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Cover Page Footnote

Many thanks to the Smithsonian Environmental Research Center (SERC) volunteer citizen scientists, without whom this paper would not have been possible, and to Jim Gibb for access to this data. Kylie Gilbert deserves special recognition for her identification and cataloging of the faunal assemblages from both sites. I am grateful to my former employers at New South Associates, Inc., who generously provided funding and support for conference travel, and to SERC for providing transportation to the conference at which this journal edition was conceived. I would like to express my appreciation to the anonymous reviewers for their recommendations to improve this work. Finally, I am deeply indebted to George Hambrecht and Barnet Pavão-Zuckerman for their astute advice, steadfast support, and assistance in strengthening this article.

"Wild Neat Cattle": Using Domesticated Livestock to Engineer Colonial Landscapes in Seventeenth-Century Maryland

Valerie M. J. Hall

The excavation of two 17th-century sites in Anne Arundel County, Maryland, provides an opportunity to explore the impacts of domesticated livestock on the surrounding landscape. Faunal assemblages are analyzed following Henry Miller's (1984, 1988) foundational study of subsistence practices of early English colonists in the Tidewater region. Data sets from Sparrow's Rest (18AN1436) and Shaw's Folly (18AN339) are examined to determine the percentages of domestic livestock vs. wild game consumed by the families at each site as compared to the patterns identified on contemporaneous sites in Miller's survey, as well as to elucidate potential environmental impacts from the free-ranging herds of cattle and swine. Analysis shows the Shaw and Sparrow families relied primarily on domesticated livestock, rather than exploiting indigenous mammal, bird, and fish species for the majority of their dietary needs. However, each family's domesticated livestock reshaped the colonial landscape, causing far greater impacts than 17th-century subsistence and cultivation practices alone.

Les fouilles de deux sites du 17e siècle dans le comté d'Anne Arundel, dans le Maryland, offrent l'occasion d'explorer les impacts du bétail domestiqué sur le paysage environnant. Les assemblages de la faune sont analysés à la suite de l'étude fondatrice de Henry Miller (1984, 1988) sur les pratiques de subsistance des premiers colons anglais de la région de Tidewater. Les assemblages de Sparrow's Rest (18AN1436) et de Shaw's Folly (18AN339) sont examinés pour déterminer les proportions de bétail domestiqué par rapport au gibier sauvage consommés par les familles sur chaque site, en comparaison avec les tendances identifiées sur les sites contemporains dans l'étude de Miller, ainsi que pour élucider les impacts environnementaux potentiels des troupeaux de bovins et de porcs. L'analyse montre que les familles Shaw et Sparrow s'appuient principalement sur du bétail domestiqué, plutôt que d'exploiter des espèces indigènes de mammifères, d'oiseaux et de poissons pour la majorité de leurs besoins alimentaires. Cependant, le bétail domestiqué de chaque famille a remodelé le paysage colonial, provoquant des impacts bien plus importants que les seules pratiques de subsistance et de culture du 17e siècle.

Introduction

Researchers in the Chesapeake region have examined faunal assemblages to explore questions of subsistence or economic capital, but little attention has been given to the environmental impacts of domesticated animals on the landscape prior to the silting-in of local waterways in the 18th century. Excavations at two plantation sites in Anne Arundel County, Shaw's Folly (18AN1436) and Sparrow's Rest (18AN339), provided an opportunity to explore animal use and landscape change on plantations in the latter half of the 17th century. The sites are located approximately 0.25 mi. (0.4 km) apart in the Rhode River watershed, on what is now the Smithsonian Environmental Research Center (SERC) campus (FIG. 1).

Henry Miller's (1984) extensive study of 17th- and 18th-century plantations explored changing subsistence patterns as English colonists became established in the Chesapeake region. Following Miller's study, faunal analysis was undertaken on animal remains recovered from features dating to the 17th century. Data was compared to Miller's study to place sites within the larger context of regional trends in the exploitation of wild fauna and domestic livestock. In addition to Miller's conclusion that livestock were used by colonists as sustenance and for economic capital, this article suggests a third possibility—that domesticated animals were used as agents of landscape change to clear wooded and overgrown areas for future agricultural use. While early tobacco-farming methods had a negli-

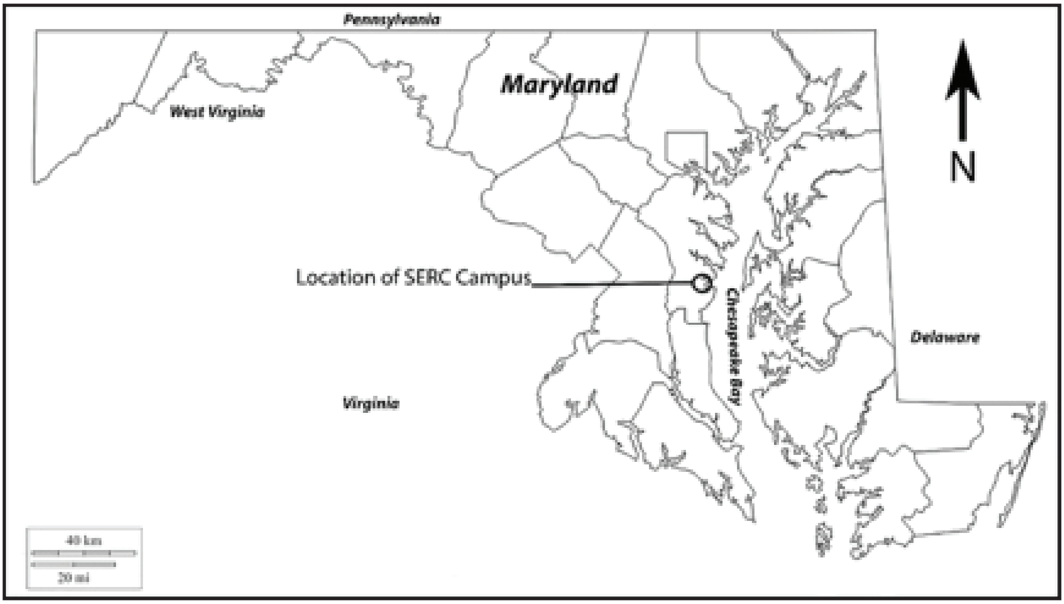

Figure 1. Map of Maryland, highlighting the location of the Smithsonian Environmental Research Center (SERC) campus in Anne Arundel County. (Base map, d-maps.com; map by Valerie M.J. Hall, 2019.)

gible effect on erosion in the region (Brush 2001, 2009; Earle 1988; Earle and Hoffman 2001), the present research suggests that the keeping of domestic herds in colonial Maryland altered the landscape more profoundly than contemporary cultivation, and that plantation owners may have allowed their livestock to forage in the surrounding landscape as a means of intentionally clearing their lands.

