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Counter-Mapping Maroon Cartographies: GIS and Anticolonial Modeling in St. Croix

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Abstract

Formal spatial modeling and analytical approaches to maroon settlement, fugitivity, and warfare in the colonial-era Caribbean have tended to mine historical cartographic sources instrumentally to analyze the distributions and simulate processes driving marronage in St. Croix (Dunnavant 2021b; Ejstrud 2008; Norton and Espenshade, 2007). Through close-in analysis, we compare two Danish maps of St. Croix produced in 1750 and 1799 in relation to modern cartographic sources, to explore how cartographic forms and cartesian conventions (attempt to) elide blind spots in the colonial gaze. By modeling possible subject-oriented

maroon movement on georeferenced colonial maps and contemporary LiDAR, we demonstrate how GIS can recover anti-colonial agency. Additionally, the practice of georeferencing itself is a critical site of analysis, revealing distortions suggestive of social and environmental conditions that limited colonial cartographers' ability to map certain wilderness and contested landscapes that lay outside of their control.

Keywords

Counter-mapping, LiDAR, GIS, Caribbean, colonialism, slavery, marronage

Introduction

The dislocations of the trans-Atlantic slave trade and the encompassing colonial systems that it serviced have rendered Black subjects and Black histories "ungeographic" (Gilmore 2002; Hawthorne 2019; King 2019; McKittrick 2006; McKittrick and Woods 2007). Such "discourses that erase and despatialize [the Black subject's] sense of place" (McKittrick 2006, xiii) not only render Black bodies perpetually "out of place," but have also positioned Black scholars pursuing questions of Black spatial practices outside of traditional geography. As Katherine McKittrick writes in *Demonic Grounds*:

> Black geographies are often unimaginable because we assume they do not have any valuable material referents, that they are words, rather than places, or that their materiality is always already fraught with discourses of dispossession. So, what happens if these places, spaces, words, and experiences are imaginable, complex geographies, which have always existed before our very eyes? (2006, 8)

While traditional geography and its analytical tools—like geospatial modeling—have often perpetuated the erasure of Black place-making, here we make a case for how these tools can be effectively reframed and deployed to center Black subjectivity in place, thus responding to McKittrick's call to imagine the complexity of Black geographies.

In this paper, we reflect on an ongoing project that seeks an anti-colonial, counter-mapping approach to geospatial modeling to illuminate how landscape affordances facilitated possibilities of marronage in the colonized landscape of the island of St. Croix (Dunnavant 2021b; Ejstrud 2008; Norton and Espenshade 2007). It attempts to model a landscape of marronage affordances—that is, a spatial representation of the propensity for clandestinity. To many theorists of landscape, such an endeavor may seem oxymoronic, as critical geographers have characterized geographic information systems (GIS) and related geospatial technologies as modernist, surveillant, positivist, reductive, and ultimately oppressive (Lyon 1994; Pickles 1995). We argue, by contrast, that geospatial modeling need not depend on the reductive treatment of the environment as an independent variable via cartesian abstractions and synoptic views of space, but instead can be fruitfully deployed to simulate layered, subject-inclusive, and goal-oriented views of dwelling in and moving

through past landscapes. Formal geospatial modeling and analyses provide a suite of tools that can be used in both uncritical, overly reductive, and critical, subjectively-informed ways (Openshaw 1991). Here, we build on a growing critical archaeological GIS literature (e.g., Ejstrud 2008; Harmon et al. 2006; Howey 2007, 2015; Howey and Burg 2017; Norton and Espenshade 2007; Randle 2011; Supernant 2017; Whitley 2002) that is developing theory and methodologies for modeling perception and experience of past environments, as well as movement through them. Yet even within this literature, few studies have attempted to model how differently-situated social groups with distinct orientations and goals might subjectively perceive and navigate an environment, and fewer still attend to how the affordances of an environment—including their uses and characteristics—can change through time (cf. Gillings 2009, 2012; Kosiba and Bauer 2012; Llobera 2011, 2012; Wernke, Kohut, and Traslaviña 2017; for ethnographic examples, see Fitzjohn 2007; Kwan 2002).

Our project strives to make visible the affordances of landscape through the subject positions of enslaved Africans seeking refuge and liberation from the depredations of the Danish colonial sugar plantation regime. It also illustrates the errors and limitations of the eighteenth-century cartographic campaigns that produced key instruments of surveillance for Caribbean colonial officials. In doing so, we first show how these places of liberation were rendered ungeographic by colonial cartographers. We then ask, how might a landscape have been perceived and navigated by enslaved African laborers relative to its potential for refuge? In this framing, the environment is not an a priori set of features and properties to which humans adapt and transform; it is an emergent, relational assemblage that enmeshes variously situated human subjects of distinct orientations and intentions. Environments and people were mutually constitutive in the colonial order. Landscapes that were tamed for plantation agriculture and administration were under colonial control, while remote, "wild," or untended landscapes outside of the colonial gaze afforded the unique opportunity for maroon fugitivity (Malm 2018; Wright 2019). Moreover, we seek to redeploy the same technology of colonial surveillance to anti-colonial ends by using historical maps of St. Croix from different periods to chart the changing qualities of surveillance and matrices of opportunities for marronage through the eighteenth century. We then create a suitability model accounting for variables including global landscape permeability, local landscape permeability, distance from settlements, distance from roads, proximity to streams coupled with path distance and fuzzy overlay analyses. An analysis of these historical maps in relation to contemporary geospatial light detection and ranging (LiDAR) data reveals an unexplored maroon geography and a limitation of the colonial surveillance project: the inability of colonial cartographers to accurately map maroon and "wild" landscapes.

