Functional and Spatial Patterning in Artifact Distribution at the Luna Settlement Site

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Abstract

Since the 2015 discovery of the 1559-1561 Tristán de Luna settlement in Pensacola, the University of West Florida has conducted archaeological investigations of the site of this earliest multi-year European settlement in the continental United States. Based on a comprehensive shovel-test survey, three summer field schools, and multiple mitigation projects in this residential neighborhood, we continue to learn about this short-lived colony. This paper discusses ongoing analysis of the spatial distribution of artifacts across the Luna settlement, focusing on the relative proportions of various functional artifact categories as a means for understanding patterns of residence and activity within the settlement.

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The 2015 discovery of the 1559-1561 settlement of Tristán de Luna y Arellano at Emanuel Point on Pensacola Bay has provided an amazing opportunity to conduct a direct examination of the archaeological traces of a massive but short-lived Spanish colonial habitation site. Today located underneath a quiet residential neighborhood overlooking the wrecks of three of Luna's ships lost in the 1559 hurricane that devastated the colonial fleet, the site has been the subject of archaeological investigations by the University of West Florida for the past three and a half years. With the gracious permission and cooperation of numerous private landowners, UWF archaeologists undertook a year-long shovel-test survey to define the boundaries of the site, and have conducted three ten-week summer field schools and a number of mitigation and monitoring projects in advance of impending construction projects. Concurrent laboratory analysis has resulted in a large and robust dataset that holds considerable promise for learning about both the Luna Settlement and the material culture of the broader Spanish colonial world that launched it.[1]

The settlement was established in 1559 by 500 Spanish infantry and cavalry soldiers along with another 1,000 settlers, including women and children, servants, slaves, and some 200 Aztec Indian warriors and craftsmen. From Pensacola the army was to march inland and follow Hernando de Soto's route across the Appalachian mountains to the Atlantic coast where another port settlement was to be established at the Point of Santa Elena in modern South Carolina. The fleet of 12 ships that brought the expedition from Veracruz was devastated by a hurricane just 5 weeks later, however, leaving the settlers struggling for food. Over the next two years, despite a resupply trip to Cuba and four relief expeditions from Mexico, combined with the temporary relocation of about 1,000 people inland to central Alabama for some four months in 1560,

[1] Worth 2016a, 2016b; Worth et al. 2017; Benchley and Worth 2017; Bratten and Lloyd 2017.

privation and internal disputes accompanied the piecemeal evacuation of the settlers, and in August of 1561 the settlement on Pensacola Bay was abandoned.[2]

In order to develop a better understanding of what the artifactual debris at the site can tell us regarding the spatial distribution of people and activities across the Luna Settlement, I have attempted to group specific artifact types as defined by archaeologists into functional categories that reflect their actual usage by the members of the expedition. While this analytical strategy is similar to the broader approach originally developed by Stan South for comparative cross-cultural pattern analysis,[3] my own more narrowly-focused approach is, in part, designed to differentiate between different functional groups within otherwise identical artifact classes, such as ceramics. My original intent for developing this strategy was to examine the question of exactly why and how Native American ceramics were incorporated by Spanish colonists into their own ceramic assemblages,[4] and how the combination of Spanish and Native ceramics actually may together have comprised a functionally-complete set of ceramics used by households and other small groups of individuals in cooking and serving food, as distinguished from other ceramics used principally for transporting, storing, and dispensing liquids. For example, a small Native jar might easily substitute for a Spanish *olla* with regard to cooking a stew, but a 16-liter Spanish *botija*, or olive jar, effectively had no equivalent either functionally or morphologically in Native ceramic assemblages. But in addition to ceramics, I also wanted to examine the distribution of other well-represented classes of artifacts found across the Luna Settlement, sometimes grouped together as functional suites, such as all arms and armor-related artifacts, and other times split into different functional sub-groups, such as discriminating

[2] Priestley 2010; Hudson et al. 1989; Worth 2018a, 2018b, 2018c.
[3] South 1977, 1978a, 1978b.
[4] Worth 2018c; Worth et al. 2017.

between the distinctive caret-head nails thought to have been used as horseshoe nails, and other wrought iron nails likely used in house construction.

While this analysis is still ongoing, and involves much more than can be detailed in this paper, here I would like to focus on the results of my analysis of the relative proportions of several of these functional artifact groups both at the sitewide scale, and also within a series of analytical areas I have subdivided the site into. Based on the shovel test survey, the Luna Settlement site minimally comprises an area of some 12.7 hectares, 8.9 of which are situated on a high, level terrace overlooking the heart of Pensacola Bay, with another 3.8 hectares extending downslope along the shoreline to a hypothesized boat landing area, and surrounding a freshwater pond draining into Bayou Texar to the west.[5] Based on documentary descriptions of the planned settlement in combination with manuscript maps of contemporaneous Spanish colonial towns in the New World, a hypothetical rectangular grid of 140 house lots and streets can be overlaid over the tested site boundaries, encompassing roughly 11 hectares on the upper terrace. Building on this layout, therefore, for my analysis I have subdivided the upper terrace portion of the Luna Settlement into 16 analytical areas measuring just over 66 x 88 meters, extending this grid downslope to the southwest to encompass virtually all of the rest of the site in an additional 8 areas.

The reasons for this spatial subdivision are twofold. First, it provides smaller analytical areas with sufficiently large artifact samples within which to compare the relative proportions of various functional groupings of Luna-related artifacts and learn about the range of spatial variability in assemblage composition. And second, it allows the portions of the site that are demonstrably more likely to contain prehistoric and later colonial occupation debris to be separated from the inland portions of the upper terrace, which appears to contain a less mixed

[5] Worth et al. 2017.

Luna-era artifact assemblage. While time does not permit me to explore all facets of my ongoing analysis in this paper, a preliminary discussion of the methodology I have employed and some of my initial results should provide a sense of the potential of this line of research.

The most abundant and easily distinguished marker of habitation by Spanish soldiers and other settlers at the Luna Settlement is pottery. Excluding for the moment the local Native pottery that co-occurs with the Spanish materials, the standard assemblage of archaeological ceramic types includes three broad categories: tin-enameled majolica, lead-glazed and unglazed coarse earthenwares, and lead-glazed and unglazed olive jars. Majolica comprises about 9% by count and 5% by weight, coarse earthenwares comprise 48% by count and 27% by weight, and olive jar comprises 43% by count and 68% by weight of the total Spanish-tradition pottery at the site. Within the majolica category, decorated sherds comprise 39% by count and 29% by weight, mostly blue on white, but including some polychrome and green varieties. Lead glazing makes up 30% by count and 46% by weight of the coarse earthenwares, and 22% by count and 20% by weight of the olive jar.

More importantly for our purposes here, these archaeologically-defined ceramic types and groups of types correspond relatively well with functional categories for the Spanish-tradition pottery vessels, permitting us a glimpse into the types of activities that are likely to have occurred where they are found.[6] Originally called *loza* by contemporary Spaniards, majolica sherds are for the most part remnants of Spanish tableware, numerically dominated by vessel forms called *platos* and *escudillas*, which are abundantly documented to have been the standard dining ware used for consuming liquid and solid foods at the table. The bulk of lead-glazed and unglazed coarse earthenwares other than olive jar seem to correspond well to kitchen cookwares

[6] e.g. Lister and Lister 1974; Deagan 1987:25-105; Marken 1994; Sánchez Cortegana 1994, 1998; Worth 2017a, 2017b, 2019.

used in 16th-century Spanish food preparation, including deep, round-bottomed cooking pots called *ollas* and shallower flat-bottomed casserole dishes called *cazuelas*, which when combined with metal frying pans and saucepans as well as griddles and grills constituted the basic cooking equipment for the era. Olive jars, on the other hand, were simply the standard liquid transport and storage vessels called *botijas*, used primarily as containers for water, wine, vinegar, and olive oil, and never in cooking or dining. While these functional associations are not fully exclusive, and some overlap existed, for example with coarse earthenware pitchers used at the table and occasional tableware used in measuring during cooking, the function of each category seems well-supported by the bulk of the vessels comprising it.

