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Flood Risk as Legacy Vulnerability: Reading the past into the present for environmental justice

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ABSTRACT

Decades of environmental justice research has focused on identifying existing patterns of disproportionate burdens to environmental harms across social difference. However, relatively few studies examine the "legacy effect" of historical patterns. In flood risk studies specifically, several scholars have highlighted the role of systemic processes in historically shaping and producing observed disparities in flood risk patterns. These studies reveal that such relations are tied to histories of racialized land struggles and territorial dispossessions. In this paper, I argue that scholars need to do more than quantify today's disproportionate burdens across social difference or explain the systemic processes causing those disparities. I suggest that "legacy vulnerability" helps identify how the potential for harm from flood risk to marginalized groups may reside in events of the past that have imprinted a spatially hidden, but spatiotemporally revealed unjust pattern upon today's landscape. In a flood risk assessment of Sapelo Island, the initial results suggest that when comparing contemporary flood risk of Sapelo's Geechee descendant (Black and mostly low-to-middle income) to non-descendant newcomer owners (mostly white and affluent) an environmental justice disparity in proportional flood risk burden does not exist. However, results of a counterfactual flood risk assessment show that approximately one-third of historically owned, Geechee property is located outside the contemporary 100-year flood zone compared to zero percent outside of it today. In other words, roughly one-third of Geechee property's flood risk today is a legacy vulnerability directly tied to racialized land dispossessions that unfolded in the middle twentieth century.

1. Introduction

Standing high above the tide water on a bluff of Blackbeard Creek, I can see the Atlantic Ocean peering around the south end of Blackbeard Island. The ocean is more clearly visible since Hurricane Irma severed Blackbeard's southern end in 2017 (Shearer 2018). I am in Raccoon Bluff, a former Saltwater Geechee community founded in 1871 on Sapelo Island, Georgia. It was 93 years later in 1964 when George Grovner, the last of hundreds of Raccoon Bluff residents, closed his door for the final time and moved to the community of Hog Hammock some two miles south (Crook et al. 2003, 91). He followed in the footsteps of so many before, including previous resident Allen Green who, in reflecting upon Grovner's move during an interview in 1992, lamented "I wish I been there now" (Crook et al. 2003, 91).

Fourteen years earlier in October 1950, Hicks Walker closed his door in Belle Marsh and relocated his family about three miles south to Hog Hammock shuttering the community of Belle Marsh. A small community of two households, Belle Marsh was founded by Walkers' ancestors 65 years earlier in 1885. Recounted by his daughter in her memoir, Cornelia Walker Bailey wrote, "Papa didn't say nothing as we drove away, not a word. He just looked. He was carrying all his worldly goods with him on the back of a truck. He could see the marsh edge of Belle Marsh for some distance and he kept on looking till he couldn't see Belle Marsh no more" (Bailey 2001, 103).

The closure of these two communities bookends a decade and a half of household relocations and subsequent community closures across Sapelo Island from 1950 to 1964. Lumber Landing nearby to Belle Marsh closed in 1956. And, Shell Hammock on the south end closed in 1960 "to build apartments there for marine scientists" (Bailey 2001, 261). When asked why residents left Raccoon Bluff, Allen Green said,

> *"Reynolds want the people to move from there. He said to get all the people in one settlement, he could do more for them. That was a trap set. And this hunk of land you got, he give same amount of land in Hog Hammock, and build you a house. And give you a house where you wouldn't be staying in Raccoon Bluff, they haul 'em to Hog Hammock for you, free of charge. Won't cost you nothing."* (Crook et al. 2003, 93).

The "trap" that Green references signifies discontent with the

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coercive and manipulative tactics that were all too common in this era between wealthy white elites, such as Reynolds (son of tobacco magnate, R.J. Reynolds, Sr.), and Black people in coastal environments of the United States that lead to Black land dispossession (see Kahrl 2012).