In this paper, we do not present this methodology or its outputs in detail, but instead pursue the theoretical and methodological challenges that the project presents, providing examples for illustrative purposes. There are indeed significant epistemological challenges inherent to the project, as, on the one hand, we cannot know all of the relevant dimensions of marronage affordances, but on the other hand we also know that those seeking refuge

perceived and navigated the landscape very differently than plantation owners and Danish colonists. Yet we argue that modeling of marronage landscapes is a worthy pursuit as it can surface otherwise "ungeographic" people seeking refuge. Whereas the clandestine nature of maroon landscapes was integral to their continuation during the era of slavery, today, rendering these maroon landscapes legible allows us to understand, with greater nuance, how Africans were conceptualizing and "making livable worlds" (Lloréns 2021) in the Danish West Indies. Nonetheless, we can begin to understand how a landscape might be differentially perceived and navigated if one's goals were clandestinity and refuge from colonial surveillance and capture. As in any exercise in modeling, we know that our simulacra are rather impoverished proxies for changing affordances for marronage and perceptions of those seeking refuge. The resultant model outputs are therefore necessarily partial, provisional, and speculative—they are an invitation to critical engagement, for thinking through as part of a broader project for charting the machinery of colonial subjugation as well as otherwise "hidden transcripts of resistance" (Scott 1990) to it. In these senses, we try to think through the maps we produce as a form of placemaking aligned with the anti-colonial efforts of would-be maroons seeking a measure of clandestine liberation. In what follows, we provide an account of the theoretical and methodological approaches that inform this ongoing work in colonial St. Croix and situate it within regional and broader scholarly currents on marronage in the Atlantic World and colonial geography.

Toward Anticolonial Geospatial Modeling

In attempting to chart these clandestine maroon landscapes, we center and render visible these places of refuge for enslaved Africans on St. Croix. From the first moment enslaved Africans were brought to St. Croix, it is believed that some escaped captivity and established autonomous maroon communities in the island's remote areas. Danish accounts in the 1700s discuss a maroon settlement in the area known as Maroonberg (Maroon Ridge), a remote mountainous enclave in the northwestern region of the island. Although a known site of resistance, the Danes were unable to disband the community even after repeated "maroon hunts" (Hall 1985). To date the location and extent of the maroon community is still unknown. Our approach to modeling affordances of marronage builds from phenomenological GIS approaches, which emphasize the experiential and sensorial constructions of landscape. We emphasize how the perception and experience of landscape emerge in relation to subject positionality—as an emergent property of goal-oriented action in and through an environmental assemblage (Gillings 2009, 2012, 2017; Howey 2007, 2011; Kohut 2018; Llobera 1996; Wernke, Kohut, and Traslaviña 2017; Wheatley 2004).

In our approach to modeling marronage on St. Croix, we draw on perspectives that push against the notion of *spatial transparency*: that material and physical realities are directly perceived and easily understood through Cartesian representations (Hawthorne 2019; McKittrick 2006). Instead, we acknowledge that the landscapes in which Black and Native lives are most salient are often rendered ungeographic (placeless and geographically invisible) through traditional geographic approaches. However, we maintain that formal

geospatial modeling does not need to depend on a conception of the environment as a set of static variables (slope angles, slope aspects, soil types, watershed basins, Euclidean distances), and work instead toward modeling that considers the relational affordances that such factors (avoiding sites used by colonial agents, maintaining militaristically advantageous positions, seeking areas of dense vegetation) might have for people—what Gillings (2017, 127; after Baires et al. 2013, 199) has termed "relational fields." That is, while traditional GIS practice maps out static variables in search of correlations against the spatial distribution of the phenomenon of interest, the approach we seek focuses on the relational capacities that such variables might have for people engaged with them given their intentions, goals, and conceptions of place. Approaching landscape in this way acknowledges the various perspectives by which landscapes may be perceived and made visible.

Phenomenology in archaeology has been a fraught field of scholarly debate. Its early enunciation (Tilley 1994) centered on subjective perceptual experience and dismissed formal geospatial modeling as Cartesian, reductive, and synoptic rather than subject- and experientially-oriented. Conversely, archaeological GIS practitioners pursued diverse approaches, ranging from econometric and ecological-adaptationist orientations on the one hand, to interpretive, subject-centered, political-ecological, and holistic landscape approaches that were (often implicitly) rooted in phenomenology on the other. A potted history of the theoretical and methodological diversification and development of archaeological GIS need not be rehearsed here (for illuminating perspectives on the development of archaeological GIS, see, e.g., Gillings 2012, 2017; Howey and Burg 2017; Kosiba and Bauer 2012; Lock and Pouncett 2017), but for our concerns, perception and movement were among the most important (and accessible) dimensions of experience that geospatial modeling and analysis developed. Various forms of visibility/viewshed and anisotropic cost surface models (landscape permeability, least-cost path analysis, etc.) in particular found widespread adoption, with whole edited volumes dedicated to them (Lake and Woodman 2003; White and Surface-Evans 2012). In some ways, the development of these approaches repeated some of the problems that emerged with early adopters of GIS in archaeology more generally: as early archaeological GIS subsisted on the low hanging fruits of raster- and vector-based environmental variables to construct rather vulgar environmental determinist perspectives on human land-use practices, early adoption of visibility and mobility modeling tended at times to consist of rather uncritical application of viewshed and least-cost path analysis using public domain Digital Elevation Models (DEMs) to produce thin, reductive, rational actor representations of human perception and movement (for critique and intervention, see, e.g., Gillings 2015; Llobera 2000, 2001, 2003; Lock 2000; Howey 2007; Ogburn 2006, among others). Critical dialogue within this community of practice led to a period of theorization and enrichment over the last ten to fifteen years. In the process, the role of GIS and related geospatial tools have changed from a set of "tools" or methodological adjuncts to integral components of theorization itself (Burg 2017a; Burg 2017b; Howey and Burg 2017; Lock and Pouncett 2017). Spatial thinking, modeling, and analytics have thus moved from the "periphery"—as a post hoc set of

operations bolted onto archaeological research projects—to the center of a more holistic orientation around spatiality, spatial practice, and the place of people in broader assemblages of landscapes, biota, and things (Lock and Pouncett, 2017).

Theoretical overtures made by archaeological GIS practitioners to critical landscape phenomenologists have been largely unrequited (Gillings, 2012), but we are not weary of the prospects for dialogue. After all, if we are to take the insights of new materiality seriously, the affordances of geospatial technologies must not be determinative, but rather emergent phenomena in their application, susceptible to reflexive monitoring (Gillings 2017). Critiques of geospatial phenomenological approaches have relied (somewhat ironically) on an implicit deterministic understanding of the effect of GIS and related tools on the kinds of research questions that can be addressed, how they can be framed, and how they can be answered. We are not doomed to be interpellated by GIS; rather we suggest that through the reflexive development of research questions (and their mediation through methodology), we may find provisional routes through anticolonial geospatial modeling. Moreover, incorporation of colonial cartographic source materials in such projects do not condemn them to reproducing the colonial gaze. As colonial textual sources can be read against the grain to reveal hidden transcripts of resistance, colonial cartographic sources (as text in graphic form) may also be counter-mapped (through geospatial modeling) from subaltern subject positions to render multidimensional perspectives on the past (Harris and Hazen 2006; Oslender 2021).