One important factor in considering the relative proportions of these functionally-defined pottery categories is the fact that each potsherd found at the site does not necessarily represent the same thing in terms of the number of vessels originally present. For this reason, the relative proportions of sherds may only indirectly relate to the relative proportion of vessels being used in each functional category. For example, 12- to 16-liter olive jars were for the most part quite huge, while majolica tableware was much smaller in both size and weight. In an effort to evaluate these relationships, I have made use of data from the Luna Settlement in terms of both count and weight to calculate not just the relative proportions of each, but also the average sherd size for each category. I then analyzed these numbers with reference to what few intact mid-16th-century archaeological specimens we have actual weights for. While additional examples are needed, two intact vessels were used as general baselines for majolica and olive jar vessel weights, an Isabella Polychrome *plato* from the 1559 Emanuel Point I shipwreck, and a full-size olive jar from the 1564 Santa Clara shipwreck.[7]

[7] Bratten 2018; Malcolm 2017.

The whole olive jar weighs 6,592 grams, while the majolica *plato* weighs only 644 grams, making a ratio of 10.24 to 1 by weight. Extrapolating from this, using the average weight per sherd of olive jar at 8.54 grams and majolica at 3.09 grams at the Luna settlement, that translates to an average of 772 sherds per olive jar, and 208 sherds per majolica *plato*, working out to a ratio of 3.7 to 1 by sherd count. In comparison, at the Luna Settlement the ratio of olive jar sherds to majolica sherds by weight is 13.74 to 1, while the ratio by count is 4.97 to 1. The entire collection of olive jar and majolica sherds recovered to date from across 12.7 hectares at the Luna Settlement add up to just 1.55 of these hypothetical olive jars, and 1.16 majolica *platos*. While of course this is not the case, it does however suggest that the total number of individual olive jars and majolica vessels broken at the site is roughly comparable, with a ratio of just 1.34 to 1.

As for other coarse earthenwares, while I have yet to incorporate any weights for intact 16th-century cooking vessels, their average weight doubtless falls somewhere between olive jar and majolica, probably on the lower side. At the Luna Settlement, these coarse earthenwares actually outnumber olive jar sherds, but their smaller average weight at just 3.03 grams means they comprise less than half the weight of olive jar. The ratio of coarse earthenwares to majolica by weight and count is nearly identical at 5.56 to 1 and 5.46 to 1, respectively. If the average weight per coarse earthenware vessel falls somewhere between 2 and 6 times that of a majolica *plato*, then the number of such cooking vessels could be between 1 and 3 for every vessel of majolica and olive jar.

It is very important to emphasize that these relative proportions of these functional categories of pottery found at the Luna site reflect the proportions in which they were *broken and discarded*, which is only a subset of the relative proportions that were actually *in-use* during the

two-year Spanish occupation. In other words, using these calculations, we might infer that across the site perhaps three coarse earthenware cooking vessels were broken for every majolica vessel and olive jar. But this does not mean that there were three times as many cooking vessels as plates or bowls at the settlement, just that they were more likely to be broken during use. Documentary inventories of 16th-century Spanish kitchen and dining equipment on both land and sea make it quite clear that the number of cooking vessels was generally far outnumbered by the number of tablewares,[8] and so whether the low proportion of broken majolica at the Luna Settlement is a reflection of the common use of other materials such as wood or metal, or simply the lower average breakage rate of ceramic tablewares, or both, we cannot assume that the proportion of discard directly reflects the proportions of use.

This being said, however, I believe we can reasonably infer that a correlation should exist between the relative proportions of vessels broken in each category and the relative proportions of vessels originally in use, and so if we compare assemblages between different spatial areas of the site, we may be able to glean some insight into the range of spatial variability in cooking, serving, and food storage activities across the site, which in turn may tell us more about who lived where across the site. To that end, an examination of the proportions of these ceramic functional categories by both count and weight of sherds in each of the 24 analytical areas described above demonstrates clearly that there is indeed a range of variability. Methodologically, comparisons between categories within each area can be carried out using ratios and percentages of raw counts and weights of sherds alone, but comparisons within categories between multiple areas requires raw numbers to be divided by the total surface-area excavated within each area, resulting in comparative density values of count per square meter and weight per square meter.

[8] Cook et al. 2016:85-87; Worth 2017a, 2017b, 2019.

If we look at the three ceramic categories of tableware, cookware, and storage ware, represented by majolica, coarse earthenware, and olive jar, respectively, a map with individual pie charts for each analytical area show that some areas of the Luna Settlement have proportionally very high proportions of cookwares, while other areas have higher percentages of storage wares. The proportions of tablewares are normally quite small in comparison to cookwares and storage wares, but some areas clearly have more than others. However, the most balanced proportions between all three categories are generally situated on the inland portion of the upper terrace portion of the site where we believe the core of the settlement to have been located, with the exception of the bluff-edge on the northeastern corner overlooking the bay, which may correspond to a lookout area.

Since not all these areas have the same overall density of potsherds, I have also plotted these same results using pie charts standardized to the maximum total sherd count per square meter, with the remainders indicated in purple to show how much or how little pottery is found in each area in the same proportions indicated in the previous chart. In this map we can see that most of the same areas that seem to have the most balanced proportions of tablewares, cookwares, and storage wares are precisely the areas that have the highest overall densities of potsherds per square meter. In other words, areas with the greatest concentration of broken pottery also tend to have the most balanced proportions of all three categories. My current interpretation of this pattern is that these areas of the site witnessed the lengthiest and most intense residential occupation during the settlement's two-year duration. There is another area downslope to the southwest along the bluff, currently interpreted as a possible landing area, that also has a somewhat higher density of Spanish ceramics, though it is dominated by cookwares.

Other ceramics also in use at the Luna Settlement include Aztec Red pottery and local Native American pottery. Aztec pottery comprises an average of less than 2% of the total assemblage by count and weight, while in contrast, Native pottery dominates at roughly 70% by count and 60% by weight in the inland areas of the upper terrace, where only limited to no prehistoric occupation seems to have occurred. If we expand our analysis to include these ceramics, we can see that the areas with the greatest density and highest relative proportions of Aztec pottery correspond well to the core residential areas inferred above, comprising more than 3% in the heart of the site. Moreover, the most balanced proportions of Native American pottery with respect to Spanish and Aztec pottery also correspond to these same areas, which themselves have the most balanced proportions of the three functional categories of Spanish pottery described above. The proportion of Native pottery drops below 40% in some of these areas. Moreover, those areas that have greater proportions of Spanish cookwares also seem to have greater proportions of Native American pottery. I am presently uncertain whether this association is simply an incidental result of overlap between late prehistoric occupation along the bluff edge, or is instead related to variability between the activities carried out in these areas during the Luna occupation, or perhaps a result of differential access to Spanish ceramics based on social status, but future research will be directed toward understanding these patterns in ceramic debris.

Turning our attention to different classes of material culture, comparing the relative proportions of wrought iron fasteners across the Luna site is also informative. These fasteners are divided into three categories based on size and shape, including one easily-recognizable type called the caret head nail, commonly thought to have been 16th-century horseshoe nails,[9] and two additional size-based categories of other nails and spikes, likely used in house construction

[9] Mathers et al. 2010; Mathers and Haecker 2011; Ewen and Hann 1998:83-84.

and other similar functions.[10] Perhaps unsurprisingly, the relative proportions of these fasteners is generally both densest and most balanced in the projected residential areas described above using ceramics, namely the core inland area of the upper terrace and the inferred lookout on the northeast bluff edge. However, the most dense concentration of wrought iron fasteners is actually located downslope to the southwest along the bluff, which on the one hand definitely has Luna-era ceramics, but which on the other hand also coincides with an 18th- and early 19th-century British and later Spanish ranch facility. The low relative proportion of both caret head nails and Aztec pottery in this area, however, suggest that some of these nails and spikes may post-date the Luna expedition.