Upon arriving in the colony of Maryland, English settlers supplanted the indigenous population, buying or otherwise laying claim to prime fields. When cleared fields became scarce, planters moved to wooded areas and, through the adoption of native farming methods, began the process of clearing the land and raising North American crops, including tobacco and corn (Carr et al. 1991; Earle 1988; C. Hall 1910; V. Hall 2012; Main 1982; Miller 1984, 2001; Potter and Waselkov 1994; Walsh 2001; see also Anderson [2004] and Pavão-Zuckerman and Reitz [2011] for exploration of indigenous populations' reactions to and interactions with Eurasian domesticates introduced by colonizers). However, alongside the use of metal tools, colonists retained one key element of European farming practices—the keeping of domesticated livestock.

Prior research indicates that, despite abundant local game, English immigrants in late 17th-century Maryland chose to maintain roaming herds of domesticated livestock as a primary food source, following a pattern first identified by Henry Miller in his comprehensive survey of plantation sites in colonial Maryland and Virginia (Miller 1984, 1988). Previous research suggested that owners of newly established plantations found it more cost effective to let hardy livestock forage while directing labor toward cultivation of the tobacco cash crop and subsistence agriculture. Rather than enclosing herds, the Maryland General Assembly directed the planter to "fence his corne and other ground against cattell at his own perill" (Archives of Maryland Online 1883: 96). The free-roaming herds became so ubiquitous by the early 18th century that a 1715 law established guidelines for the appointment of rangers to "range the Woods and Forests after Wild Neat Cattle and Horses" with "Wild Neat" meaning free-ranging, domesticated livestock (Bacon 1765: 698). Miller (1988: 193) noted the "colonists' reliance upon the natural environment for food diminished greatly between 1650 and 1700", as domesticated herds increased. These animals ranged free to find forage and required little financial or time investment on the planter's part. Valuable herds of roaming livestock also served as an "important economic buffer for planters against low prices and poor crops" (Miller 1988: 194). In addition to Miller's conclusions, this study suggests that, while free-ranging herds may have damaged unfenced crops, in foraging they also cleared wooded areas for cultivation. This clearing of overgrown areas saved planters time and labor in creating new areas for future planting.

Modern research reveals the powerful ways that domestic animals can shape landscapes through erosion, nutrient inflows, competition with local wildlife, and through the alteration of local plant and animal communities (Backus et al. 1998; Bari et al. 1995; Bankovich et al. 2016; Correll et al. 1995; Jordan et al. 1997; Seward et al. 2004; Strand and Merritt 1999; United States Department of Agriculture 2015). There is a significant and growing body of archaeological research that has been exploring these dynamics, as well (Arbuckle and Bowen 2004; Dugmore et al. 2005; McGovern et al. 2007; Silver 2001; Simpson et al. 2004; Walsh 2001; Yentsch and Reveal 2001). This article will draw on available paleoecological records from the Chesapeake region to discuss the potential environmental impacts of colonial era husbandry and the need for further environmental archaeological work to investigate the ways in which European colonists created the colonial Chesapeake landscape, in part, through their use of domestic animals (Crosby 2004).

A True and Perfect Inventory

Environmental interactions and impacts beyond exploitation of local resources can be examined to elucidate practices used in establishing colonial settlements; however, the Shaw and Sparrow sites must first be placed within the context of Miller's study to better understand whether practices at the two sites are representative of patterns across the Chesapeake region. Miller divided the sites he studied into three temporal periods: 1620–1660, 1660–1700, and 1700–1740. Both the Shaw and Sparrow tracts explored in this article were granted to the planters in the 1650s and were patented by mid-1660, placing both sites in Miller's second temporal period, ranging from 1660–1700 (Miller 1984, 1988: 186–190). Augustine Herrman's map of the Chesapeake Bay created in 1670 (FIG. 2) shows plantation dwellings in approximately the same locations as the Shaw and Sparrow sites, near the "Road River" (Rhode River) in Anne Arundel County, Maryland (Herrman et al. 1673).

The social status and level of wealth of the Chesapeake planters determined their ability to procure resources, leading Miller to investigate the respective wealth of the plantation owners in his survey (Miller 1984: 182–198). Grouping the landowners by wealth level, he found two-thirds of those from his second temporal period classified as "middling" planters of middle- or upper middle-class status; the remaining third was identified as being of high wealth level (Miller 1984: 197–198). Probate inventories from the Shaw's Folly and Sparrow's Rest sites are useful not only in determining the livestock held by the two plantation owners, but also in estimating their relative wealth as compared to other colonists of the time period. After John Shaw's death in 1674, a "true and perfect inventory" of his property was recorded. His neighbor, Thomas Sparrow, died just two years later, leaving contemporaneous records of the two estates (Maryland State Archives 1674, 1674/75). Probate inventories and artifactual evidence suggest both heads of household would be classified as "middling" planters (Horn 1988a, 1988b; Main 1982; Miller 1984, 1988).

Regardless of other material goods, both the Shaw and Sparrow families would be ranked in the middling-planter category by virtue of the value of their livestock herds alone. In the 17th

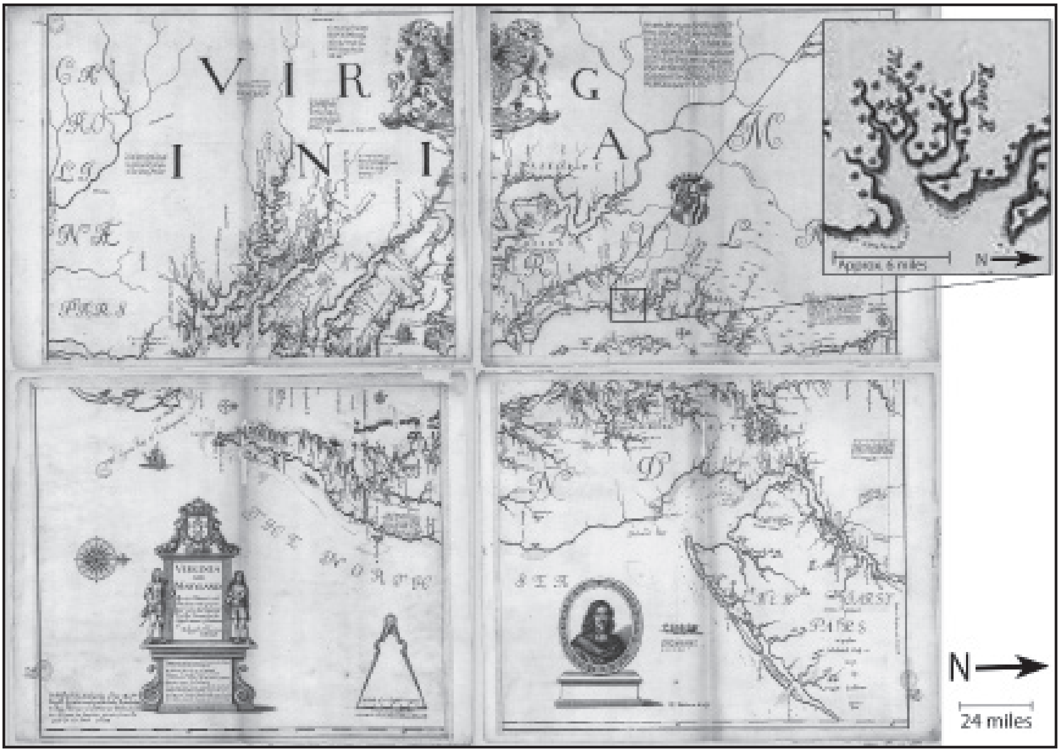

Figure 2. Augustine Herrman's 1670 (Herrman et al. 1673) map of the Chesapeake with inset highlighting the location of the Shaw and Sparrow sites.

