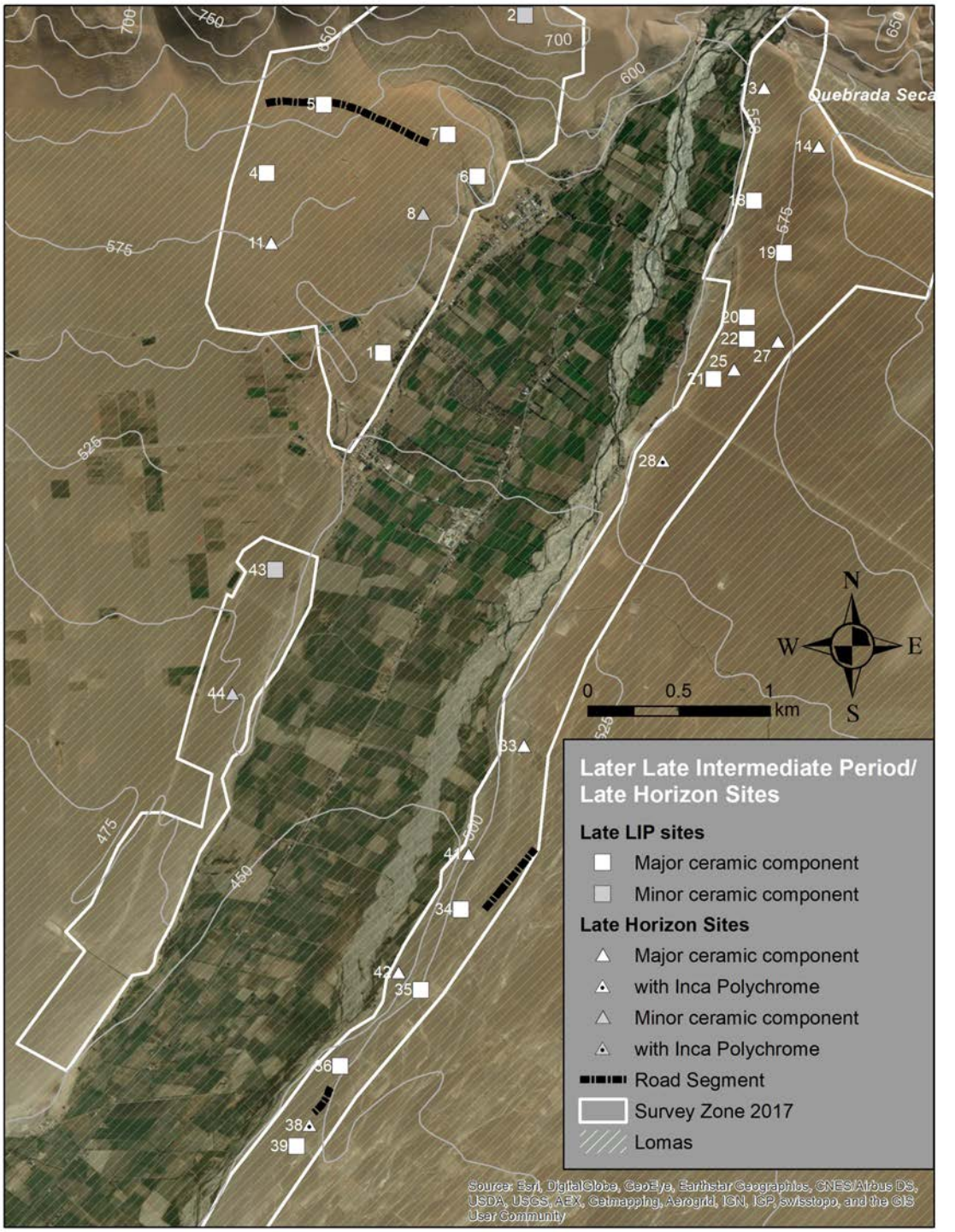

Figure 10. Location of Late Intermediate-Late Horizon period sites in the middle Sama Valley.

Ubicación de sitios PIT tardío/Horizonte Tardío en el valle medio de Sama.