Another notable divergence of the distribution of wrought iron fasteners from the general pattern noted above is the fact that even though caret head nails are strongly correlated with the inferred residential areas, the densest concentration of caret head nails is actually located along the site's northeastern margin just inland from the bluff. Presuming that these nails are indeed associated with shoeing horses during Luna's time, this location might be hypothesized to be a corral for the horses brought on the expedition. The location is actually quite optimal for two reasons: first, it is precisely the location from which Luna's cavalrymen would leave the settlement and ride northward along the bluff edge headed up the Escambia River valley and inland, and second, it is generally downwind from the rest of the site with respect to the prevailing air currents moving from southwest to northeast.

Turning our attention to lead shot, which is found in small amounts across the site, and which is presumably associated with firearms used in both hunting and warfare, the distribution is considerably more limited, restricted primarily to the very core area of the upper terrace, but also extending to the inferred landing area downslope to the southwest, and including the

[10] e.g. South et al. 1988; Lyon 1979.

hypothesized lookout to the northeast. While no attempt has yet been made to determine whether some of this shot belongs to later periods, such as in the 18th-century ranch location, the distribution of lead shot does correspond well to the even more limited distribution of other definite 16th-century arms and armor artifacts, including six copper crossbow bolts along with several fragments of both mail and brigandine armor, and scabbard tips, almost all of which are found in two of the analytical areas at the very core of the site on the upper terrace, and also in the area with the bluff-side lookout area to the northeast.

One final type of artifact that is strongly associated with exactly these same inferred residential areas is the basalt mano and metate, 22 fragments of which are found in only three analytical areas. Used in grinding corn hominy for making tortillas, some 1,800 pounds of these tools are actually documented to have been brought with Luna from Veracruz, and their discovery at the Luna site is fully consistent with the diet of both Spanish colonists and indigenous Native groups in New Spain during the 16th-century.[11] Not only does their presence provide additional material confirmation of the Mexican origin of the inhabitants of the Luna Settlement site, their very restricted distribution at the site corresponds quite well with other artifactual evidence for loci of food preparation activities, possibly even suggesting that there were only a few centralized locations with manos and metates where bulk corn was ground for subsequent preparation elsewhere by more widely dispersed cooking and dining units.

In sum, although the results presented in this brief paper are necessarily limited in scope and depth, and of course only preliminary, the methodological approach that I have described and employed above seems demonstrably well-suited for the analysis of functional and spatial patterns in the artifact assemblage belonging to the Pensacola Bay settlement of the Tristán de Luna y Arellano expedition. I believe more in-depth and detailed exploration of these patterns

[11] Bolte and Worth 2017, 2019.

holds considerable promise for elucidating not just the spatial distribution of people and activities across the Luna Settlement, but also the very nature of the artifact assemblage as a reflection of the practices of daily life for individuals of many different backgrounds living in the mid-16th-century Spanish colonial world. Even as archaeological fieldwork by the University of West Florida continues at the site, concurrent laboratory and data analysis are shining new light on this pivotal and only poorly understood era in the early colonial history of Florida.

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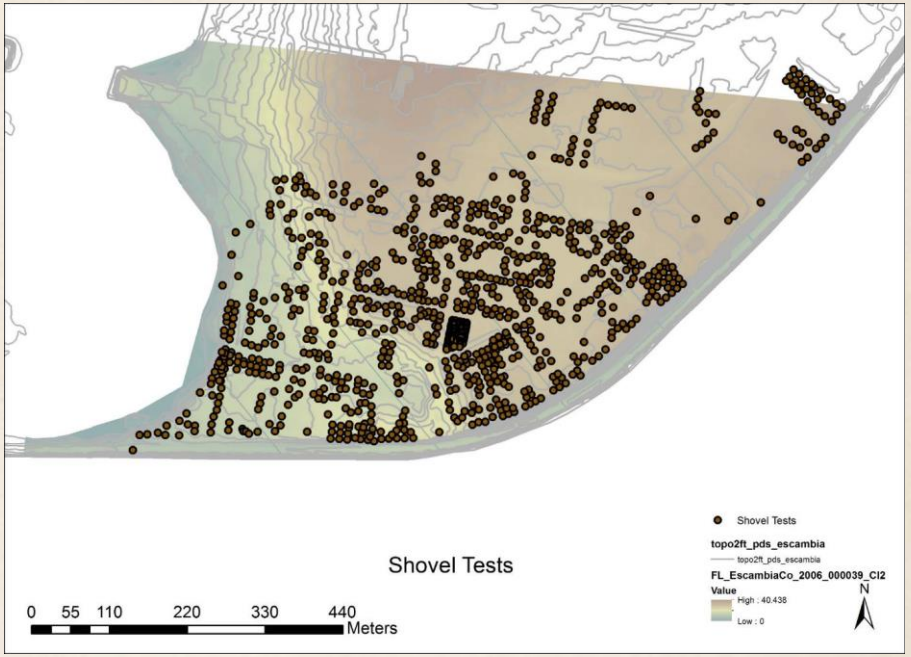
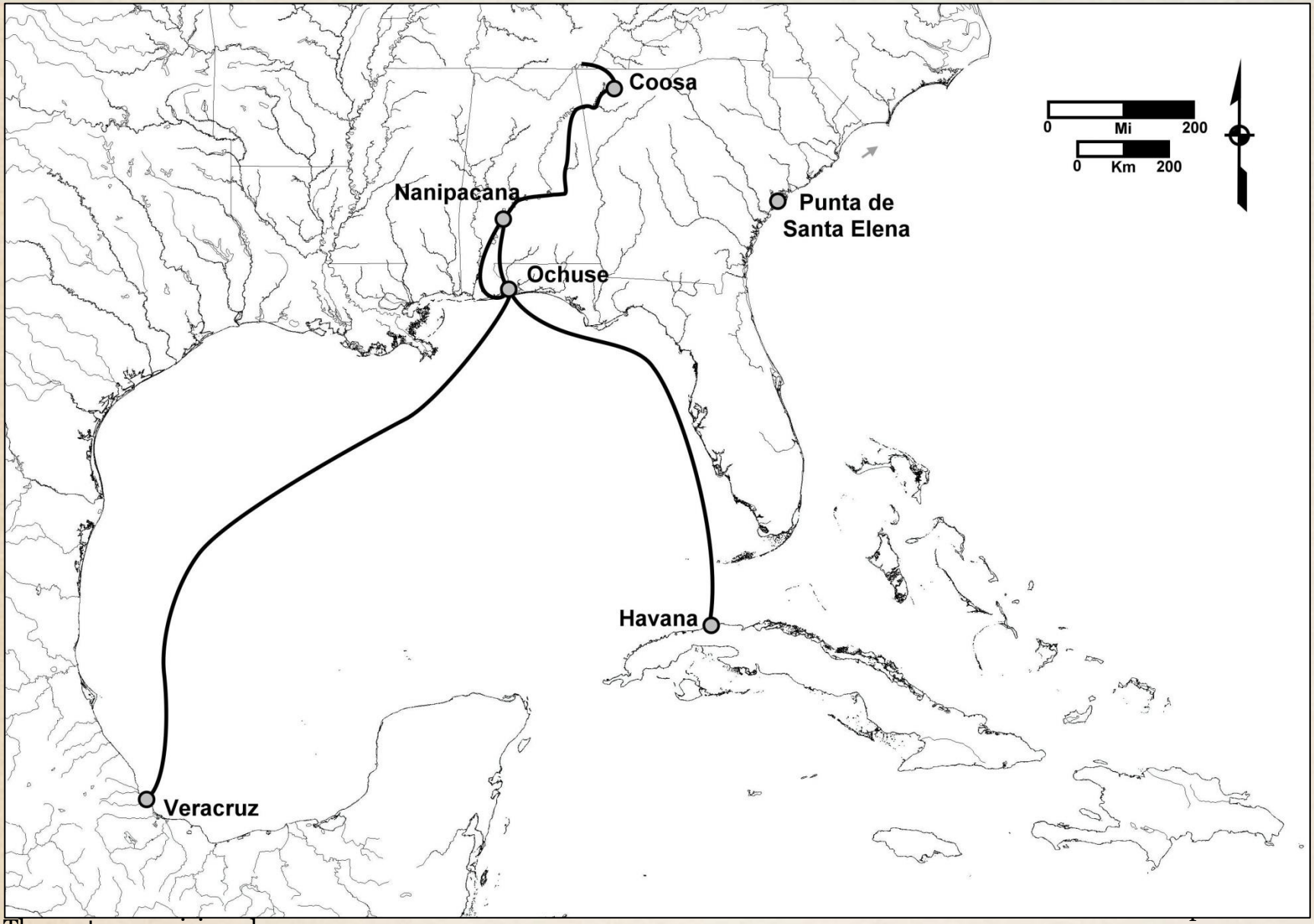
Florida Anthropological Society,
Crystal River, Florida
May 11, 2019