Given the likely perception of such duplicitous intent and the weight of being the ones to "close" their communities, I suspect that George Grovner and Hicks Walker were not thinking about their moves precipitating an increase in flood risk for their families. Yet, Raccoon Bluff averages nearly three feet higher in elevation above high tide than Hog Hammock and Belle Marsh sits about two feet higher than Walker's new Hog Hammock property. Consequently, the legacy of these relocations precipitated increased vulnerability to flooding for these families, their descendants, and many of their similarly relocated neighbors. Understanding flood risk on Sapelo Island today necessitates asking why Walker and Grovner, their neighbors, and many other households from these four historical communities swapped their land for land owned by a tobacco magnate heir in Hog Hammock. What if they had not moved? What would flood risk be for their descendants today, especially in an era of climate change?

Considering such counterfactual histories has its own dilemmas but conceiving of "what if" pasts may help conceive of "what if" futures under climate change. Historian Richard White argued this point at the end of his book, *Railroaded*, writing, "Considering only what happened is ahistorical… To deny the *contingency* of the past deprives us of alternative futures" (White 2011; emphasis added). The present is the future's past, and one possible future path for Sapelo includes racial reconciliation that will demand recognition and reparations. Such recognition requires acknowledging Sapelo's history as a site of several plantations in the eighteenth and nineteenth centuries as well as recreational home to white patriarchs in the first two-thirds of the twentieth century. Examining this racial history will require reproducing data on Black death and loss, but one that should avoid "data that honor and repeat and cherish anti-black violence and black death" (McKittrick 2014, 18). In other words, I intend to highlight the persistence of Black life on Sapelo in considering "what if" futures and not the white patriarchs so often applauded in historical accounts.

Walker's and Grovner's families may have been displaced to a higher flood risk zone, but their descendants still live on Sapelo Island and are thriving in various ways (see Severson 2020; Nicholson 2022). Such intimate family histories are tied to historical geographical processes, the same ones entangled with the production of flood risk. I suggest that how Black futures are envisioned on Sapelo are predicated upon the capacity to see how Black life has persisted through death and loss (see McKittrick 2013, 2014). Thus, any flood risk assessment that ignores how these historical processes were racialized would be an affront to Black life and to descendant residents and property owners on Sapelo today.

Hog Hammock is the last remaining private community on Sapelo Island with an area of over 400 acres. The community is a Gullah/Geechee sea island community where descendants of enslaved people identify as Saltwater Geechee (Bailey 2001), a cultural identity with connections to West African heritage with its own unique history (see Cooper 2017). Residents have been resisting displacement since Reconstruction began in the 1860s and many continue resisting today against gentrification by non-descendant newcomers who are mostly white and affluent (Hardy, Bailey, and Heynen 2022). Such a demographic shift raises concern of environmental justice around disproportionate burdens associated with flood risk in Hog Hammock, which averages three feet in elevation above the high tide. Yet, even if an unequal burden exists across Geechee descendants and non-descendant newcomers, such an analysis would not reveal the historical geographical process of dispossession and displacement that led to heightened flood risk for the Walker and Grovner households and so many more.

That Sapelo's Black Geechee population is at high risk to flooding is likely no surprise to many readers. It is well-documented within academic scholarship across the United States that lower elevation, higher flood risk zones are often disproportionately inhabited by economically-disadvantaged people (Qiang 2019) and/or people of color (Ueland and Warf 2006; Bullard and Wright 2009; Knighton et al. 2021). Yet, while the broader pattern is not consistent (see Maantay and Maroko 2009), it generally holds that inland flood zones are disproportionately inhabited by people of color and/or low income households while coastal flood zones are typically inhabited by affluent white people with access to resources (Ueland and Warf 2006; Collins, Grineski, and Chakraborty 2018). The reason for coastal zones being disproportionately affluent and white is often attributed to amenity migration (e.g., Collins, Grineski, and Chakraborty 2018), but this pattern is also backed by decades of racist policies at multiple levels of government (Kahrl 2012). While sections of the Gulf region display this pattern, pollution heavy, oil refinery regions do not, such as in Houston, TX and coastal Louisiana where marginalized communities are often located in high flood risk areas (Collins, Grineski, and Chakraborty 2018; Barra 2021). Being a sea island, Sapelo's population defies this affluent coastal zone narrative also, likely partially because it is rural and accessible only by ferry, but more likely due to decades of Black activism locally that has slowed and defended against dispossession and displacement (Bailey, 2001; Davis, 1983; Severson, 2012; Bailey, 2019; Davis, 1995; Severson, 2020).