Critical cartography and counter-mapping emerged to understand and critique the relations that colonial cartography and mapmaking practices enforce (Hauser 2022; Oslender 2021;). They highlight how maps and mapmaking are agentative processes which often reinscribe colonial notions of land as property denuded of humans and other species of relatively little importance. Counter-mapping (Byrne 2016) and participatory mapping (White 2022) strategies allow archaeologists to explore renewed perspectives, agency, and worldviews of colonized peoples beyond the scope of the colonial gaze. Furthermore, while counter-mapping activities usually result in static analog cartographic representations, geospatial modeling enables dynamic, multilayered, and modeled elements and processes. Thus, GIS-based counter-mapping, when applied to colonial contexts in the Caribbean, facilitates alternative subject-oriented readings of geographies and landscapes from enslaved and, in this case, maroon perspectives. We seek to model the affordances of landscape for marronage, in part by modeling evasion of the colonial gaze that is encoded in colonial maps. In so doing, we explore how affordances in the relations among those seeking refuge and the features of landscape can shed light on Afro-diasporic practices of placemaking, and therefore how fugitivity can be modeled in the historical landscapes of St. Croix.

Mapping in Slavery and Freedom

Geographers, historians, and archaeologists have contributed to innovations in geospatial methods over the last few decades and are increasingly deploying and developing them for modeling and interrogating historical landscapes. The genealogy of these technologies can be traced back to colonialism, imperialism, and surveillance (Bell,

Butlin, and Heffernan 1995; Browne 2015; Godlewska and Smith 1994), as the birth of modern cartographic practices are tied directly to imperial expansion and the development of colonial extractive infrastructure into the present (for example, see Gupta, Blair, and Nicholas 2020). In the Caribbean, colonial maps were key instruments of colonial governmentality, as they delineated territory, facilitated imperial strategy and expansion, and quantified fertile land for plantation agriculture. These mapping practices reveal much about the colonial project and its role in reifying the quantification of landscapes while simultaneously relegating enslaved and maroon peoples to marginal or invisible status through omission.

Recent analyses of colonial cartographies demonstrate the potential for using geospatial methods to map "crevices of power" (Sharpe 2003, xxi). Drawing from Michel de Certeau's (1984) ruminations on tactics of everyday resistance, Sharpe elaborates on how the disempowered may employ tactics of resistance in interstitial and marginal places beyond the bounds of oppressive control. Mapping these crevices of power can guide scholarship towards sites of resistance and illuminate geographic forms and processes that afford anti-colonial tactics. Many inroads have been made by scholars using GIS to integrate historic maps, georeferenced to modern coordinate systems, with archival and spatial analytic methods.

Interrogating the qualitative and quantitative elements of historical geographies has uncovered varied perspectives of the colonial experience that are not readily identifiable from written archival records. In St. John, Armstrong et al. (2009) used GIS to study land use patterns on the island. Combining historic maps, tax records, and pedestrian surveys, they determined that free people of color had been increasing their land ownership nearly half a decade before emancipation on the island. These properties were often associated with land that was less conducive to cash crop cultivation. Additionally, they identified changing spatial distribution in plantations over time. Many of the cotton plantations were situated on the east and west coast of the island while the sugar plantations operated largely in the interior and along the north coast. Furthermore, when demographic data of free and enslaved Africans on the island is paired with GIS, the spatial distribution shows a majority of the enslaved Africans were concentrated in the northwestern part of the island on the large sugar estates. Imbuing historical maps with this demographic data helps to geographically and temporally situate emancipation as a process rather than a singular event.

In her study of historic plantations in South Carolina, Lisa Randle (2011) studied land-use patterns through time and conducted viewshed analysis to explore patterns of colonial surveillance. In her assessment of a regional panoptic model to the Cooper River area of South Carolina, she challenged notions that plantation owners had constant surveillance of the enslaved laborers. Instead, plantation big houses, located on high ground, were intervisible, but they did not have unobstructed viewsheds of enslaved quarters. The model was not able to map historic vegetation, weather conditions, and other factors that may have

improved or impeded surveillance, but the study raised key questions about the primacy of surveillance during slavery.

Geospatial data has also illuminated aspects of Afro-Atlantic fugitivity through slave revolts in the Caribbean. Holly Norton (2020) interrogated historic maps and demographic data to explore the circumstances surrounding the 1733 slave rebellion on St. John. As one of the largest rebellions in the Caribbean at the time, the uprising lasted eight months before a multi-ethnic group of European mercenaries was called to suppress the revolt. Mapping the 1733 plantations and their relevant demographic information, Norton concluded that participation in rebellion was geographically determined as the rebels maintained their dominance in the eastern part of St. John near the plantations where they were enslaved. During that time, ethnicity and geography were closely linked. Plantation owners occupied distinct administrative quarters based on their European ethnicity and most enslaved Africans clustered in the eastern part of the island where the revolt was strongest.

Historian Vincent Brown turned to archival documents to map the trajectory of the infamous 1760 Tacky's Revolt in Jamaica. Paired with digital humanities, Brown's creation of an animated timeline allows viewers to track the revolt across a historic map of Jamaica. In reflecting on his mapping project, he stated "[digital humanities] allows for the evaluation of great amounts of data in which previously obscured patterns may now be observed, queried, interpreted, and displayed" (Brown 2015, 134). Brown's (2020) analysis of the revolt reframes the rebellion as an extension of protracted African warfare rather than a form of reactive resistance to slavery.

On St. Croix—the geographic focus of this paper—geospatial modeling has already been used to infer probable historic maroon community locations. Norton and Espenshade (2007) first suggested using cumulative viewshed analysis as a method to locate historic maroon settlements on St. Croix in a context where traditional archaeological shovel test survey methods were not possible. Ejstrud (2008) implemented Norton and Espenshade's hypothesis a year later, developing a GIS predictive model via suitability modeling to identify likely places for maroon settlement based on various social and geographic factors. Combining a publicly available United States Geological Survey (USGS) digital elevation model with a historic 1750 map of the island, he identified select areas of high suitability for fugitive settlement.