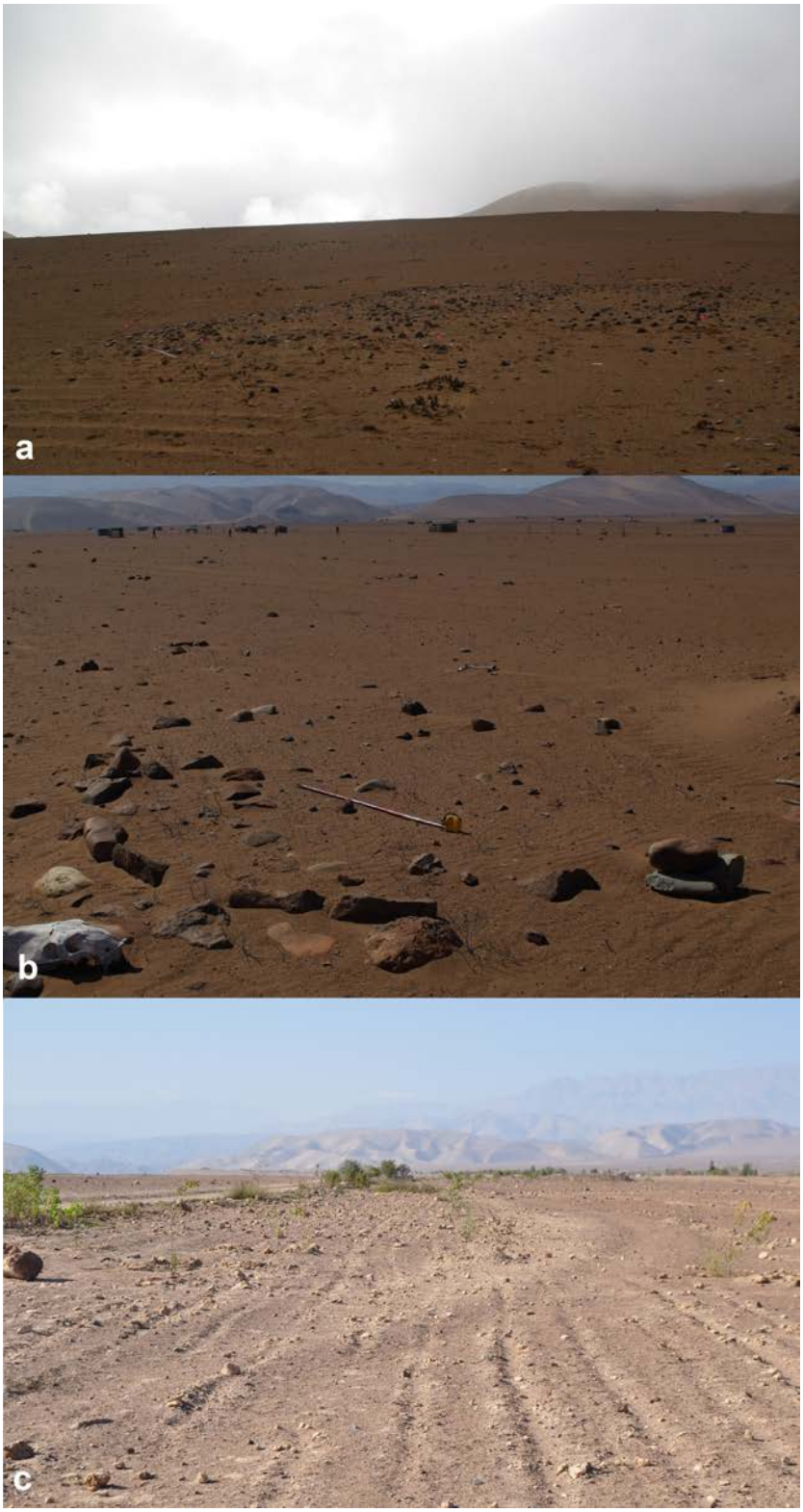

Figure 11. (a) Orthogonal stone structure at site S-13; (b) circular stone structure on platform at site S-25; (c) road segment between sites S-36 and S-34 on left valley margin (photos: AR).

(a) Estructura ortogonal de piedra en el sitio S-13; (b) estructura circular de piedras sobre plataforma en el sitio S-25; (c) camino entre los sitios S-36 y S-34 al margen izquierdo del valle (fotos: AR).

wild plant resources, and small game and birds living in the valley were welcome food to hunters, although seasonally low river levels may have limited year-round availability of these riparian resources. A high mean distance of Archaic-period sites from the valley bottom suggests hunter-gatherers probably followed transhumant camelids, cervids, and small game to the Andean foothills from the highlands or coast. A ceramic structures and plazas, although not yet firmly datable to the preceramic period, raise the possibility that the middle valley may also have been of social or ritual importance for seasonal occupants who became invested in place making (e.g., Stanish et al. 2014).