While the historical reasons for such socio-environmental patterns are increasingly well known in many places (e.g., see Horowitz 2020 for New Orleans), counterfactual histories are hard to examine. Of course, counterfactual histories will always be hard to examine, but with Sapelo being of relatively small size and having a relatively well-documented history, there is an opportunity to imagine a counterfactual history for flood risk and to show how the antecedent events of household relocations and community closures partially shaped current flood risk geographies on the island today. In this paper, I situate these relocations within a flood risk assessment of Sapelo Island that is attuned to the historical geography of racialized uneven development. My goal is to contribute to grounding theoretical arguments about how systemic relations are always reproducing vulnerability to environmental hazards (see Pulido 2017). Broadly, my argument is that anytime scholars assess flood risk, we evaluate not only a place's current patterns or how processes shaped those patterns, but also the spatiotemporal relations of how historical processes shaped patterns overtime. My hope is that such an analytical approach will contribute to imagining more equitable counterfactual histories that in turn help envision more just and sustainable futures (see Agyeman and Evans 2004; Pellow 2016).

In the following sections, I review the emergence of flood risk studies in geography as a prominent environmental justice issue over the past two decades. Then, I examine flood risk as "legacy vulnerability" on Sapelo Island, Georgia asking two questions. First, do spatial patterns of flood risk reveal an environmental justice concern on Sapelo Island today? And second, does a historical geographical approach change the interpretation of flood risk as an environmental justice concern on Sapelo Island? Importantly, I show how Hog Hammock's predominantly white and affluent newcomers' flood risk is the result of decisions to purchase property in a coastal flood plain whereas much of the community's Black and mostly low-to-middle income property owners' flood risk is a product entangled with, and in part determined by, the legacy of past socio-environmental configurations.

2. Flood risk as legacy vulnerability

The discipline of geography has an extensive history examining floods and flood risk associated with people living within flood zones. As U.S. populations grew in flood prone areas and people became increasingly affected by flooding in the late 1800s to early 1900s, local to national level governments sought to mitigate flood risk primarily through engineering projects. However, noted geographer Gilbert White recognized the fallacy of engineering-only solutions and in his 1945

dissertation, *Human Adjustment to Floods*, argued for an alternative approach that profoundly changed the way the discipline of geography as well as those beyond it thought about flood risk and flood mitigation. White argued that environmental *and social* conditions contributed to flood hazard risk stating:

> *It has become common in scientific as well as popular literature to consider floods as great natural adversaries which man [*sic*] seeks persistently to over-power. According to this view, floods always are watery marauders which do no good, and against which society wages a bitter battle… Floods are 'acts of God,' but flood losses are largely acts of man [*sic*]. Human encroachment upon the flood plains of rivers accounts for the high annual toll of flood losses.* (White 1945, 1–2)

While crucially bringing to the fore consideration of the social in flood risk studies, White implicates human "encroachment" without interrogating the precedent for why that encroachment occurred. In other words, White's thesis skips over analyzing the social processes that historically shaped, and continue shaping, floodplains. Many flood risk studies continue missing this crucial element regarding the causes of increased flood risk (though see Collins 2010).