Finally, Dunnavant's (2021b) work on mapping maritime maroon routes shifts the focus from mapping static, terrestrial maroon settlements to dynamic, maritime movement as a component of Black geography that is often overlooked. In line with DeLoughrey's (2017) concept of "critical ocean studies," these maroon maritime routes are not only important to understand mobility across a body of water but also facilitate the ontological practice of becoming that occurs through the process of marronage (Dunnavant 2021a; King 2016; Roberts 2015). Furthermore, few studies have effectively combined the practice of mapping marronage across terrestrial and maritime, land and seascapes as a continuous geography, destabilizing the arbitrary division between land and water.

Researchers generally recognize the limitations of present geospatial methods, but few have critically engaged source materials and the georeferencing process as a means of exploring past colonial cartographic experiences. These projects often relied on the digitization of historic maps but did not incorporate modern mapping technologies such as LiDAR (Armstrong et al. 2008, 2009; Delle 2014). DEMs derived from optical, radar, or terrestrial survey sources generally do not provide accurate surface (bare earth) models in areas with dense canopy. By capturing bare earth returns and extrapolating values of nearby raster cells, LiDAR has recently made it possible to produce detailed Digital Surface Models (DSMs). In the process of developing a more refined model to map subject-oriented maroon affordances on a dynamic landscape, this paper explores the process of georeferencing and digitizing features from two historic St. Croix maps and collating them with LiDAR data. This approach enables the interrogation of historic and contemporary cartographic practices to show subaltern subject-oriented perspectives within colonial landscapes.

Unraveling the Colonial Cartographies of St. Croix

In working toward an anticolonial geospatial modeling approach, we confront frontally the genealogies of cartography in European colonialism by revealing the partiality and errors of the maps as representations of colonial landscapes. Co-registry of past and current spatial representations reveals blind spots in the colonial gaze and enables subject-oriented models to situate a "Black sense of place" (McKittrick 2011) through marronage. Maps were a key technology of colonial governmentality—they both reflected and produced the expropriation of lands and subjugation of peoples. As complex textual and graphical artifacts, maps both enabled rival European powers to "fly by instrumentation"—to grasp and understand their putative possessions abroad by means of reductive cartographic representations (Harley and Woodward 1987; Perry 2018)—and to present a version of inter-imperial affairs in manners most advantageous to a given sovereign's interests (Schmidt 1997). Colonial maps were instrumental, appropriative, and aspirational of colonial power, even as—or perhaps especially as—they seemed to simply and accurately (re)present the world in its sheer actuality, shorn of rhetorical artifice (Greenlee 2015; Harley 1989; cf. Dodge and Perkins 2015). This discursive sleight of hand through techniques of graphic apprehension and conventionality fostered imperial expansion and inter-imperial rivalry, while also instrumentalizing colonial policy through surveillance and intelligence gathering (Harley 1989). These aspects are in abundant evidence in the case of Danish St. Croix.

To understand the limitations of these maps, it is imperative to first understand colonial cartographic methods and motivations. The Danish West India Company (VGK) purchased St. Croix in 1733 as a speculative investment. The island was purchased with funds raised by stockholders in Copenhagen looking to gain a return on their investment. Various British, French, and other European colonial interests had already attempted cotton, sugar, indigo, and other monocrop plantation agriculture. Some failed, others—mostly cotton plantations—endured. Land survey of existing and potential plots for cultivations and taxation was a first means of apprehending the resources and delineating properties on the

island. While previous maps had been produced, they were knowingly inaccurate. The VGK did not know exactly how large the island was, the extent of its potentially arable land, nor the topography of the island. Thus, one of the first orders for the newly appointed Governor Frederik Moth was to survey, identify and divide the best lands for cultivation (Hopkins 1992a). Under early Danish colonial rule, the island was divided into nine administrative quarters: West End, Northside A, Northside B, Prince, King, Queen, Company, East End A, and East End B. To standardize the process, all plots were to be divided equally into 2000 x 3000 Danish foot sections (a Danish foot is approximately 0.3138 meters; thus, plots were approximately 59 hectares). The island was to be divided into nine Quarters composed of such plots and valued equally, before being distributed to stockholders through lottery (Figure 1). Based on these calculations, Moth first estimated that the island could hold roughly 1000 sugar plantations and another 1000 cotton plantations (Hopkins 1992c, 6). Philip Gardelin, the General Governor of the Danish West Indies, was more conservative in his estimations, speculating St. Croix could sustain 1323 plantations in total. In actuality, based on the actual size of the island and the desired sizes of the plantation tracts, only 350 plantations could be plotted on St. Croix (Hopkins 1992c, 14).