8ES1 - Emanuel Point / Luna Settlement Site

October 2015 Surface Finds

UWF Shovel Test Survey 2015-2016

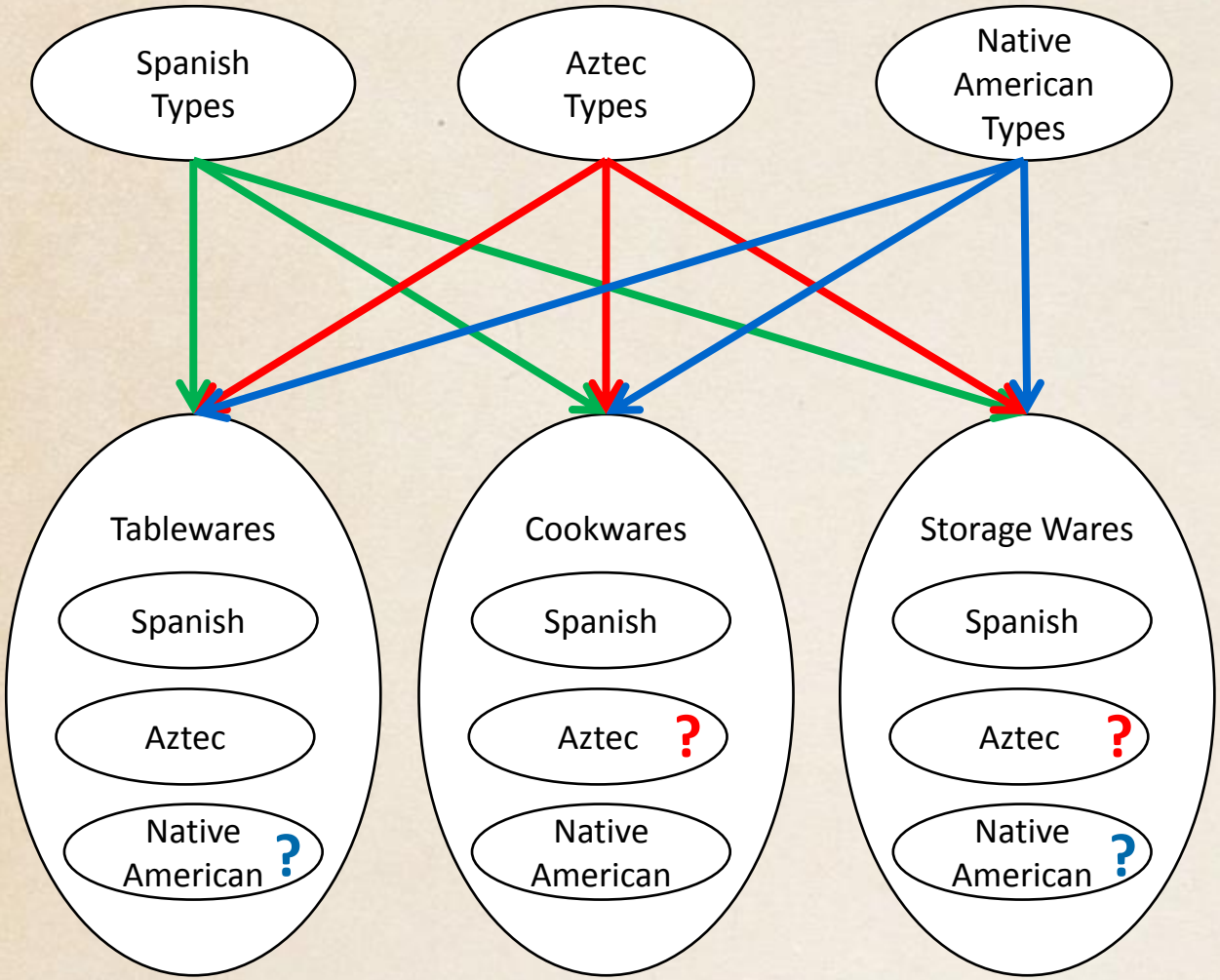




The route as envisioned

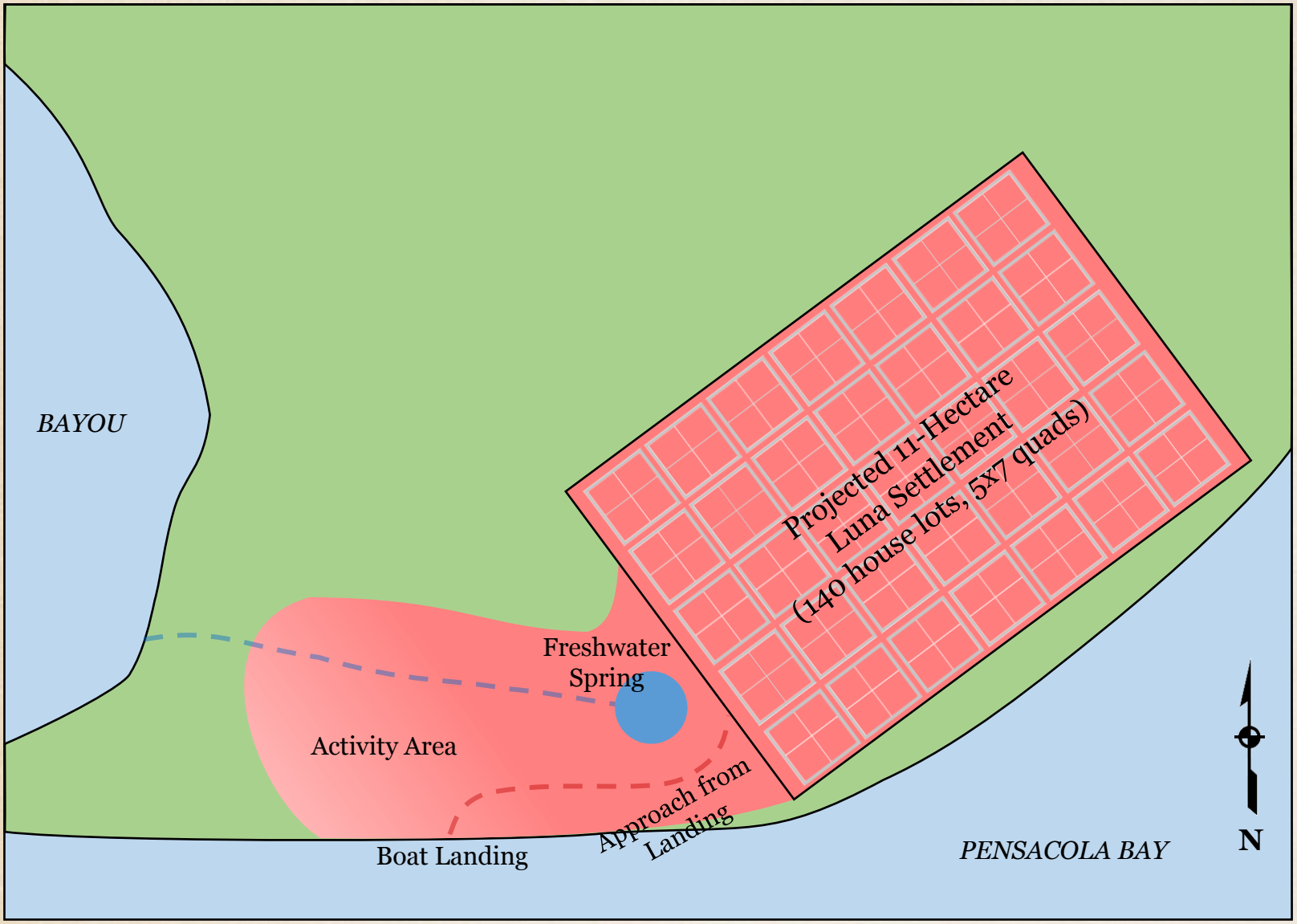
The Luna Expedition: Relief Fleets and Relocations