Notably, all of White's suggested "adjustments" that became incorporated into what was known as the "dominant" approach in hazards mitigation and planning did not take systemic social processes into consideration, for which it was critiqued by several contributors to Kennith Hewitt's *Interpretations of Calamity* in the early 1980s (Hewitt 1983; see Macdonald et al. 2012). Following much debate, studies of social vulnerability have taken a more interdisciplinary approach that encompassed some of White's central ideas along with those of his critics' which were that systemic issues such as poverty and marginalization are key contributors to the production of vulnerability (see Macdonald et al. 2012). Yet, often studies examining these key issues have fallen short of explaining why some social groups are more vulnerable to certain hazards and risks than others. If poverty or marginalization are indicators of increased vulnerability, then why are poverty and marginalization experienced unevenly across axes of social difference? *Critical* hazards studies and *critical* environmental justice studies have both taken to examining more deeply the causative mechanisms that contribute to increased vulnerability and risk when hazards arrive as well as expanded upon the issues under consideration (Ribot 2014; Pellow 2016; Thomas et al. 2019). I draw on both literatures in thinking about vulnerability to flooding. I define vulnerability as the "potential for harm" to examine how such potential is produced across race and class differences over time and space.

My thinking is inspired by previous work in Baltimore on what is called the "legacy effect", or that "[l]egacies of social and environmental injustices can leave an imprint on the present and constrain transitions for more sustainable futures" (Grove et al. 2018, 524). I suggest that "legacy vulnerability" helps identify how the potential for harm from flood risk to marginalized groups may reside in events of the past that have imprinted a spatially hidden, but spatiotemporally revealed unjust pattern upon today's landscape. Thus, I suggest that such patterns are not fully discernable without examining historical patterns and processes together. With the case of Sapelo Island, such a framing helps examine how the community closures in the middle twentieth century may have affected flood risk for residents today. However, understanding the justice implications of flood risk as legacy vulnerability first requires a brief review of the intersection of flood risk studies and environmental justice studies, particularly the roles of pattern and process.

Geographers have examined the roles of pattern and process equity across social difference – respectively, distributive justice and procedural justice – in their analyses of environmental justice for decades (see Cutter 1995). The former aides in identifying if an equity issue exists while the latter helps explain the causative mechanisms for why an equity issue exists. Much environmental justice research has focused on identifying existing *patterns* of disproportionate burdens to environmental harms across social difference, typically technological hazards (e.g., UCC 1987). However, since Hurricane Katrina pummeled New Orleans causing relatively extreme disproportionate impacts for Black and low income neighborhoods, scholars have come to more widely recognize environmental hazards, and specifically flood risk, as an environmental justice issue (Fielding and Burningham 2005; Dixon and Ramutsindela 2006; Ueland and Warf 2006; Bullard 2008; Bullard and Wright 2009; Walker and Burningham 2011).

Geographers and beyond have continued broadening understanding of how patterns of flood risk are an environmental justice issue through improving statistical measures and mapping techniques (Chakraborty, Collins, and Grineski 2019; Debbage 2019), better understanding the effect of flood probabilities (Chakraborty et al. 2014), discerning the differences between inland and coastal flooding (Ueland and Warf 2006; Chakraborty et al. 2014; Montgomery and Chakraborty 2015), and considering climate change effects (Wing et al. 2022). And, while scholars examining disproportionate patterns may at times acknowledge the importance of history, historical context, and systemic processes on existing patterns – even going so far as to include such points in the publications – such approaches are still critiqued as they may at times "elide historic drivers and geographic processes of marginalisation" (McCreary and Milligan 2021, 724).

Environmental justice scholars have looked beyond patterns more frequently since at least another landmark study, Laura Pulido's (2000) work in Los Angeles that showed how the processes of white privilege shape the patterns of environmental pollution in southern California. Broadly, such work explains that the causes of environmental injustice lie in how systemic *processes* benefit primarily white, affluent communities and harm primarily nonwhite, lower income communities. However, environmental justice scholars continue to identify that an insufficient number of studies examine the systemic processes that cause observed patterns of environmental injustice (e.g., Pulido 2017; Van Sant et al. 2018; Van Sant, Milligan, and Mollett 2021).