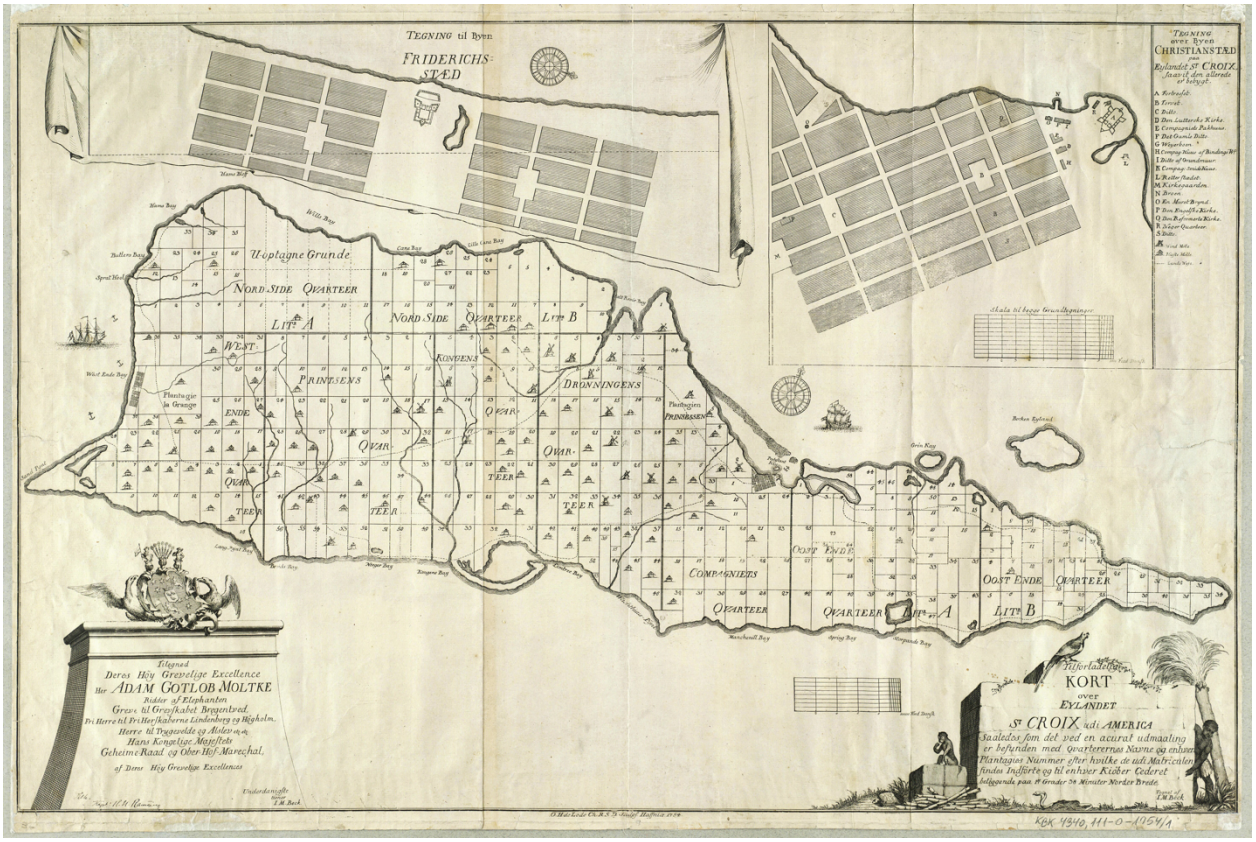

Figure 1. Beck, I.M. Tilforladelig kort over Eylandet St. Croix udi America. 1754. Retrieved from the Library of Congress, https://www.loc.gov/item/74696187/

Soon after purchase, the VGK called for the construction of forts, watch posts, and formal towns to prepare the infrastructure needed to cultivate and export cash crops from the island (Hopkins 1992c, 4). With all of the effort Governor Moth devoted to mapping the island, the first maps would not be made until after his death. By 1754, two maps of St. Croix were produced. One is the highly detailed map by Johann Cronenberg and Johann von Jaegersberg produced in 1750 (Hopkins 1992a). The other is the more popularly referenced map by Jens Beck in 1754. These maps outlined administrative regions, colonial buildings, and major roads, rivers, and towns. Once created, they could be reproduced for taxation, planning, and other administrative means, thus giving landscapes and property renewed legibility to markets (Fourcade and Healy 2016).

While the cadastral maps of St. Croix demarcate seemingly cleanly-delineated plantations, the actual practice of surveying the terrain proved much more problematic (Hopkins 1992b, 1992c). For one, Danish magistrates had to reckon with settlers and squatters with previous land claims on the island, particularly on the East End. These claims, of course, did not fit neatly within plot boundaries varying in size and dimensions. Secondly, many parts of the island were covered in thick vegetation making it difficult for surveyors to access certain parts for proper surveying (Hopkins 1992a). Without consistent manicuring, cultivated lands could quickly turn back into unnavigable thick brush. Thirdly, early endeavors to map the island were met with labor shortages. Moth complained to his administrators about shortages of laborers as many of them—free and enslaved—were tasked with repairing the French battery and other construction projects. Furthermore, his main surveyor died soon after arriving on the island forcing him to seek out a qualified replacement. The combination of intense heat and labor associated with clearing, tropical diseases, and lack of rations all contributed to repeated illness, at times halting the survey altogether (Hopkins 1992c). Fourthly, hurricane season and inclement weather limited survey seasons. Strong winds and rain would fell trees, blocking previously clear transects and flooding would impede overland movement (Hopkins 1992c, 12). Finally, some areas of St. Croix could not be mapped and therefore do not appear named on historic maps. In fact, the only area not surveyed in Beck's Map was on the Northwest side of the island, labeled "Uoptagne Grunde" (unrecorded/unoccupied grounds). This area came to be known as Maroon Ridge.

Given the vagaries of initial surveys, inconsistencies over plot boundaries ensued. Administratively, the company directors complained they had not received any land or tax rolls between 1747 and 1752 (Hopkins 1992a, 71). Initial colonial interests speculated that investors would establish plantations and produce taxable annual crops, but several early investors purchased lands, cleared them, and sold the timber, quickly reselling the cleared land for a profit. To curb the practice of "flipping" property and to encourage the development of plantations, the VGK explicitly forbade land speculation as it had been widespread throughout St. John (Norton, 2015, 55).

By the late 1700s, the Danes initiated a formal census, led in part by Danish military engineer Peter Oxholm. Soon after the completion of the census, Oxholm completed a new, more detailed map of St. Croix in 1794, which was printed in 1799. This updated map corrected many of the coastline issues in previous maps, provided renewed bathymetric data, elevation change, and details of inland waterways (Hopkins, Morgan, and Roberts 2011). In addition to his cartographic endeavors in the Danish West Indies, Peter Oxholm's accounts of slavery and society provide invaluable insight into colonial society at the turn of the century, through discussions on slavery, social life, and economics on the islands.

The challenges of mapping St. Croix continued throughout the other Danish colonies. The inaccuracies of these maps were noted by Armstrong et al. (2009, 106) in the case of St. John where tax records contradicted named boundaries on administrative maps. Similarly, Weik (2019, 55), notes how errors in maps arose due to inadequate survey equipment, miscalculation, distortion of the map parchment, and errors that arose during the process of reproduction. In many cases, these maps were not created by skilled cartographers but colonial administrators (Hopkins 1992c, 1). Inaccuracies in St. Croix became more pronounced during the process of digitizing historic maps and georeferencing them to modern cartographic sources.