century, animal values were assessed in terms of pounds of tobacco (Main 1982; Maryland State Archives 1674, 1674/75). Thomas Sparrow's herd, including 32 head of cattle, 26 pigs, and 6 horses, was valued at 19,200 lb. of tobacco (TAB. 1). At a penny per pound (an approximate average of the fluctuating value of a pound of tobacco during the time period in question), the equivalent monetary value of Sparrow's livestock would total exactly £80. John Shaw's herd of 17 head of cattle, 2 sows, and 4 horses was valued at 12,550 lb. of tobacco, which, at a penny per pound, would have had an equivalent monetary value of £52 5s 10d. Shaw's inventory also lists "one mare seized for going unmarked" (TAB. 1), confirming that his herds were indeed free roaming and branded with their owner's mark to prevent theft.

The inventories of both the Shaw and Sparrow families place them in the middle to upper level of wealth (Horn 1988b; Main 1982), which means faunal assemblages from these sites are comparable to assemblages from sites in Miller's second temporal period of study (Miller 1984, 1988). To ensure more accurate comparisons between the SERC material and Miller's data sets, two specific sites from Miller's second temporal period were selected for comparative analysis of their faunal assemblages. The Wills Cove and Drummond sites present the best comparative information from Miller's study, as both sites are contemporaneous with the Shaw and Sparrow occupations and located along rivers, suggesting each of the four sites had equal access to riparian resources.

The first data set derives from faunal remains recovered from two large pits at the Wills Cove site, located on the Nansemond River in Virginia. Little is known about the identity or status of the site's 17th-century occupants, but artifactual evidence indicates they were middling planters. The second data set was recovered from the Drummond site,

Table 1. Livestock owned by John Shaw and Thomas Sparrow as listed in their probate inventories.

Shaw Livestock	In Pounds of Tobacco	Sparrow Livestock	In Pounds of Tobacco
2 cows	1,300	2 steers 5 years old	1,000
2 steeres 5 years old	1,100	2 steeres 4 yrs old	800
1 steere 6 years old	600	1 steere 3 yrs old	300
1 bull 5 years old	400	1 bull 3 yrs old	300
3 steeres 2 years old	700	10 cows and 7 calves	6,700
2 steeres 3 years old	600	3 heifers 3.5 yrs old	1,200
2 heifers 3 years old	1,000	4 ditto 2.5 yrs old	1,200
3 heifers 2 years old	800	2 ditto 1.5 yrs old	400
1 bull 2 years old	150	1 old horse	1,000
2 sows	500	6 sows and 7 piggs	700
1 horse 3 years old	1,200	13 shoates [young, weaned pigs]	600
1 mare seized for going unmarked	1,000	2 old mares and 2 young colts; 1 mare 3 yrs old and ditto 2 yrs	5,000
1 mare	1,300	—	—
1 mare	1,900	—	—
Total	12,550	Total	19,200
Equivalent to £52 5s 10d		Equivalent to £80	

which Miller (1984: 193) refers to as "a major plantation." Drummond established the plantation on the James River in 1650 but in 1676 was hanged, drawn, and quartered as a result of his opposition to the Virginia governor during Bacon's Rebellion. His family, however, continued to run the plantation into the 18th century. Due to the long period of occupation, Miller divided the features from the Drummond site into three phases—Phase I from 1650–1680, Phase II from 1680–1710, and Phase III from 1710–1740. Information from faunal material recovered from features dating to Drummond Phase I, when the plantation was becoming established, comprises the second comparative data set (Miller 1988).

Probate inventories for both the Shaw and Sparrow estates indicate the families held much of their wealth in free-ranging livestock herds, while faunal assemblages suggest they also used domestic animals as a primary meat source. Miller's survey, including the Wills and Drummond sites, indicated that in the years 1660–1700 colonists were eating less wild game than in the preceding period of settlement, "but wild foods in total account for about 10 percent of the meat consumed" (Miller 1984, 1988: 187). To determine whether the Shaw and Sparrow families also relied on local game to supplement the "wild neat cattle" and pigs brought to their tables, the faunal assemblages from both sites were analyzed and compared to Miller's results.

Wild Neat Cattle and Horses

Faunal materials recovered from 17th-century features at the Shaw and Sparrow sites were analyzed in the course of this research. Initial exploration of the Shaw site was undertaken in 2012 using noninvasive methods, including surface collection, magnetometry, and metal detection, to delineate the site's boundaries. Magnetometry indicated a rectangular feature, measuring approximately 18 × 32 ft., as well as two circular features to the west. The SERC archaeology team's excavations focused on the circular features (part of an extensive, intact surface midden). The rectangular feature, which is likely the footprint of the Shaw dwelling, has not yet been defined via excavation; however, the structural footprint appears consistent in size with the typical dwelling of a middling planter in the later 17th century (Carson et al. 1981; Horn 1988b; Main 1982). Faunal specimens recovered by the team originated in the sub-plowzone middens dated to the 1650–1680 occupation of the site (Grady 2015).

Unlike the Shaw site's limited occupation range, the Sparrow site was occupied intermittently from the 1650s into the early 20th century. Extensive excavations in 2010 by the Lost Towns Project of Anne Arundel County found evidence of a post-in-ground structure measuring approximately 16 × 20 ft., although nearby construction of a large brick dwelling in the 18th century, extensive terracing of the formal landscape (Clifford, this issue), and more recent efforts to shore up the extant ruins of the house have to some extent degraded the archaeological integrity of the site. Both original dwellings for the Shaw and Sparrow families were impermanent structures, as was common in the Chesapeake region, with the wooden buildings expected to last 20–30 years at most (Carson et al. 1981; see also Main [1982: 140–66] for an extensive discussion of house styles in colonial Maryland). Researchers suggest this impermanent housing allowed planters to move to new areas on their tracts when exhausted fields required fallowing (Arbuckle and Bowen 2004; Earle 1988; Earle and Hoffman 2001; Potter and Waselkov 1994; Walsh 1977, 2001). The excavations at Sparrow's Rest focused on the footprint of the original 17th-century dwelling and associated features (Cox et al. 2011). To ensure faunal material was comparable to the Shaw assemblage and originated in deposits of the same time period, materials for analysis were selected from sealed features associated with the Sparrow family's 17th-century dwelling.