In flood risk studies specifically, several scholars have highlighted the role of systemic processes in historically shaping and producing flood risk. In Columbia, SC, for example, Cutter et al. (2018) show how increased flash flood risk in predominantly affluent suburban regions is directly related to the historical processes of lax regulations in rapid urban development and white flight. In Bangalore, Ranganathan (2015) reveals that urban flood risk can only be explained through examining historical socio-political manifestations around stormwater drains and racialized uneven development. Similarly, in Washington DC, Ranganathan and Bratman (2019) show how histories of plantation capitalism increased erosion and flooding along the Anacostia River in predominantly Black suburban neighborhoods. In Paso del Norte, Collins (2010) examines both pattern and process to show how uneven development lead to the unequal production of flood risk on the Mexico-USA border. These process-based flood risk studies reveal that such relations are tied to various, but independent and repeating, histories of racialized land struggles and territorial dispossessions. In other words, many contemporary unjust flood risk patterns are *legacies* of past socio-environmental relations. However, there is a need to continue closing the gap between pattern-based and process-based approaches (Collins 2010; Collins, Grineski, and Chakraborty 2018).

As Collins' (2010) work demonstrates, some scholars explicitly work at this process/pattern intersection; yet, even in these studies the historical and process-oriented analyses are typically limited to causative explanations for *contemporary* patterns of injustice. For example, Collins (2010) highlights the importance of critical hazards scholarship for explaining patterns of uneven vulnerability through the concept of marginalization, turning to critical social theory to explain the broader "generative causes" of current flood risk patterns in the Paso del Norte region. Building on this research, Collins et al.'s (2018) work on flood risk in Miami and Houston seeks to reconcile the apparent break between distributive environmental justice studies of disproportionate patterns and process-based social vulnerability explanations. They

highlight that process-oriented approaches help overcome two limitations of distributive environmental justice, which they define as the "incomplete conception of risk as high hazard exposure" and a failure to consider locational benefits in people's choices about where to live (2018, 313). Their first critique resonates with those out of human geography (Pulido 2000, 2017; Ranganathan, 2016; McCreary and Milligan 2021). But, in both cases of Miami and Houston, the authors are explaining why they observe current patterns of injustice using a historical process-based lens. Historical patterns are not central to their analysis.

These studies and the few others like them are laudable for their integration of process-based explanations for the observed contemporary patterns of injustice. However, few environmental justice studies (and even fewer, if any, flood risk studies), include an analysis of historical patterns as central to the study (for exceptions, see Grove et al. 2018; Roman et al. 2018; Locke et al. 2021). Of course, I am not suggesting that a historical pattern analysis is always necessary. I am suggesting, however, that when examining places for contemporary disproportionate patterns and finding none, or even when identifying historical processes that lead to contemporary disproportionate burdens for some groups, scholars may overlook an opportunity to quantify the degree to which those historical processes caused contemporary burdens. A legacy vulnerability approach asks, if the systemic processes upholding socially differentiated privileges had not existed historically, how might today's exposure to environmental burdens and/or harms be different, if at all for marginalized groups? Engaging the legacy vulnerability idea related to flood risk on Sapelo means asking how might Grovner's and Walker's descendants' and their neighbors' flood risk be different today if they had not been forcibly coerced into relocating to Hog Hammock?

One likely reason for environmental justice scholarship's emphasis on pattern over process in quantitative studies is partially due to the challenge of accessing historical data and reconstructing past socio-environmental landscapes, not to mention all the assumptions about how historical landscapes would have evolved into the present moment. Despite the challenges or necessary assumptions, both pattern and process matter as do both current and historical contexts that shaped – and continue shaping – existing landscapes (Grove et al. 2018). And, as Richard White argued, counterfactual histories may help imagine alternative futures.