Despite a scarcity of Formative period sites identified in the middle Sama Valley, we should assume that agriculture was introduced to the area during this period and was fed by simple canals as is the case in Formative Period Azapa and Moquegua (Goldstein 2000; Muñoz 1987). The only putatively Formative site was located just above the valley bottom near the river. Catastrophic floods and continuous use of valley bottom lands for cultivation over the past two millennia have likely contributed to the destruction of archaeological sites in this part of the valley, and colluvium from the desert terrace slopes may also have buried sites. Noticeable in the middle Sama Valley is the absent of large settlements and funerary mounds that characterize Formative period occupations to the north and south of Sama, and which often occupy desert terrace bluffs or elevated positions overlooking the valley (Goldstein 2000; Muñoz 1987; Owen 1993). Formative-period inhabitants of the middle Sama Valley would therefore have broken with a persistent regional funerary tradition, unless their presence in this part of the valley was negligible, or their settlements and funerary structures were located farther downriver (Bolaño 2007; Trimborn 1981).

A notable shift in land-use and scale of human occupation of the middle Sama Valley occurred with the appearance of Cabuza populations during the terminal Middle Horizon. The introduction of a new ceramic style to Sama without local antecedents suggests the incursion of a sizeable population that likely sustained itself through valley agriculture. In Azapa and Ilo, Cabuza is considered an outgrowth of earlier Tiwanaku influence in these valleys and may have constituted a secondary dispersal of highland or highland-derived populations shortly before or after the political decline of Tiwanaku (Korpisaari et al. 2014; Owen 2005; Rivera 1985). In Sama, there is no evidence for an earlier presence of colonization by Tiwanaku groups such as occurred in Moquegua, Azapa, and Caplina (Goldstein 1996, 2005; Muñoz and Gordillo 2016). Cabuza populations in Sama may have had access to Tiwanaku-style items from Moquegua or the Lake Titicaca Basin – a question that future excavations at the large, well-preserved Cabuza site of Los Batanes could answer.

The shift of Cabuza-style sites to lower elevations and nearer to the valley suggests an agricultural subsistence focus. Nevertheless we cannot rule out the seasonal importance of lomas for pastoralists given that Cabuza populations in Azapa are described as agropastoralists based on mortuary assemblages (Berenguer et al. 1989; Rivera 1985). Camelid bones and marine mollusks in the middens of the largest Cabuza sites in Sama hint at the mixed subsistence practiced by their occupants. If Formative populations were indeed present in Sama and relied on small-scale canal and floodplain agriculture, then the founding of Cabuza settlements along the bluff edge could signal the concomitant introduction of technologies that allowed for the extensification of agriculture such as has been observed in Caplina and Moquegua (Muñoz and Gordillo 2016; Williams 1997). Settled between the valley bottom and desert pampa, agropastoralist Cabuza populations would have had easy access to multiple local resource niches in addition to the coast and highlands.

Finally, preserved perimeter walls and projectile points at Los Batanes and Alto Poquera attest that Cabuza populations in the middle Sama Valley experienced real or perceived threats. Whether the walls are indicative of internecine conflict between Cabuza groups, or aggression between Cabuza and other groups who frequented the area during the early Late Intermediate Period – such as Gentilar or San Miguel groups – remains to be investigated. Conflict at a broader regional scale must also be considered, given that investment in defensive architecture was common across the western valleys following Tiwanaku's collapse after AD 1000 (Bawden 1989; Owen 2005; Sharratt 2016). Pending excavation and absolute dates, Sama's Cabuza occupation may have lasted into the 12th or 13th century. The presence of Gentilar, San Miguel, and Pocoma groups likely postdated the arrival of Cabuza populations in Sama (Gordillo 1996; Uribe 1999).

The second half of the Late Intermediate Period (13th-15th century AD) in Sama is marked by the appearance of black-on-red highland ceramic styles that signal the arrival of another wave of highland or highland-affiliated groups, or at least of substantial highland trade influence. Two hundred years before Diez de San Miguel reported Pacajes and Lupaqa *mitimaes* in the region; highlanders took a renewed interest in the middle Sama Valley, most likely for its agricultural potential and access to coastal resources. Pending more precise information about the longevity of early LIP occupations in Sama, we should consider

the appearance of altiplano material culture without local precedents in the middle Sama Valley evidence of a second independent incursion of highlanders to the lowlands. For the first time since the Archaic period, sites are located farther away from the valley and at higher average elevations. This resonates with regional patterns in the nearby highlands where *pukaras* indicates a rise in conflict among agropastoralist groups (Arkush 2011; Gordillo 1997). In Sama, such a move in site location also afforded inhabitants better access to lomas pasture during a period that was characterized by extended highland droughts and increased ENSO activity (Zaro and Umire 2005). Absolute dating of sites will be crucial to elucidate the overlap between different culture groups in the valley during this time and to understand access to and competition over agricultural and lomas resources.