Previous research and analysis examined and cataloged faunal assemblages from both the Sparrow's Rest and Shaw's Folly sites (Gilbert and Gibb 2015). Specimens were identified by element and to the most specific taxon level possible, with a total of 19 species identified to the family, genus, or species level (TAB. 2). Remains that could not be identified to the family, genus, or species level were not included in subsequent analyses and interpretation.

Recovered bones were, for the most part, well preserved, likely due to the abundance of oyster shell deposited in the features. Discarded oyster shells release calcium carbonate into the soil, neutralizing the soils' natural acidity and acting to preserve bone (Miller 1984: 202–205). Fragmentation was evident throughout both assemblages. Gilbert and Gibb's (2015) initial analysis suggested bones were processed subsequent to butchering to extract the nutrient-rich marrow or fats for soap making. It is far more likely that fragmentation occurred postdeposition as a result of taphonomic processes, including pigs feeding on table scraps and livestock trampling food remains (Lyman 1994; Reitz and Wing 1999). Free-roaming, omnivorous pigs ate refuse, including table scraps, leading Zierden and Reitz (2016: 49) to suggest they "were essentially roving garbage disposals". Unfortunately, the data set did not include identification of rodent or canine gnawing which would have indicated long exposure to the elements; however, the Shaw assemblage's surface-midden provenience makes it likely the materials were subject to degradation, not only from domestic animals, but also from human foot traffic, scavengers, and weathering (Lyman 1994; Miller 1984: 200–201; Reitz and Wing 1999).

Zooarchaeological analysis of the assemblage included identification of the number of identified specimens (NISP) and minimum number of individuals (MNI). A biomass formula based on an allometric relationship between bone weight and body weight was then applied to calculate the biomass of soft tissues from faunal remains (Lyman 1994;

Table 2. Zooarchaeological species list for Shaw and Sparrow sites.

	Shaw's Folly Species List				**Sparrow's Rest Species List**			
	NISP		**MNI**		**NISP**		**MNI**	
Taxa	**No.**	%	**No.**	%	**No.**	%	**No.**	%
Osteichthyes Indeterminate bony fish	42	1.71	2	5.26	19	1.24	1	3.57
Acipenser oxyrinchus Atlantic sturgeon	1	0.04	1	2.63	—	—	—	—
Pogonias cromis Black drum	3	0.12	1	2.63	—	—	—	—
Micropterus salmoides Largemouth bass	1	0.04	1	2.63	—	—	—	—
Morone saxatilis Rockfish (Striped bass)	6	0.24	1	2.63	—	—	—	—
Sparidae cf. porgy	—	—	—	—	3	0.20	1	3.57
Lepisosteus osseus Longnose gar	—	—	—	—	16	1.05	1	3.57
Testudinata Turtles	2	0.08	1	2.63	11	0.72	1	3.57
Terrapene carolina Eastern box turtle	4	0.16	1	2.63	1	0.07	1	3.57
Pantherophis alleghaniensis Eastern rat snake	2	0.08	1	2.63	—	—	—	—
Aves Indeterminate bird	9	0.37	2	5.26	15	0.98	1	3.57
Gallus gallus Domestic chicken	9	0.37	2	5.26	6	0.39	1	3.57
Mammalia Indeterminate mammal	1,940	79.12	—	—	1,130	73.81	—	—
Mammalia Small mammal	7	0.29	—	—	49	3.20	—	—
Mammalia Large mammal	153	6.24	—	—	14	0.91	—	—
Procyon lotor Raccoon	3	0.12	1	2.63	1	0.07	1	3.57
Sylvilagus sp. Cottontail	—	—	—	—	2	0.13	1	3.57
Didelphis virginiana North American opossum	—	—	—	—	1	0.07	1	3.57
Sciuridae Squirrels	—	—	—	—	1	0.07	1	3.57
Carnivora Indeterminate carnivore	1	0.04	1	2.63	1	0.07	1	3.57
Canidae Coyotes, dogs, wolves, and foxes	—	—	—	—	1	0.07	1	3.57
Artiodactyla Even-toed ungulate	12	0.49	2	5.26	35	2.29	1	3.57
Odocoileus virginianus White-tailed deer	1	0.04	1	2.63	—	—	—	—
Bos taurus Domestic cattle	129	5.26	10	26.32	154	10.06	8	28.57
Sus scrofa Domestic pig	125	5.10	9	23.68	55	3.59	2	7.14
Caprinae cf. *Ovis aries* Probable domestic sheep	2	0.08	1	2.63	15	0.98	3	10.71
Equus caballus Domestic horse	—	—	—	—	1	0.07	1	3.57
Total	2,452	100	38	100	1531	100	28	100

Reitz and Wing 1999). Biomass estimates were calculated for mammal species identified to the family, genus, or species level. While material was dry screened at Sparrow's Rest, recovery methods at the Shaw's Folly site included water screening a large sample of material to ensure recovery of small specimens. Despite this, few fish and rodent remains appear in either assemblage. The limited range of species selected for meat, as well as the overlap between sites, suggests a stable diet almost exclusively based on a few domesticated species, predominately cattle and swine.

This preference for domesticated livestock over wild game fits the pattern Miller identified for contemporary English middling planters in the region (Miller 1984, 1988). Some wild fish and fowl found their way to the table but few wild mammals were consumed. Only one deer specimen has been found at Shaw's Folly, while no identifiable deer specimens are present in the Sparrow's Rest faunal assemblage despite the much longer occupation. Domesticated livestock, specifically cattle (*Bos taurus*) and swine (*Sus scrofa*), dominate both assemblages.

While a few sheep (*Ovis aries*) specimens appear at both sites, mutton makes up a small percentage of the total biomass at each site. Sheep and goat bones are difficult to differentiate, and thus are categorized as "sheep/goat" in most assemblages. As goats are rarely, if ever, mentioned in Maryland inventories, the specimens at the Shaw and Sparrow sites are assumed to represent sheep and have been classified as such. The recovery of sheep bones is notable because sheep do not appear in either probate list (Maryland State Archives 1674, 1674/75).