Much qualitative research already does this work, and some may ask, do we even need to know quantitatively? I suggest that analyzing how geographical processes shape socio-environmental patterns overtime may broaden the identifiable landscape of environmental justice concerns related to flood risk. I argue that it does through revealing environmental injustices that only come to light when put into context with examination of historical patterns and processes juxtaposed with contemporary landscapes. In other words, environmental justice scholars know that the cause of some environmental injustices may be legacies of the past that are hidden within history, but a more robust case for reparations and corrections to those injustices may be made through analyzing historical patterns *with* historical processes.

Thinking of flood risk as legacy vulnerability highlights that hazard risk assessments examining environmental justice must account for not only present-day environmental injustices through assessing disproportionate exposure to environmental harms, but also historical injustices that led to contemporary hazard exposure in the first place. Legacy vulnerability highlights the antecedent injustices perpetrated upon groups whose historical underrepresentation and minimal power regarding political and decision-making roles has increased their contemporary potential for harm independent of comparison to more privileged groups' burdens. A legacy vulnerability framing reveals the multidimensional, place-based, spatiotemporal processes that created contemporary potential for harm.

3. Flood Risk Assessment of Sapelo Island

3.1. Study Site Background

Sapelo's Geechee people are part of the greater Gullah/Geechee Nation, which covers an area along the southeastern U.S. coast from northern Florida into North Carolina. This region is also part of the U.S. National Park Service's Gullah/Geechee Cultural Heritage Corridor. Despite its origins, many Black coastal residents of the southeastern U.S. have co-opted the identity to positive ends (e.g., Bailey 2001; Goodwine 2015; Cooper 2017). Geographically, Sapelo is Georgia's fourth largest barrier island at approximately 16,500 acres. However, private landownership makes up a small portion of this area as the island is over 97% state-owned. The Georgia Department of Natural Resources has operated most of the upland as a wildlife management area since 1976. And, through an agreement with the former owner and now a lease with the state, the University of Georgia's Marine Institute has hosted scientists conducting research on the surrounding estuarine ecosystem since 1953.

Long before state ownership, and likely even interest, freed Black people settled the sea islands of the southeastern U.S. in earnest following the Civil War with the aid of the U.S. Freedmen's Bureau, and in particular Tunis Campbell in Georgia (see Duncan 1986). The processes of racial capitalism that facilitate Black land dispossession began as soon as Black land acquisition occurred in the U.S. South. Campbell was central to this effort of Black land acquisition in coastal Georgia. By the end of 1865, he had settled hundreds of Black people along coastal Georgia's sea islands, including Sapelo Island as well as St. Catherine's and Ossabaw Islands (Duncan 1986). However, this effort at post-bellum land redistribution to freedmen was quickly short-circuited by President Johnson which left many freedmen and freedwomen open to the exploitive sharecropper labor system as one of the limited opportunities to accrue sufficient wealth for land purchases (Duncan 1986).

Sapelo's freed Black people made numerous land purchases beginning in the 1870s including 650 acres at Racoon Bluff, 60 acres at Lumber Landing, and 50 acres at Belle Marsh, as well as several purchases at Shell Hammock and Hog Hammock (Sullivan and Gaddis 2014). An 1891 surveyor's map shows Black people owning approximately 50.65 acres[1] at Shell Hammock and 306.51 acres[2] at Hog Hammock (Wylly 1891). It is arguable that such growth in landownership following the Civil War likely contributed to Sapelo's documented Black population reaching above 500 residents in 1910 (U.S. Census 1910; see Hardy and Heynen 2021). Sapelo's narrative aligns with Black landownership nationally, which also reached its height in 1910 (McGee and Boone 1977). Much like other sea islands such as St. Helena and Daufaskie Islands in South Carolina, Sapelo's Black population has been declining over the past century due to limited job opportunities and the 1978 school closure (Bailey 2001), but it has persisted as the majority private landowner group.

Of the five Black communities identified above, all existed in 1934 when R. J. Reynolds, Jr. purchased most of the island. The history of Reynold's relations with the Black population plays a central role in my flood risk assessment of the island. Not only were Sapelo's social relations imbued with race and class hierarchies at the time between its majority Black residents and the new majority landowner, but Reynolds was heir to an elite white tobacco magnate, R. J. Reynolds, Sr., whose fortune was derived from processes inherent to racial capitalism.