Modeling Marronage: Methods for Simulating Perception and Movement

Our aims for this project were two-fold. The first was to better understand how landscapes of marronage on St. Croix were revealed and obscured through colonial cartographic methods and motivations. The second was to render visible the landscapes of marronage through a subject-oriented spatial modeling approach that considered the unique affordances of the island to Africans fleeing enslavement. Our source materials consisted of two digitized historic maps of St. Croix—the Johann Cronenberg and Johann von Jaegersberg map produced in 1750 and Peter Oxholm's 1799 map—and a bare earth DEM constructed from LiDAR data collected in 2013. Here, we briefly describe the methods used in service of these aims.

The Cronenberg and Jaegerberg map and the Oxholm map capture colonist renderings of St. Croix across half a century, providing a dynamic record of colonial expansion over time. The historical maps were rendered in GIS through a process known as georeferencing, which involves ascribing coordinate values to raster imagery usually by associating key features to known GPS coordinates or by aligning an image in relation to a reference map via control points. In this case, the latter was used with high resolution satellite imagery as the reference image. The georeferenced historical maps served dual purposes. First, the process of georeferencing necessarily involves stretching and warping the historical image to fit modern cartographic renderings. Examination of the areas of congruence along with those places of distortion provided a foundation for examining limitations to the reach of colonial cartography, as we discuss below. Second, these maps provide a record of colonial infrastructure—including roads, windmills, plantations, and

fields—which we then digitized as a means of making visible the changing landscape of surveillance.

In order make visible maroon landscapes, we generated a number of raster surfaces to convey subject-oriented encounters with the landscape, including landscape permeability, proximity to freshwater streams, distance from colonial infrastructure, and occlusion. We specifically focus on accessibility as embodied experiences of the landscape. First, the digitized the locations of colonial settlements and roads were conceptualized as points of potential surveillance. From these points and the 10 m-resolution DEM we generated a walking cost-distance raster, representing distance from surveillance infrastructure based on slope. The same approach was used to model anisotropic walking costs to rivers and streams, which acted as attractors for potential maroon encampments and settlements, using a detailed hydrological theme.

In addition to these points of attraction and avoidance, we also modeled landscape connectivity to understand how the topography of the island shaped possibilities for movement and accessibility. Landscape connectivity models are widely used in ecology to understand habitat connectivity and species movement (e.g. Beier et al. 2011; Chetkiewicz, St. Clair, and Boyce 2006; Crooks and Sanjayan 2006; Rayfield, Fortin, and Fall 2011; Taylor et al. 1993) and have been applied to model human mobility potential in archaeological contexts (e.g. Howey 2011; Howey and Burg 2017; Kempf 2020; Kohut 2018). The advantage of landscape connectivity models over other geospatial approaches to mobility, like least-cost path analysis, is their ability to capture mobility *potential* as opposed to destination-directed movement efficiency. For archaeologists, the origins and destination of our subjects are often unknown or even a minor concern compared to understanding overall patterns of movement. We used *Circuitscape* (McRae et al. 2008), an open-source application that uses circuit and graph theory to model landscape connectivity. To do so, the landscape is modeled as a raster where the value of each cell reflects the relative cost to move through it. Areas with many connected cells of low relative cost have high connectivity, while areas with cells of high relative cost have low connectivity. For maroons, areas with low connectivity would have provided protection from surveillance and capture, aiding in escape and seclusion.

A relational approach to affordances of clandestinity in the St. Croix landscape requires the assembly of a multidimensional model that approximates features and processes salient to those seeking refuge. How does the landscape "look" to those seeking clandestinity? How are its affordances for refuge perceived and distributed through space and over time? Conversely, how are perceived risks of detection and capture distributed, and how do they change through time? In answering these questions, we leverage GIS-based suitability modeling to approximate a subject-oriented perspective of dwelling in and moving through a landscape, though not from the perspective of any particular agent in the past. Suitability analysis involves the combination of multiple raster-based themes, each encoding a continuous phenomenal field of greater or lesser "suitability," or, conversely,