Due to the integral role of sheep in British agriculture and diet, early English immigrants to the colony were optimistic about raising sheep for both mutton and wool. They soon found predatory wolf packs decimated mid-Atlantic herds (Bowling 1942: 44; Miller 1984: 231–233, 1986). Miller also suggests sheep management was too labor intensive for plantation owners focused on tobacco cultivation. Following his in-depth analysis of a sheep burial excavated at the St. John's site in southern Maryland (Miller 1986), Miller was told by a farmer who herded sheep that shepherds often would bury the remains of deceased individuals to keep their sheepdogs from scavenging them. Once a working dog developed a taste for mutton, the farmer noted, the animal would begin to prey on the herds it was supposed to protect (Henry Miller 2017, pers. comm.). This anecdote prompts speculation that perhaps remains of animals kept for wool or brought to the table were buried away from the main living areas that tend to be the focus of archaeological investigation, thus rendering them less visible in the archaeofaunal record.

Cattle and swine were the primary sources of meat for both families, with cattle specimens making up half the assemblage from Shaw's Folly (NISP=129 out of 260 total mammal specimens) and two-thirds of that from Sparrow's Rest (NISP=154 out of 231 total mammal specimens). As noted above, fragmentation was evident throughout the collection, likely affecting NISP counts disproportionately for larger species, as larger bones tend to break into more pieces. When biomass is calculated to adjust for the higher meat yield from large animals (cattle and pigs) as opposed to smaller wild species, results suggest that 96% of the Shaw family's meat intake was from domesticated species (FIG. 3). The Sparrow family's percentage from this sample is much higher, fully 99% (FIG. 4). About 4% of the Shaw's family diet was comprised of wild species, while for the Sparrow family this number drops to less than 1%—results significantly lower than the approximately 10% observed in Miller's study of concurrent plantation sites (TAB. 3) (Miller 1984, 1988).

Bone weights from Miller were unavailable for biomass calculations; however, the Wills and Drummond sites described above were selected for NISP and MNI comparisons. The types and numbers of species exploited on the Miller sites and the SERC assemblages were

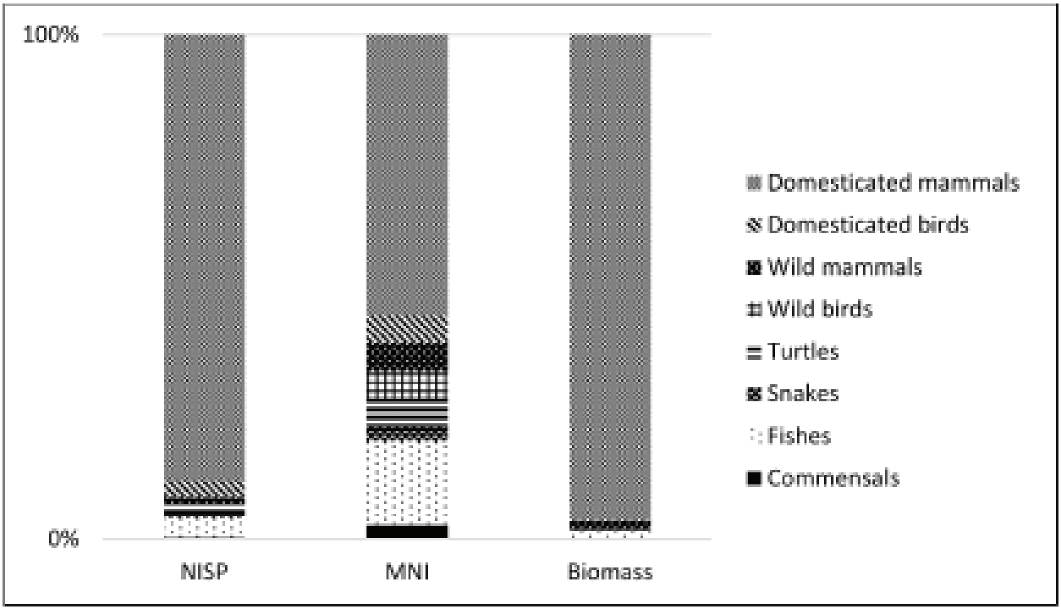

Figure 3. NISP, MNI, and biomass calculations for the Shaw site. (Figure by Valerie M.J. Hall, 2018.)

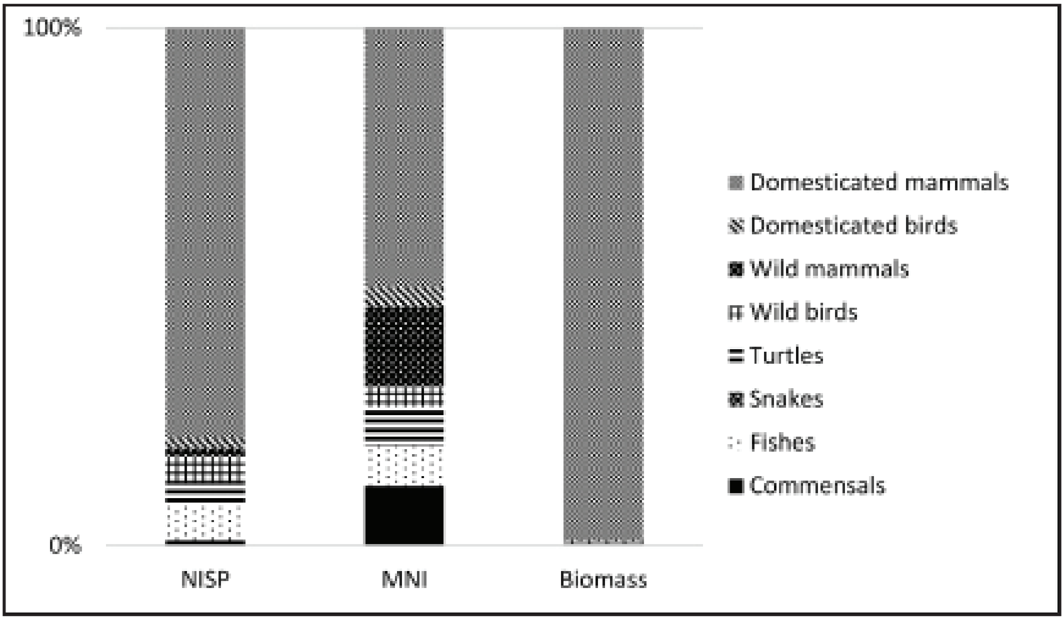

Figure 4. NISP, MNI, and biomass calculations for the Sparrow site. (Figure by Valerie M.J. Hall, 2018.)

very similar. The occupants of all sites preferred a diet of beef and pork, in fine English tradition, with little wild game to supplement their diets. As Miller (1988: 177) noted, meat "was a central element of the traditional British diet and... meat consumption carried a high cultural value" (FIG. 5).

Miller identified a far greater number of deer (*Odocoileus virginianus*) bones in his assemblages, with 22 specimens identified from Wills Cove and 14 from Drummond Phase I. This is a marked contrast to the single white-tailed deer element discovered at Shaw's Folly, while deer is entirely absent from the

Table 3. Shaw's Folly site and Sparrow's Rest site summaries.