[1] Several lots (4) have names but no reported acreage as well as several lots (8) with no names. No named lots are assumed to be owned by majority island owner. Acreage for four lots with names are estimated based on reported chain lengths of parcel boundaries.

[2] Lot 24 owned by March Wilson does not include acreage. Based on current acreage of overlapping lots, Wilson's lot is estimated to be 9.5 acres. Sixteen lots (83.48 acres) have no name associated with them, so are assumed to be under ownership of majority island owners at the time.

Reynolds' father extracted his wealth from the tobacco industry, but more directly through exploiting Jim Crow segregation in the U.S. South throughout the late nineteenth and early twentieth centuries (see Enstad 2018). His father's accumulation of wealth and power facilitated Reynolds' ability to purchase Sapelo and to use his inherited wealth and power in a segregated South to manipulate Sapelo's residents out of their land through coercing Black landowners to sell or trade their property with him through acre-for-acre swaps (Bailey 2001; Crook et al. 2003).

While Reynolds' predecessor, Howard Coffin, is known to have made property deals with Black landowners during his 22-year tenure (see Crook et al. 2003), 1930 U.S. Census data and available maps containing structure locations suggest Reynolds' tenure had a significant effect on the size and location of Sapelo's Black population, which declined from 345 in 1930 to an estimated 211 by 1963 (see Blumberg and Hesser 1971; Crook et al. 2003). By 1964, the year of Reynolds' death, all but Hog Hammock had been "closed" and enclosed within the ownership claims of Reynolds' organization, The Sapelo Foundation. The Foundation sold the majority of its interests to the state of Georgia first in 1969 and then again in 1976 (Stephens 1969; Morrison 1976). The Foundation absolved itself of all remaining interests in 2002 selling its remaining interest to the state (Williams 2001). In other words, Sapelo's socio-environmental landscape was shaped within a broader context of uneven socio-economic relations between Black Geechee residents and elite white landowners.

Presently, flood risk is of increasing concern for Sapelo Island residents. In October 2015, the region experienced a flood event via a "king tide," which is loosely defined as an exceptionally high spring tide (NOAA 2023). The event logged by the long-term NOAA tide gage at Fort Pulaski approximately 50 miles north near Savannah, Georgia recorded it as the third highest flood event since record keeping began there in 1935. The USGS gauge at Meridian, Georgia located six miles west of Sapelo Island recorded a 10.9-foot tide in 2015, its highest tide in 10 years at the time; 10.2 feet is considered flood stage and 11.2 feet is a major flood. Three months prior to this event I gave a public presentation at the local library to island residents on the topic of sea-level rise and projected increases in flooding. A friend and resident later told me that another resident had exclaimed, as water poured down their road, "Is this what that guy was talking about at the library?" Despite living on a sea island, many residents had expressed limited experience with significant flooding. However, five of the past eight years have led to relatively significant flooding (Fig. 1).

A year later in October 2016, Hurricane Matthew passed approximately 50 miles off the coast of Georgia bringing an 11.3-foot tide fueled by storm surge. Less than a year later in September 2017, Hurricane Irma passed inland of Sapelo and brought a 13-foot tide fueled by storm surge, setting a record for the local gauge as well as a record for the highest documented water level in 83 years of tide gauge records at Fort Pulaski. During Irma's flood waters, the southern end of Blackbeard Island was cleaved, creating a new island. In over 21 years of documented flood stage levels at Meridian, 55% have occurred over the past six years (29% of the record). What these high-water levels in recent years reveal is that such flooding is occurring much more frequently on Sapelo Island.