The association between Saxamar/Inca-Pacajes ceramic materials and Inca Polychrome styles in the middle Sama Valley shows a connection between altiplano and Inca imperial investments. The site of Sama la Antigua best reflects this affinity with its multi-cultural ceramic assemblages. From this administrative center the Inca exerted could control the valley directly, likely in association with resident Pacajes or Lupaqa *mitimaes* (Williams et al. 2009). The site commands a view of the valley bottom, the lomas, and the entrance to the upper valley, and its location facilitated control over downriver water supply.

The importance of controlling movement through the valley is also made evident by road segments and smaller Inca installations along the left valley margin. Although only partially preserved, prehispanic roads in the middle Sama Valley fit the description of Inca coastal roads (Hyslop 1984). The southern coastal Qhapaq Ñan was stone-lined and less than 3 m-wide – smaller and less important than highland roads for the movement of goods and people (Hyslop 1984:262). The left margin of the valley may have been a preferred route to the coast, avoiding the abandoned walled settlements of earlier periods on the right valley margin. Abandoned settlements on the right valley margin lack such architecture. Movement along the left valley margin would have facilitated southward mobility to the Caplina, Lluta, and Azapa valleys. Upriver from Sama la Antigua, the road would have linked the middle valley to the Inca site of Qhile (3,200 masl) (Williams et al. 2009) and from there to the western shores of Lake Titicaca, facilitating the "flow [of goods] up rather than down" valley (Hyslop 1984:249).

The road segment north of Sama la Antigua paralleling the Andean piedmont leads to the highlands (Moqi) and the coast (Tacahuay) of Locumba. Like the *tambos* of the south coast, Sama la Antigua had access to longitudinal and vertical sections of the Qhapaq Ñan. The scale and complexity of the site's architecture (see Trimborn1981: Plano 2), much of which no longer exists today, demonstrates its likely administrative importance. It is possible that the construction and use of roads occurred earlier, but the formal characteristics of the roads found in the middle Sama Valley tie in well with the local and regional geography of the Late Horizon period.

Conclusion

Full-coverage pedestrian survey of the middle Sama Valley on the far south coast of Peru shows human presence in the area since the Archaic Period. Notwithstanding the methodological limitations of archaeological survey, our initial systematic investigation of the piedmont section of the Sama Valley has produced data instrumental for observing broad patterns of human occupation and resources exploitation. As one of the case studies from which Murra (1972) developed his "vertical complementarity" model, the Sama Valley naturally lends itself to archaeological investigations of long-distance exchange and highland-to-coast mobility. The results presented in this paper have provided a starting point for understanding such dynamics over the course of 10,000 years of human occupation in Sama.

Early hunter-gatherer groups occupied riparian and lomas environments along the Andean foothills as part of a wider regional mobility circuit that allowed them to procure raw materials or tools from highland and coastal locations. The arrival of highland-affiliated populations at the end of the first millennium A.D. likely postdates the introduction of agriculture to the valley that may have occurred during the Formative period but is unobservable in the middle Sama Valley. The incursion of Cabuza populations into Sama dramatically increased the scale of human presence and agropastoralist activities in the valley. Large settlements along the valley margin facilitated access to year-round arable valley lands and expansive pastures on the desert pampa during the austral winter, supplemented by marine resources. Future studies are needed to elucidate Cabuza subsistence and exchange practices as mobilizing local, coastal, and highland resources.

A second arrival of highland populations during the later LIP is reflected in shifting site locations and the appearance of non-local ceramic styles from the south-central Andean highlands. Our survey results cannot speak to subsistence or other economic activities during this period. The Lupaqa *mitimaes* in the middle Sama Valley in the 16th century may have been the descendants of earlier highland arrivals, or at least benefitted from the connections that formed in the late prehispanic period. The establishment of several Inca sites, including the large site of Sama la Antigua,

suggests that the attraction the Sama piedmont held for the altiplano kingdoms was also shared by the Inca Empire. Infrastructure, such as an administrative center and roads, integrated Sama with the imperial landscape of the south-central Andes.

In the future, continued survey of the lower and upper Sama Valley, excavations, radiocarbon dating, a local ceramic typology, and material analyses will allow us to expand on the findings presented here and explore how mobility, seasonality, and exchange shaped human existence in Sama. Comparison with regional histories from neighboring areas such as Moquegua, Azapa, and the altiplano has proven a useful heuristic device to form an initial understanding about the middle Sama Valley in its broader geographic and culture-historical context. It has also shown, as hinted by the 1567 *visita* of Garci Diez de San Miguel, that the Sama Valley played an important role especially for highland populations due to its unique geographical and ecological features, among them access to the Pacific coast and the richness of the valley's lomas.

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Note

[1] Domestic architecture at S-46 was also found outside the enclosure wall.