Shaw's Folly Site	**NISP**		**MNI**		**Biomass**	
	No.	%	**No.**	%	**Kg**	%
Domesticated mammals	256	88.58	20	55.56	2637.0	96.17
Domesticated birds	9	3.11	2	5.56	5.0	0.18
Wild mammals	4	1.38	2	5.56	41.5	1.51
Wild birds	0	0.00	2	5.56	4.0	0.15
Turtles	6	2.08	2	5.56	5.0	0.18
Snakes	2	0.69	1	2.78	1.0	0.04
Fishes	11	3.81	6	16.67	48.0	1.75
Commensals	1	0.35	1	2.78	0.5	0.02
Total	**289**	**100**	**36**	**100**	**2742.0**	**100**
Sparrow's Rest Site	**NISP**		**MNI**		**Biomass**	
	No.	%	**No.**	%	**Kg**	%
Domesticated mammals	224	79.15	13	50.00	5145.50	98.96
Domesticated birds	6	2.12	1	3.85	3.50	0.07
Wild mammals	4	1.41	4	15.38	4.00	0.08
Wild birds	15	5.30	1	3.85	5.00	0.10
Turtles	12	4.24	2	7.69	11.50	0.22
Snakes	0	0.00	0	0.00	0.00	0.00
Fishes	19	6.71	2	7.69	16.00	0.31
Commensals	3	1.06	3	11.54	14.00	0.27
Total	**283**	**100**	**26**	**100**	**5199.50**	**100**

Sparrow's Rest assemblage. Deer were so plentiful in the region during the mid-17th century that John Hammond, writing in 1656 to extol the virtues of the Chesapeake colonies to Londoners, described "deare all over the Country... so many that venison is accounted a tiresom meat" (Hammond 2005: 291). George Alsop, writing a decade later (1666), also described "the extreme glut and plenty" of venison, noting it "so nauseated our appetites and stomachs, that plain bread was rather courted and desired than it" (Alsop 2005: 345). These accounts suggest that dietary preference might account for the lack of deer specimens in the assemblage.

Yet, the choice to prioritize domestic species over wild might have been a practical one, as hunting for wild game was a time-consuming endeavor with little guarantee of success. Even if a hunter was successful at bagging a large deer for the table, average meat yields from a modern white-tailed deer range between 30 and 150 lb. Compare that to an average 17th-century steer, which would respond placidly—potentially coming when called for feeding—and would yield roughly 400 lb. of beef, while a 17th-century hog would yield approximately 100 lb. of pork (Miller 1988: 199). Although Miller notes that some wealthy landowners could pay professional hunters to procure venison and other game, it is unlikely that the Shaw and Sparrow families could afford this expense (Baltimore 1885: 143; Miller 1988: 186). If all hands were needed for

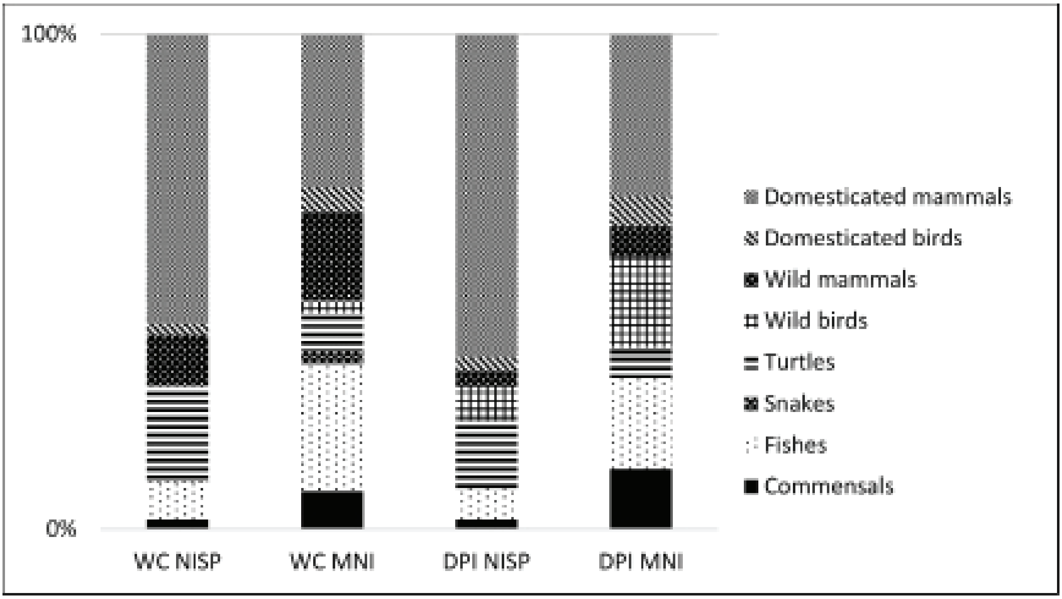

Figure 5. NISP and MNI (biomass data was not available) from the Wills Cove (WC) and Drummond Phase I (DP1) sites. (Data from Miller 1984: 402, 405; Figure by Valerie M.J. Hall 2018.)

tobacco cultivation, as Miller (1984, 1988) suggests, little time could be wasted hunting when the benefit-to-cost ratio of focusing on domestic species was much higher.

While the Shaw and Sparrow families do not seem to have exploited much local game, they were influencing local faunal and floral communities regardless. They likely used their free-roaming, domesticated livestock as agents of landscape change to clear vegetation and alter the surrounding landscape for further agricultural productivity.

Environmental Impacts

English settlers in the Maryland colony arrived to find a landscape already shaped by human activity. Documentary and archaeological evidence reveals colonists selecting land on which settlements and crops had been established by generations of indigenous groups, a common pattern of usurpation that Potter and Waselkov note can be traced back to the Anglo-Saxon colonization of the British Isles (e.g. Hall 1910; McSherry 2005; Miller 1984, 2001; Potter and Waselkov 1994: 31). Sedimentation and palynology studies (Miller 2001; Silver 2001) suggest the indigenous population used anthropogenic fires to clear underbrush and land for planting. Early colonists settled near "old Indian fields" and adopted native farming methods for their tobacco cash crop (Brush 2001; Earle 1988; Hall 1910; Main 1982; Miller 1984; Potter and Waselkov 1994; Walsh 2001). Indigenous agricultural practices likely were taught to colonists by Indian women, whose engendered tasks included farming and foraging, although these and many similar contributions to early colonial Chesapeake culture have been largely overlooked (Hall 2012; McWilliams 2005; Miller 2001). These native methods included creating swidden plots and girdling trees to clear wooded areas, as well as allowing farm fields to lay fallow for up to 20 years in order to replenish fertility (Main 1982; Miller 1984, 2001; Potter and Waselkov 1994).