Functional Analysis of Artifacts: Ceramics



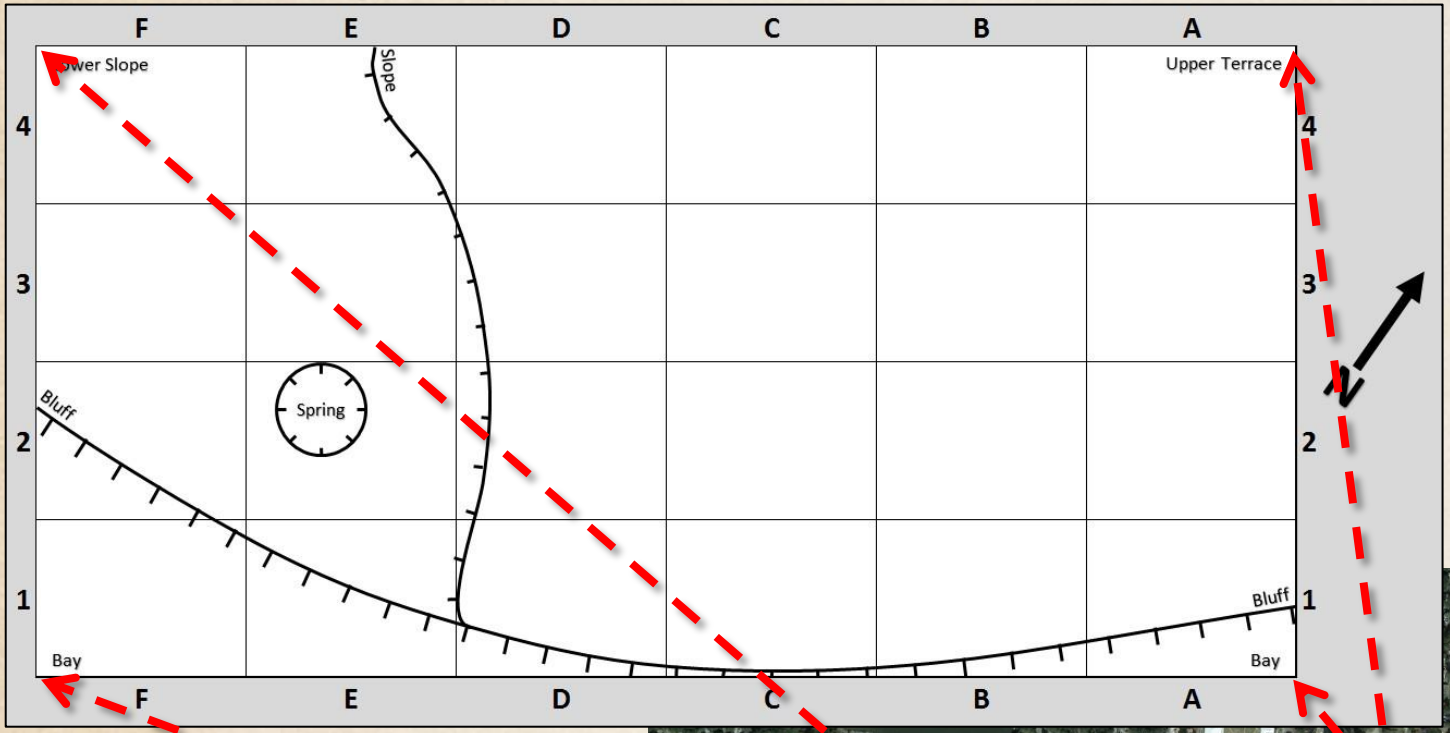
Traditional Ceramic Type Approach

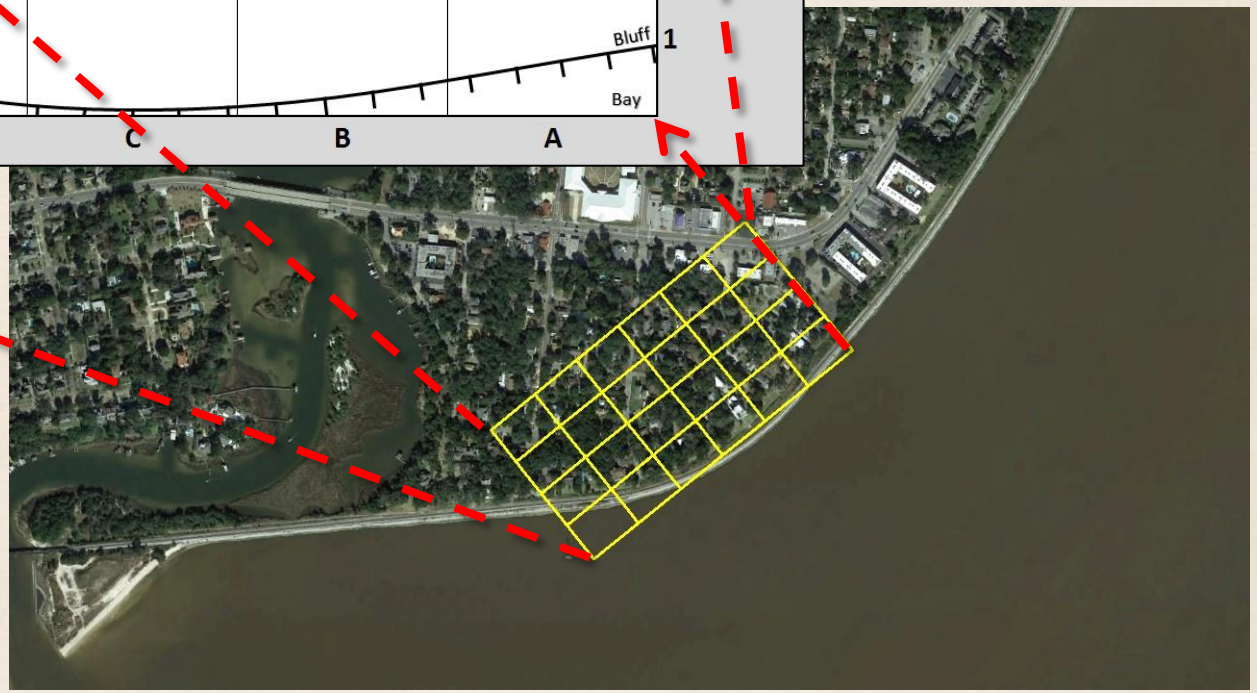
Ceramic Function Approach



Hypothetical Original Luna Settlement Layout

Analytical Areas within the Luna Settlement (8ES1)





Spanish Pottery at the Luna Settlement

Artifact Type	Count	Weight
Majolica, Blue on White	61	119.60
Majolica, Polychrome	11	13.00
Majolica, Caparra Blue	6	13.30
Majolica, Columbia Plain Green Variant	15	69.60
Majolica, Plain	148	529.70
Melado	9	46.40
Lead Glazed Coarse Earthenware	155	571.50
Lead Glazed Redware	234	1258.80
Unglazed Coarse Earthenware	943	2192.10
Glazed Olive Jar	260	2076.80
Unglazed Olive Jar	938	8160.00
Total	2780	15050.8

Spanish Pottery at the Luna Settlement

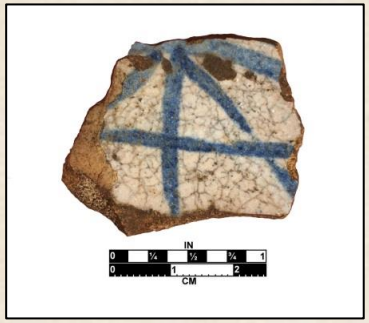
Artifact Type	% Count	% Weight	Weight/Sherd (g)
Majolica	8.67	4.95	3.09
Coarse Earthenware	48.24	27.03	3.03
Olive Jar	43.09	68.01	8.54