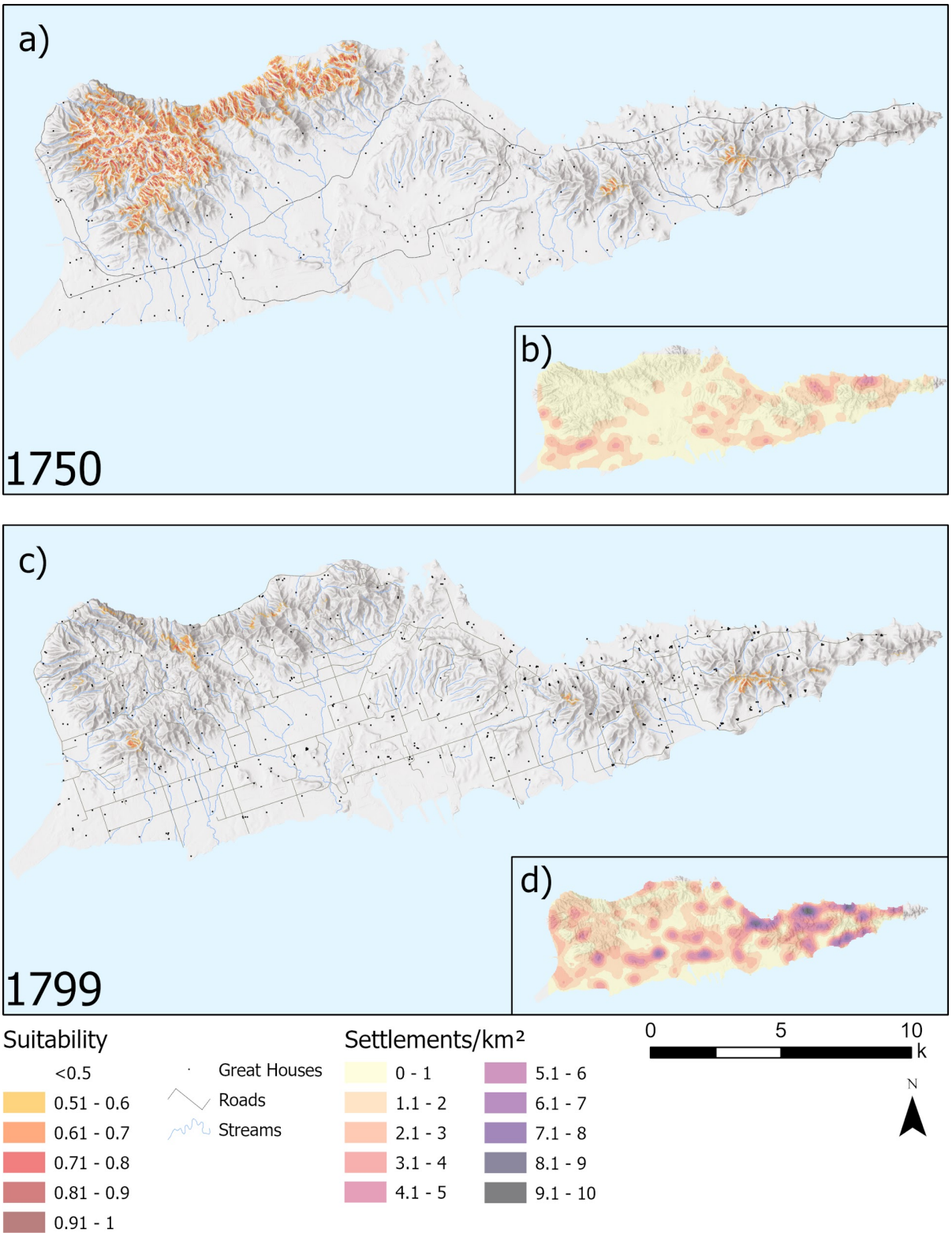

Figure 2. The results show a marked contraction of suitable areas for marronage between 1750 (a) and 1799 (c). Inset maps (b and d) show changes in the density of colonial settlement across these times.

impedance to such suitability for a given task (i.e. Davis et al. 2020; Helmer and Brown 2021; Kohler and Parker 1986; Verhagen and Whitley 2012). Our approach to modeling such contingent landscapes builds on GIS-based suitability analysis to simulate culturally- and historically-contingent affordances of St. Croix maroon landscapes. Employing higher resolution LiDAR and DEM data, and multiple historic maps to conduct a multi-temporal analysis, our model extended earlier attempts to locate maroon settlements on St. Croix through GIS (Ejstrud, 2008; Norton and Espenshade, 2007) with concepts similar to ideal distribution modeling (Weitzel and Codding 2022). The details of preparing the global and local landscape permeability raster data as well as the fuzzy overlay and path distance analyses are beyond the scope of this paper. But the models clearly indicate a dramatic contraction of maroon geography between 1750 and 1799—a reduction of some 90%—as colonial plantation infrastructure expanded through the island's sugar boom (Figure 2). The resulting maps overlay the results of the suitability models as raster layers which combine the suitability layers modeling walking cost surfaces relative to colonial buildings and settlements, viewshed visibility relative to them, and distance from water sources. The expansion of settlement and plantations between 1750 and 1799 had the effect of nearly eliminating areas well-suited for refuge on the island, leaving only a handful of small patches on Maroon Ridge (Figure 2).

Discussion

The voices and lives of enslaved African peoples have been muted and dislocated—rendered ungeographic—yet traces of their resistance and emancipatory efforts are detectable through critical reading and counter-mapping of colonial textual and cartographic sources. Accounts of fugitivity are limited to a few slave narratives and fragments in the scarce second-hand accounts of colonial reports and runaway slave ads. Even in cases where slave narratives discuss fugitivity, such as Frederick Douglass's autobiography, the details of escape are intentionally vague and incomplete. Geospatial modeling can extend our perceptual apparatus in building an anticolonial cartography of the African Diaspora. While the specific experiences of maroons on St. Croix may be lost to us, geospatial modeling that centers maroon-specific experiences of the landscape allows us to reconfigure St. Croix as pockets of possibilities, rather than administrative partitions. Shifting away from the colonial gaze, this model provides us with a map of general maroon possibilities in lieu of known individual experiences. Of course, we are unable to know the specific affective elements of escape, but we can generalize the needs and desires of self-liberated Africans. Maroon settlements were often located in the most remote and hard-to-reach places, away from colonial roads, buildings, and surveillance. At the same time, fresh-water streams would have been important for a steady supply of potable water and potentially crop cultivation, as evidenced by the role of forests and rivers amongst Saramaka maroons in Suriname (Weik 1997).

However, modeling maroon affordances is a countermapping process that also requires an understanding of colonial movement as well. Modeling movement and

surveillance in colonized landscapes is important for understanding where and how maroons likely navigated a terrain punctuated by surveillance and other risks of detection and capture. Thus, a key part of our analysis was modeling mobility affordance across the island at both global and local scales. Globally, the mountains to the northeast and pockets of hilly terrain punctuated the relatively flat areas that were first developed. Modeling mobility affordances across the island allowed us to simulate overall possibilities for movement, and in turn, those spaces of seclusion that could provide opportunities for marronage. Locally, the immediate terrain provides a range of affordances for movement, highlighting pockets of solace within well-trod areas and even greater security in more isolated areas.

In the early maps of St. Croix, architecture was not drawn to scale, but recording the general location of wind and animal mills allowed administrators and speculators to assess production potential. Most of these mills, by the mid-1700s, were concentrated in the central and western parts of the island—likely on the most productive plantations. The northern and eastern parts of the island had only a few mills sparsely accounted for, which could gesture toward less fertile lands or plantations that produced other crops like ground provisions.

The most likely areas of runaway enslaved habitation clustered around the area known today as Maroon Ridge. Maroon Ridge is regarded as the sole maroon settlement on the island. Located in the general northwestern region of St. Croix, it is one of the mountainous regions of the island with the highest elevation, abutting the Caribbean Sea. The extent of occupation at Maroon Ridge is unknown (see Roopnarine 2010). In a 1791 census, maroons outnumbered "free Blacks" 1386 to 953, respectively, and likely occupied various smaller communities around Sandy Point and East End as well (Akin 2022). Some accounts purport that the settlement was at its height in the early eighteenth century before the Danes purchased the island from the French. Others have argued Maroon Ridge was more of a transitional habitation zone where maroons camped for a short time before making their way to Puerto Rico, Vieques, Tortola, and other islands. The most detailed accounts of Maroon Ridge come from Moravian missionary Christian Oldendorp, sent by the German government to report on the status of Moravian missions in the Danish West Indies in the mid-1700s. He lived on the island from May 1767 to October 1768 and describes how maroons on Maroon Ridge were protected by dense vegetation and built their own fortification of poison-tipped wooden stakes (Pope 1972, 153). They subsisted on soursop fruit (Annona murciata) and collected rainwater in basins and rock crevices to sustain themselves. It is unclear where he received this information from, and we must be skeptical of all colonial accounts of maroon life. However, historical accounts mention regular maroon hunts or "battue" conducted by colonial officials three times per year, but they were of little success (Carstens 1994). Other accounts report maroons living in the mountains as late as 1828, suggesting that it may have served as a site of sanctuary until the abolition of slavery in 1848 (Norton and Espenshade, 2007). Historian Neville Hall (1985) contends that the increasing spread of plantation agriculture cleared large, forested areas and drained marshes and mangroves, which reduced maroon refuge spaces in the late eighteenth century. As a

result, maroons increasingly turned to maritime marronage, finding refuge on neighboring islands (Dunnavant 2021a; Tyson and Olsen 2012).