Geomorphological and palynological evidence suggest that the adoption of native farming methods by English colonists did not precipitate erosional events. Major signs of erosion do not appear in these records until the introduction of the plow in the latter half of the 18th century (Brush 2001, 2009; Earle 1988; Earle and Hoffman 2001). However, it is likely the importation of European domesticated animals reshaped the landscape in other important ways, with effects that were perhaps anticipated or even intended by colonists (Silver 2001; Yentsch and Reveal 2001).

Grazing livestock can have both beneficial and detrimental effects on surrounding ecosystems. Examining this phenomenon in the past through archaeology and environmental history has revealed the ability of past cultures to dramatically alter their environments through the use of domestic animals (Arge et al. 2009; Dugmore et al. 2005; Hambrecht 2015; McGovern et al. 2007; Simpson et al. 2004; Thomson and Simpson 2006). Not only do grazing herbivores compact soils and injure plants through trampling, they also graze selectively. Trampling and selective grazing of preferred plants changes soil structures and the structure of plant communities by altering reproductive capabilities, freeing ungrazed species from competition, and allowing structurally different types of plants to take hold in overgrazed areas. This provides ideal growing conditions for invasive species, the seeds of which may even hitch a ride in the fur, hooves, or digestive tracts of domesticated livestock, while at the same time clearing large areas for future agricultural use (Backus et al. 1998; Bankovich et al. 2016; Bari et al. 1995; Seward et al. 2004; Yentsch and Reveal 2001; United States Department of Agriculture 2015).

The structural changes observed in plant communities can translate into direct impacts on local wildlife. Rooting and grazing degrade the habitat of indigenous species, destroying vegetation commonly used for food and camouflage, and often leading to the extirpation of local species (Lynch 2001; Yentsch and Reveal 2001; Walsh 2001). Domesticated species might also carry and transmit diseases to indigenous wildlife and plants against which local populations have very little resistance. Strand and Merritt (1999: 14) noted that "cattle prefer to graze in and around streams," leading to increased erosion, siltation, and alterations to water chemistry; these changes affect the aquatic-insect communities that comprise food sources for fish and other riparian species, which are affected in turn. It is possible that the lack of local wildlife diversity within the Shaw's Folly and Sparrow's Rest assemblages is due in part to the grazing of domesticated herds decimating habitats and extirpating local indigenous species, although it may also be attributed to cattle directly competing with deer for forage (Backus et al.1998; Bankovich et al. 2016; Bari et al. 1995; Seward et al. 2004; Strand and Merritt 1999; United States Department of Agriculture 2015).

Soils are heavily impacted by the grazing, trampling, and rooting activities of domesticated livestock. Pigs instinctively root into the soil with their snouts, destroying floral root structures and leading to the collapse and compaction of soil. Trampling causes similar effects, and local plants are not always able to recover spontaneously. New growth is often unable to penetrate compacted soils, while water tends to pond due to poor drainage in the collapsed soil structures. Waterlogged soils lose nitrogen easily, while trampled zones are more susceptible to erosion and phosphorus runoff into local waterways (Bankovich et al. 2016; Giguet-Covex et al. 2014; Seward et al. 2004). Cultivation and vehicular traffic affected soil erosion in the Rhode River watershed (Grady, this issue) but erosion brought on by free-ranging herds also might have contributed significantly.

Plants and soils also are affected by wastes deposited by domesticated livestock. While manure provides some benefits to local plants, the urine deposited by livestock delivers a highly concentrated burst of nitrogen, often burning vegetation and its roots. While a small portion can be absorbed by surrounding vegetation, a majority of the nitrogen leaches into the groundwater or evaporates into the atmosphere. Phosphorus is also deposited and is only removed via erosion of contaminated soils. Runoff from areas where these chemicals are present, aided by compaction of soils as discussed above, impacts local waterways as well as the aquatic species inhabiting them. Soil-chemistry testing could be an effective way to measure deposited nutrients from domestic herds (Sullivan and Kealhofer 2004), although the long history of agriculture in the Rhode River watershed might make isolating and sampling 17th-century deposits challenging.

Perhaps even more speculative is the potential impact of methane emissions from the growing New World herds of the colonial period. It has been proposed that methane emissions from early agriculture in China might have led to an anthropogenic impact on atmospheric chemistry (Ruddiman et al. 2011). Methane is the second largest contributor to global warming, and emissions from farmed animals produce nearly half of the methane that is implicated in global climate change. Enteric fermentation produced by ruminant digestion causes livestock to burp methane into the atmosphere, and manure production, while adding nutrients to the soil, further adds to the methane emitted into the atmosphere by individual animals (Bari et al.1995; Grainger and Beauchemin 2011; McGinn et al. 2004). Using calculations from current research on methane emissions, faunal remains, and records of herd sizes, it may be possible to model methane emissions produced by historic livestock herds in the Chesapeake region, adding a new dimension of information to the examination of the growth of cattle and dairy industries over the last few centuries (Janesko, this issue); however, this suggestion is purely speculative.

In transporting the classic Eurasian/African Neolithic package of domesticated animals (including cattle, sheep, horses, pigs, goats, and dogs) to the New World, English settlers were following a pattern of colonization stretching back hundreds, if not thousands, of years (Pavão-Zuckerman and Reitz 2011). A number of studies of colonial phenomena from a variety of time periods (i.e., medieval Norse, medieval German, Polynesian) suggest that domesticates were introduced by colonists as a way to engineer landscapes to their needs (Arge et al. 2009; Brown and Pluskowski 2011; Dugmore et al. 2005; Hambrecht 2015; Kirch 2017; Kirch and Hunt 1997; Kirch and Kahn 2007; McGovern et al. 2007; Pluskowski 2010; Simpson et al. 2004). In light of these studies, it is reasonable to suggest that animals introduced by colonists in the Chesapeake region should be investigated beyond their value for subsistence and economic capital.

Domesticated livestock in the Maryland colony served to clear vegetation from wooded areas and fallowed fields experiencing second growth (Arbuckle and Bowen 2004; Silver 2001; Walsh 2001). Allowing livestock to forage released plantation owners from the labor and cost involved in feeding penned animals, while the free-roaming herds cleared wooded areas for future use as tobacco fields. In this way, imported domesticated species were agents of landscape change, and therefore, might be conceptualized as a form of ecological niche construction (McClure 2015).

Future Directions for Research

Given the many ways in which domesticates can influence ecological conditions, examining paleoecological proxy data from the Chesapeake could reveal areas in the record where impacts from domestic animals might be present. Brush (2001, 2009) notes increases in the ragweed-to-oak ratio beginning in the Chesapeake region as early as the 1650s as ragweed began to colonize freshly disturbed soils and cleared forests. Similarly, she charts an increase in the nitrogen influx into regional waterways beginning approximately in the 1660s when planters at all socioeconomic levels held livestock (Brush 2009: 20; Main 1982: 62–68). This trend holds steady through the middle of the 18th century. Unfortunately, Brush does not note the locations of sediment core samples taken from the Chesapeake Bay (Brush 2001, 2009), and while more recent studies have explored nitrogen and phosphorus runoff in the Rhode River watershed (Correll et al. 1995; Jordan et al. 1997), those studies span only a few decades. Future directions for research should include local sediment coring and an investigation of the palynology of the Rhode River watershed over the last several centuries to determine whether correlations can be established between settler/livestock colonization of the region and increased nutrient burdens, as well as exploring shifting pollen signatures as livestock cleared wooded areas and brought new species into the landscape.