Artifact Type	% Count	% Weight	Weight/Sherd (g)
Decorated Majolica	38.59	28.92	2.32
Plain Majolica	61.41	71.08	3.58

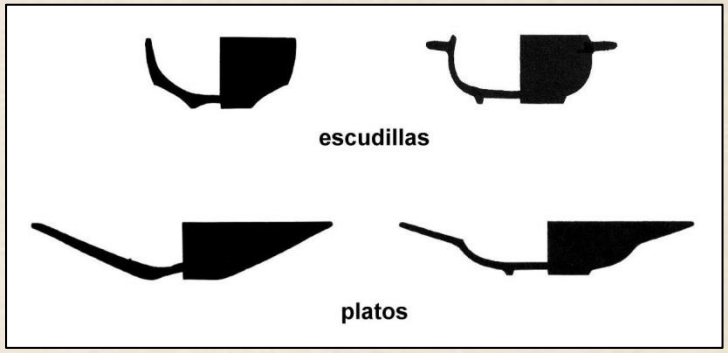
Artifact Type	% Count	% Weight	Weight/Sherd (g)
Lead Glazed Coarse Earthenware	29.68	46.12	4.72
Unglazed Coarse Earthenware	70.32	53.88	2.32

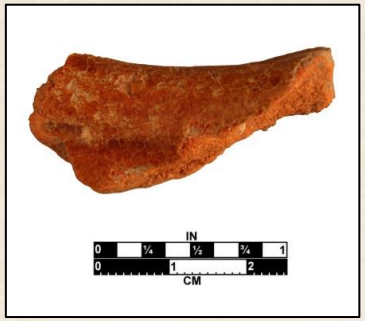
Artifact Type	% Count	% Weight	Weight/Sherd (g)
Glazed Olive Jar	21.70	20.29	7.99
Unglazed Olive Jar	78.30	79.71	8.70

16th-Century Spanish Pottery

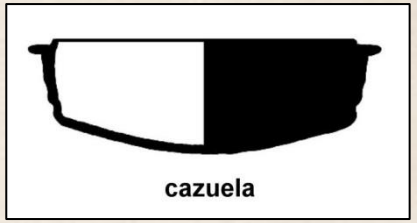


Majolica - Tableware

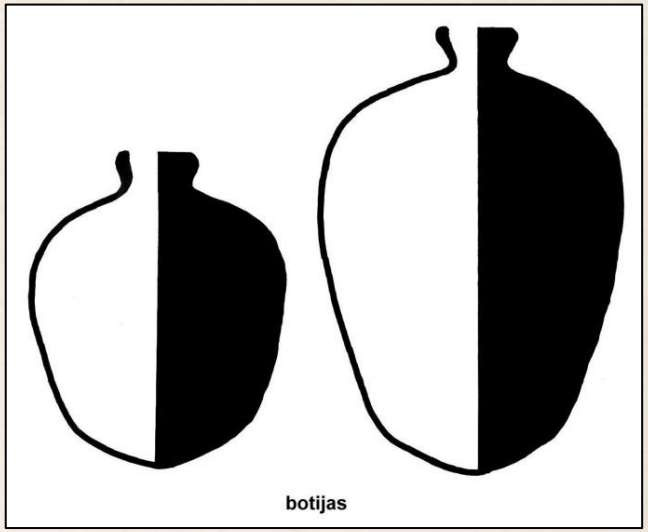




Coarse Earthenware - Cookware



Olive Jar – Storage Ware



Whole Vessels

Artifact Type	Site	Weight (g)	Ratio
Isabela Polychrome plato	Emanuel Point I (*San Juan de Ulua*, 1559)	644	0.10
Olive Jar, full arroba-size botija	St. Johns Bahamas (*Santa Clara*, 1564)	6,592	10.24

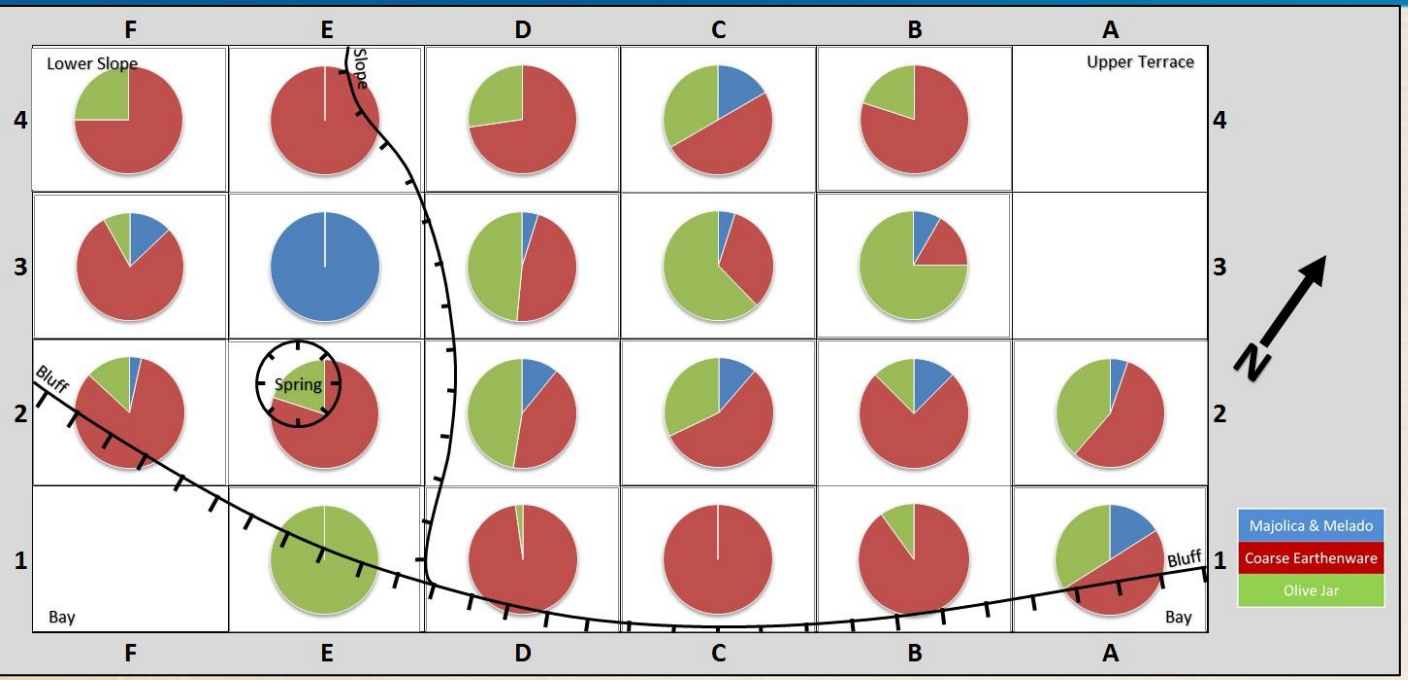
Artifact Type	Luna Settlement Weight/Sherd (g)	Ratio
Majolica	3.09	0.36
Olive Jar	8.54	2.76