Interestingly, although Maroon Ridge was known by plantation owners and colonial administrators, it does not appear on the early maps of St. Croix. In fact, it was the only area not surveyed in Beck's historic 1754 map. Instead, it is labeled "Uoptagne Grunde" (unrecorded/occupied grounds) (Figure 1). As a known maroon site, Beck and other surveyors would have likely feared an encounter with the maroons and thus were unable to complete their survey. However, it is also possible this omission was intentional, perhaps not wanting to stir concern from investors and colonial officials in Copenhagen. He could have easily labeled it Maroonberg without surveying it.

In the process of georeferencing the historic maps, the northwest coast corresponded least to the more accurate modern maps of the coastline and landforms of the island. The distortion in the northern coast of St. Croix found in the early colonial maps is likely a product of the fact that the North Side mountains west of Bassin remained largely inaccessible to colonists (Hopkins 1992c, 13). The relationship between wild and unruly sites and maroons has been explored as a mutually constitutive relationship under the colonial gaze. As maroons occupied terrains deemed "wild and unruly" to the colonial order—the uncultivated and uncharted mountains, forests, and swamps—they began to embody the wild and unruly tropes in the mind of colonialists, forming a mutually constitutive relationship (Malm 2018; Wright 2019). But for maroons, the wild was a space of refuge—a radical space of worldmaking outside the control of the colonial power. Maroon sites are, by their nature, fugitive sites that defy conventional mapping practices. The agentive nature of other maroon sites like the Great Dismal Swamp in Virginia, Cockpit Country in Jamaica, and even Le Morne in Mauritius was due to the fact that they were generally considered unmappable and nearly unnavigable. Malm (2018, 24) summarizes the ethos of the maroon ecology best, stating, "in wildness is the liberation of the world." Moreover, the variation in potential maroon habitation locations suggests that zones of freedom and unfreedom were not static but remained fluid as geographies changed and people laid claim to certain landscapes. Thus, the difficulties of georeferencing areas of historic maroon settlement reinforce the continued challenges of mapping maroon fugitivity while also positioning fugitivity as an anti-colonial practice that defies processes of categorization, mapping, and legibility.

Conclusion

The early maps of St. Croix tell a story of colonial expansion, and in the process, a compression of marronage opportunities for those seeking refuge. Over time, the maps detail the expansion of plantations, wind and animal mills, and other colonial buildings. At the same time, these maps can be used to document fugitive geographies that were not readily apparent to colonists. To the informed observer, maroon geographies become illuminated in the extant reaches of colonial cartographic limitations.

We have attempted an anti-colonial, counter-mapping practice that analyzes geospatial data in a manner that illuminates African agency and highlights colonial constraints. The suitability model—based on variables including global landscape permeability, local landscape permeability, distance from settlements, distance from roads, and proximity to streams—is far from perfect and represents only one set of possibilities. Limited documentation from maroons makes it difficult to assess the affective nature of maroon geographies. Instead, in a context such as slavery where historical accounts are either biased or non-existent, geospatial techniques provide us with another archive for "critical fabulation" (Hartman, 2008) and speculation.

Due to the colonial legacy of historic maps of the Caribbean, Tao Leigh Goffe (2020) has argued for the practice of "unmapping." In addition to being tools of imperial extraction, colonial maps are two-dimensional representations that truncate complex racial entanglements throughout the Caribbean. Goffe turns to more recent digital humanities practices, creating virtual StoryMaps with born-digital cartographic material and audio-visual media to "geolocate" Caribbean space beyond island boundaries. This concept has particular resonance where diasporic communities are in flow and flux across geographic boundaries, complicating the ability to "map" a people onto a fixed landscape.

Goffe's "unmapping" project challenges Harley and Woodward's definition of maps as "graphic representations that facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world" (Harley and Woodward 1987, xvi). Geolocating soundscapes present a new opportunity to dislodge people—colonized or otherwise—from fixed terrestrial landscapes and challenges the notion that maps are reduced solely to graphic representations.

The possibilities of mapping and unmapping—both attempting to locate a "Black sense of place"— raise important ethical questions about the potential uses and misuses of cartographic data (see Davis et al. 2021). To what extent does this subject-oriented geospatial modeling, as Rose-Redwood et al. (2020, 153) ask, continue to "[adhere] to—and thus legitimizes—colonialist-statist procedures and protocols, thereby reaffirming the colonialist assertion of a monopoly over the power to map?" As described earlier, these maroon sites were useful to maroon communities precisely because of their inability to be mapped. For some, mapping these maroon landscapes may represent a level of surveillance that these communities inherently attempted to refuse.

It is important to hold these considerations in tandem with Imani Perry's (2018, 178) ardent claim that "Cartography was and is a necessary exercise for establishing sovereignty. Textually and visually, it marks ownership, established or prospective, and it guides movement, including invasion." In many ways, mapping these maroon spaces helps to reestablish a "Black sense of place" and give historical voice and agency to communities that were literally and figuratively written out of existence.

The revelations derived from the process suggest the colonial motivations and challenges associated with colonial mapmaking produced maps that were not necessarily scientifically accurate. Their inability to produce accurate cadastral maps was limited not just by technological limitations but inaccessibility likely due to the threat of maroon habitation. While the study is germane to St. Croix and the former Danish West Indies, it speaks to larger colonial practices that occurred in the Caribbean and throughout the Americas in the eighteenth century and beyond. Maroon agency posed a threat to the colonial society but also limited colonial cartographic dominance as well.

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