At this time archaeological data sets from the Shaw and Sparrow sites allowing measurements of the environmental effects of livestock on the Rhode River watershed are limited. Soil chemistry tests and investigation of local sediment cores could inform future research into the environmental effects discussed above. Additional research should also include a reassessment of the faunal assemblages from each site comprised of an evaluation for postdepositional scavenger activity, examination of skeletal markers to determine ages of individuals when slaughtered, and the taking of measurements using the standardized system described by Angela von den Driesch (1976). Measurement information could then be compared to Arbuckle and Bowen's (2004) study of increasing cattle size during the 17th century, which the authors suggest correlates to livestock foraging in fallow land.

Arbuckle and Bowen note that cattle size increased steadily over the first 80 years of settlement in the region, with significant declines beginning around 1700. The authors suggest these declines correspond to the agricultural reforms of the 18th century that left fewer fallow fields in which cattle could graze (Arbuckle and Bowen 2004). Specimen sizes from the Shaw and Sparrow sites could be placed within this range of measurements to determine whether the cattle from these sites show similar size increases related to foraging. Ongoing stable isotope analysis measuring carbon associated with the dietary intake of native woody plants and grasses (from foraging) as compared to maize intake (from being pastured and foddered on corn), shows promise for revealing shifts in livestock management correlating to these changes in size.

The above hypotheticals suggest the need for a comprehensive environmental history of the bay region to be compiled from available environmental proxy data, including faunal assemblages, ethnobotanical materials, sediment cores, stable isotope analysis, and other interdisciplinary lines of investigation. An historical ecology framework emphasizing a landscape approach and exploration of environmental and societal changes throughout the longue durée could inform a longitudinal survey of the history of human entanglement with the bay region. An interdisciplinary team investigating multiple sites with tight spatial and temporal controls could explore the types of environmental effects theorized above, as well as investigating human actions and reactions to changing ecosystems (Crumley 1994, 1998, 2015). In using an historical ecology framework for their 2016 study of the Chesapeake Bay's oyster fishery, Rick et al. proved the efficacy of this type of approach in the region. The team used shell deposits along shorelines to explore not only recent human impacts, but also changes to the oyster community and its overall sustainability throughout the last 3,500 years (Rick et al. 2016). This type of multiscalar approach to the landscape of the Chesapeake establishes deep-time species density and diversity while elucidating environmental, climatic, and social shifts over millennia of human entanglement in the region.

The Shaw and Sparrow sites might provide a starting point for this type of long-term study of environmental change. However, multiple and diverse sites from across the Tidewater and spanning the whole of human occupation in the region should be synthesized into a broad longitudinal survey bringing together interdisciplinary researchers within an historical ecology framework. For several decades researchers at Historic Saint Mary's City have been collecting and compiling data that could be incorporated into this type of survey and a vast store of largely unanalyzed zooarchaeological material from the region is curated at the Maryland Archaeological Conservation (MAC) Laboratory and similar repositories (Rebecca Morehouse 2019, pers. comm.). The St. Mary's City landscape and the Jefferson Patterson Park and Museum campus (on which the MAC Lab is located) offer a range of indigenous and historical sites that have suffered minimal disturbance and might have additional intact proxy data with which to begin building a larger picture of environmental change over several millennia in the region.

The Nearly Infinite Series of Past Landscapes

By the 1680s, both John and Sarah Shaw were deceased and Shaw's Folly was abandoned. Thomas Sparrow's land was inherited by his son, Thomas Sparrow III, who continued the family's farming tradition. The land remained in cultivation, later becoming a dairy farm, and was worked well into the 20th century. Both properties eventually passed into the hands of the Sellman family, who left their own imprints on the landscape (Grady, this issue; Janesko, this issue).

In exploring the Shaw and Sparrow families' colonizing practices during their 17th-century occupation of the sites, I asked questions pertaining to their livestock herds: Do the faunal assemblages from each site fit the pattern identified in Henry Miller's 1984 survey of plantation sites in the Chesapeake region? How do the percentages of domestic livestock vs. wild resources compare to the data sets explored in Miller's research? What might have been the ecological consequences of the plantation owners' reliance on domesticated livestock?

Analysis of faunal deposits from John Shaw's and Thomas Sparrow's occupations show similarities between their families' dietary choices and those described by Henry Miller's extensive survey of dietary patterns in the Chesapeake region. However, the Shaw and Sparrow families appeared to supplement their diets with far less wild game than Miller saw across other sites during the same time period (Miller 1984, 1988). In addition to keeping livestock as chattel and for sustenance, this research suggests colonial farmers in the Chesapeake region perceived the value of domesticated animals in clearing wooded land for further agricultural use. The use of domesticated livestock to engineer the landscape, clearing vegetation and secondary growth from fallow fields while saving plantation owners time and labor, could have had measurable consequences on the surrounding ecosystem. Given the modern and historical/archaeological examples of such impacts, this supposition is reasonable.

Future lines of inquiry should include investigating the measurability of changes to the local plant and animal communities caused by historical herds of domesticated livestock, including an exploration of the environmental repercussions and adaptations that followed the animals across the landscape. The capabilities of the growing set of tools available to archaeology for paleoecological and paleoclimatic research should be applied to Chesapeake archaeology in order to understand the impacts of European colonization on the region. Investigating these issues using archaeological processes situates current environmental research within a long view of human impacts, adaptations, and interactions with the environment (Crumley 1994, 1998, 2015; McGovern et al. 2007; Rick et al. 2014; Rick et al. 2016) and could lend context to current and future agricultural research, as well as informing policy regarding stewardship of the Chesapeake Bay and surrounding waterways.Cronon (2001) provides an apt metaphor for the Chesapeake Bay landscape, describing it as a "palimpsest"—a recycled medieval manuscript parchment from which the original ink was scraped, but the previous writing remains faintly visible. He notes that it is important to view the bay:

> not just in three dimensions but in four. In addition to the present landscape which we see, touch, smell, and move through, there is also the nearly infinite series of past landscapes that preceded the present one in time. ... To understand why the environment around us has the shape it does, why the plants and animals and people who inhabit it live here as they do, we must connect the present of this place to its past. (Cronon 2001: 357)

In order to better envision this four-dimensional landscape, multidisciplinary research in the historical ecological mode, focusing on paleoecological work as well as environmental archaeological research, is needed. This article is a first small step in this direction.

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