Counts, Weights, Excavated Areas, and Density

Example Areas

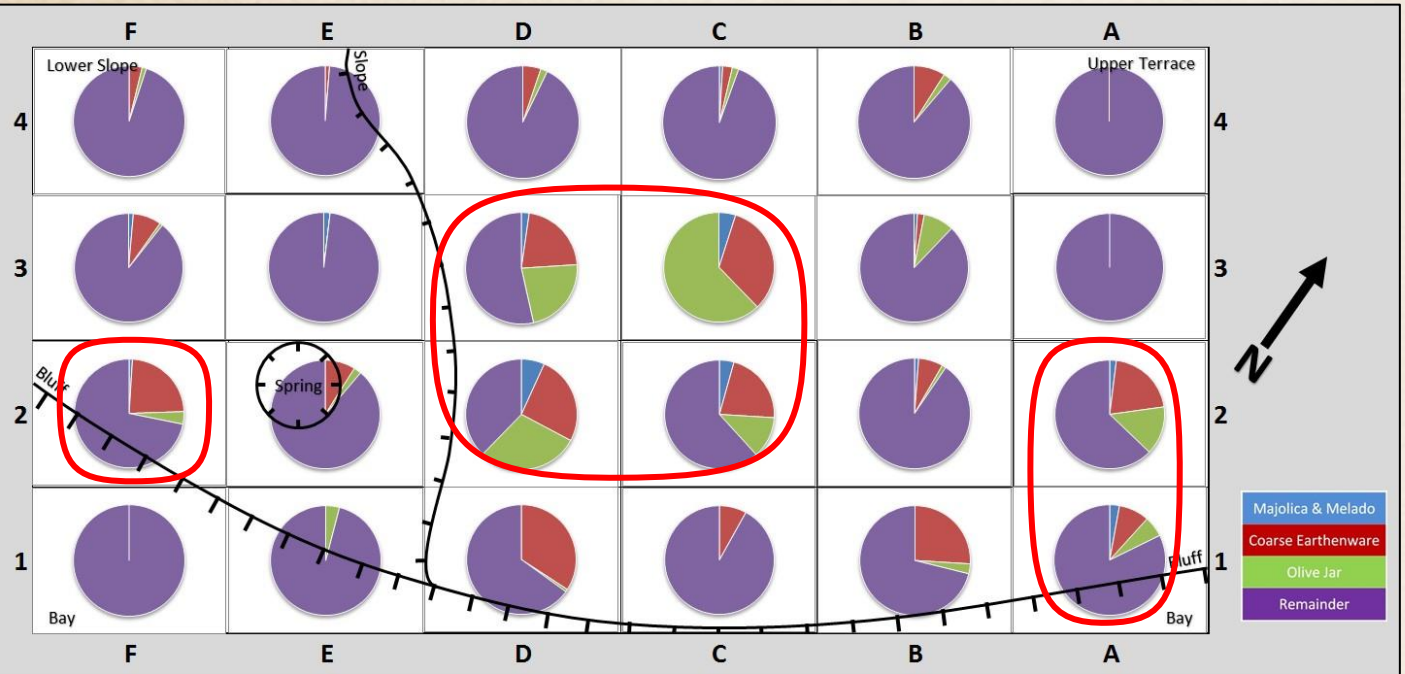
Artifact Type	Area A1	Area A2
Unglazed Olive Jar (count)	194	14
Excavated Area	189.10	7.75
Count/Square Meter	1.03	1.81

Artifact Type	Area A1	Area A2
Unglazed Olive Jar (weight)	1893.20	78.30
Excavated Area	189.10	7.75
Weight/Square Meter	10.01	10.10

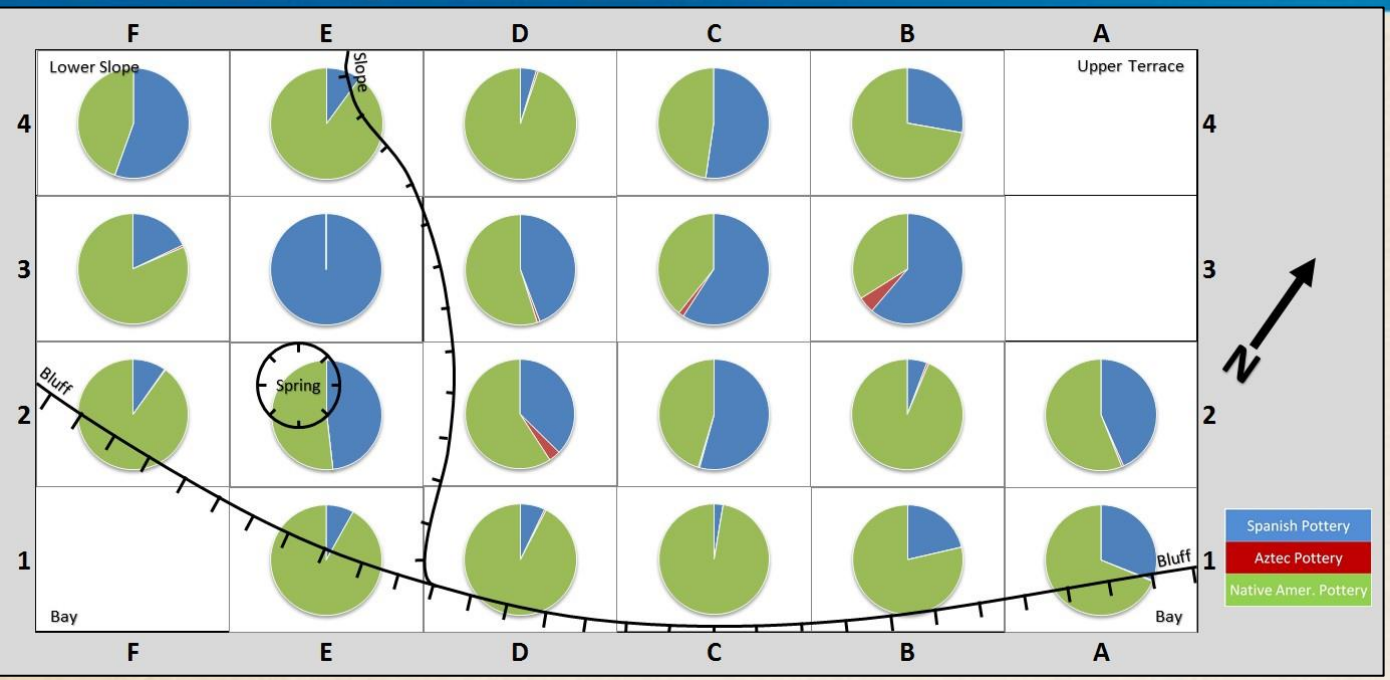


weight per square meter
(by analytical area)

Spanish Pottery

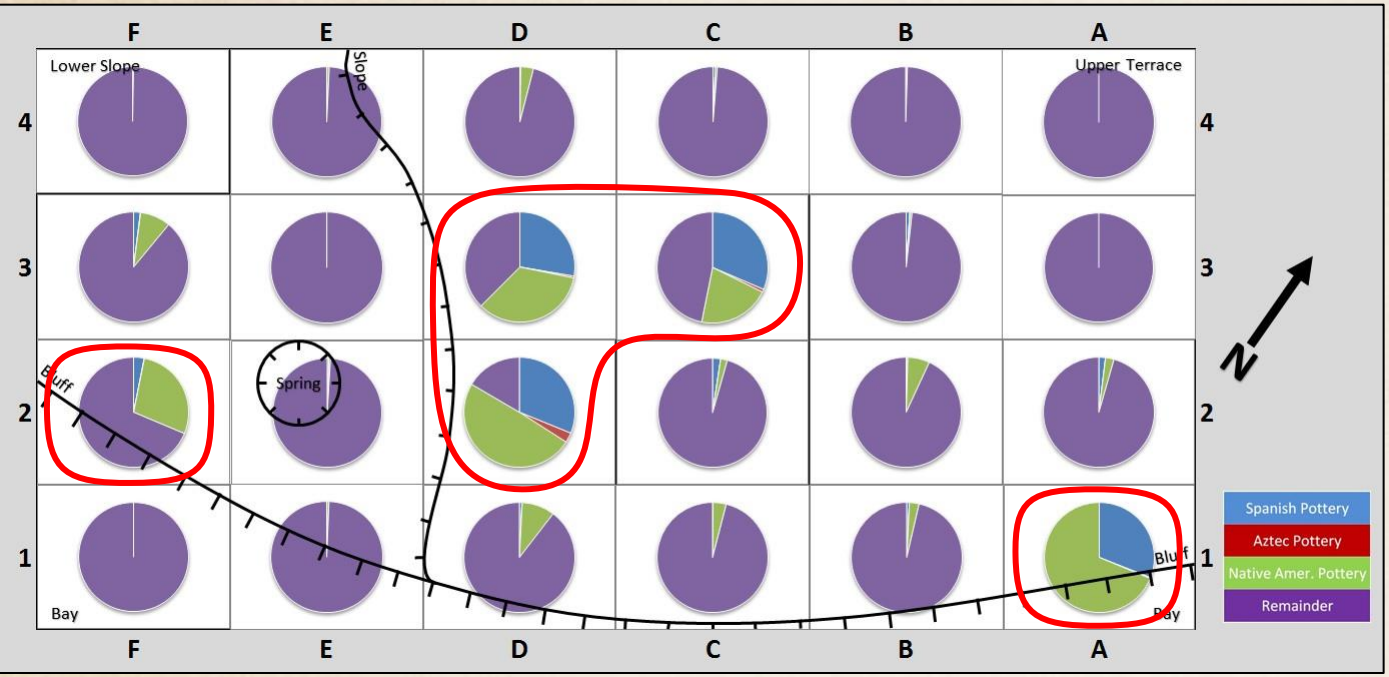


weight per square meter
(standardized across site)

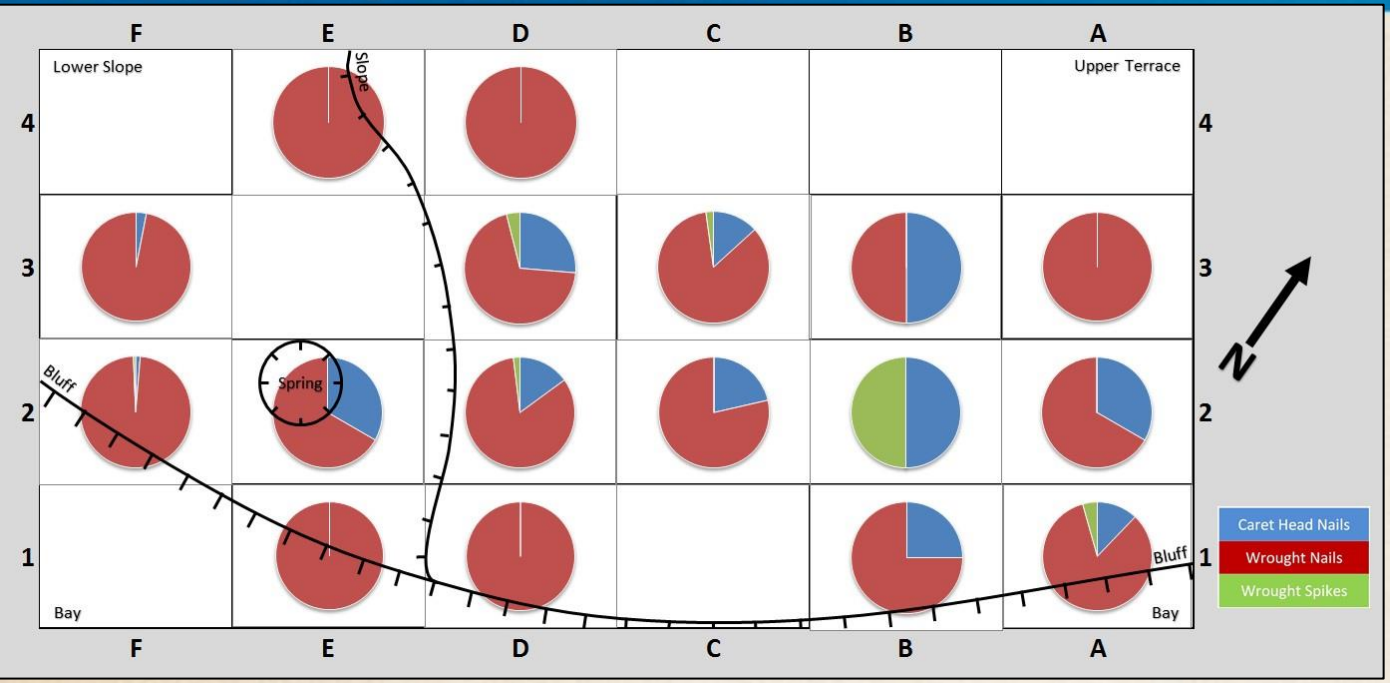


weight per square meter
(by analytical area)

All Pottery

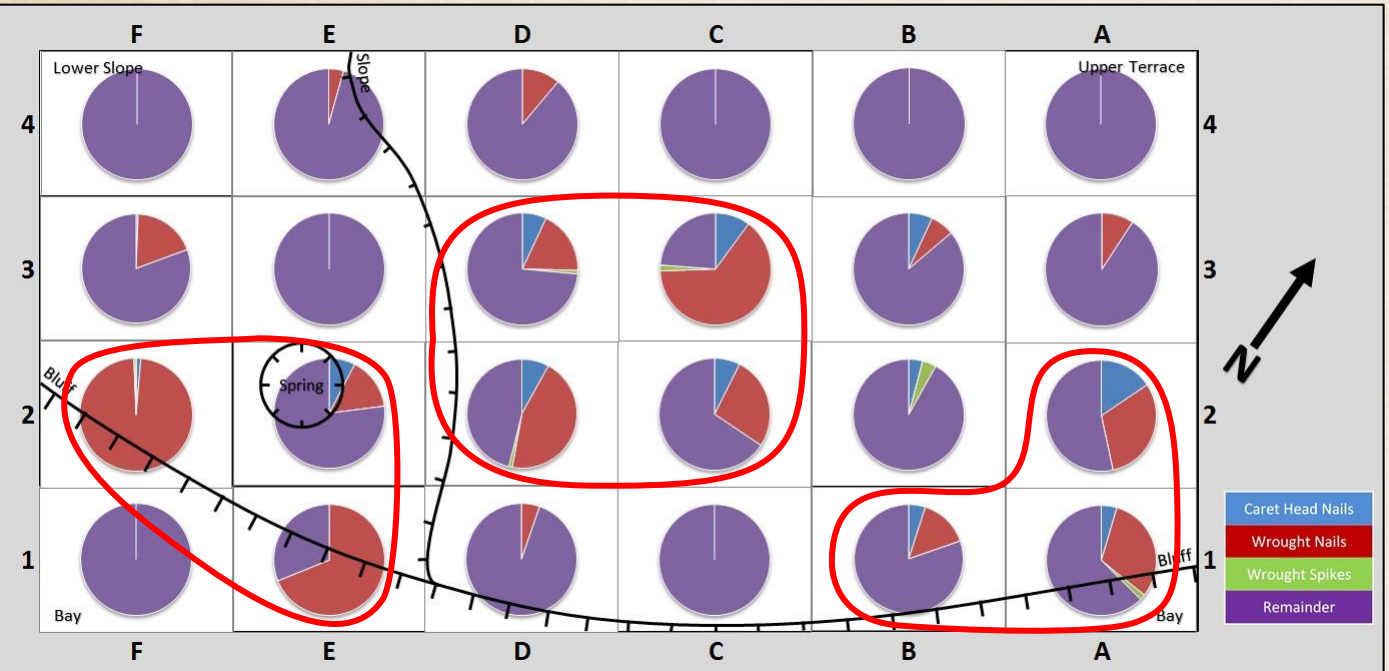


weight per square meter
(standardized across site)



count per square meter
(by analytical area)

Wrought Iron Fasteners



count per square meter
(standardized across site)

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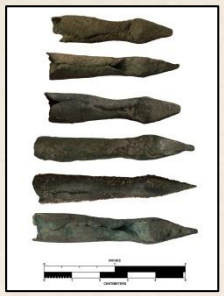
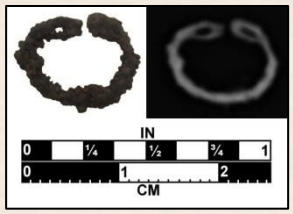
Arms & Armor

	F	E	D	C	B	A	
4	Lower Slope	Slope	1 shot 5 armor frags.			Upper Terrace	4
3	3 shot		7 shot	99 shot 1 crossbow bolt tip 4 armor frags. 2 scabbard tips	1 armor frag.		3
2	Bluff 15 shot	Spring 1 shot	66 shot 2 crossbow bolt tips 14 armor frags.			1 shot	2
1	Bay		1 shot			16 shot 3 crossbow bolt tips 6 armor frags.	1
	F	E	D	C	B	A	

N





Basalt Manos & Metates