3.2. Methods

In the following analysis, I conduct two assessments. First, I ask if flood risk is an environmental justice issue today by examining flood risk for today's Geechee descendant-owned versus non-descendant, newcomer-owned property (i.e., land and structures) in the community of Hog Hammock. Then I ask, does a counterfactual flood risk perspective highlight a legacy vulnerability of Geechee descendants to flood risk? For the second analysis, I compare the contemporary flood risk of contemporary Geechee property to the contemporary flood risk of historical Geechee property from 1930. In other words, I ask: is today's flood risk of Geechee property different due to the forced closure of four historical communities? I use contemporary flood zones in both analyses rather than try to calculate flood risk at the time in 1930 because I am interested in the counterfactual history of flood risk, or how today's flood risk has changed due to the historical relocations, not the changed environmental conditions.

While recognizing the critiques of overly simplistic uses of risk as hazard exposure and the contested and political history of flood risk zones (Collins 2010; Elliott 2017), for the following risk assessments, I use the definition of risk of flood hazard exposure as defined by being within the 100-year floodplain. Specifically, I assess flood risk using 100-year floodplain data from FEMA's National Flood Hazard Layer (only zone AE intersects with the study area on Sapelo; FEMA 2018). The 100-year flood plain constitutes the spatial geography for where water is predicted to go in the event of a 100-year flood event, or an event with a one percent chance of occurring in any given year. Despite the limitations of 100-year flood plains for assessing flood risk, they are common practice for flood risk assessments and are central to governmental policy on development as well as insurance requirements (Elliott 2017; McMichael et al. 2020; Hauer et al. 2021). Further, to assess descriptive statistics related to elevation I used data from the Georgia Department of Natural Resource's 2010 Coastal Georgia Elevation Project, specifically a lidar-derived digital elevation model corrected to mean higher high water (MHHW, or "high tide") using NOAA's VDATUM product.

In both analyses, risk is assessed through quantifying the absolute and proportional exposure of property (land and structures) within the contemporary 100-year flood plain for the "study years" 2020 and 1930. The years for the data are different for property boundaries and structures, but I use the study years for simplicity of explanation. For the contemporary flood risk assessment, I heads-up digitized structures using 2013 aerial imagery. Parcel boundaries are from 2015 McIntosh Tax Assessor records and revised following all sales and subdivisions since then through 2021. Owner categories (Geechee descendant and non-descendant newcomer) are based on initial interviews in 2015 with two island residents followed by continuous updates following property transactions and conversations with island residents through the year 2021.

For the counterfactual flood risk assessment, I determined the location of historical Geechee structures using a combination of 1930 Census data and data from an ethnographic study that identified families of households on the 1929 U.S. Department of Agriculture's Soil Map for McIntosh County (Fuller, Hendrickson, and Moon 1929; U.S. Census 1930; Crook et al. 2003). Using a scanned and georectified copy of the 1929 soil map, I created a spatial data layer of all structure locations.

All acreage for Geechee-owned land was GIS calculated. Belle Marsh's and Lumber Landing's boundaries and areas are approximations and are estimated based on the reported acreage originally purchased for each, their 1929 structure locations, and the physical geography of the landscape (e.g., marsh edge, roadways, etc.) derived from a detailed 1940 land cover map (White Jr and Marsh 1940). Shell Hammock's boundary is mapped from the 1891 map (Wylly 1891). Hog Hammock and Raccoon Bluff follow the demarcated boundary on the 1940 map. Hog Hammock's Geechee-owned acreage was derived from a 1938 plat map based on family names for 34 lots and 10 lots with undivided interest (Britt, 1938). Geechee acreage is assumed to be 100% for the other four historical communities, which may be an overestimate as Coffin had started acquiring Geechee-owned land before Reynolds time.

3.3. Contemporary Flood Risk Results

Locally, the community of Hog Hammock is referred to as being a 434-acre community. I calculate it to be 425 acres using a GIS. Hog Hammock is on average 3.0 feet (±1.2 S.D.) above local mean higher high water, or high tide. All its area and 115 structures identified in 2013 aerial imagery are located within the 100-year flood zone with a

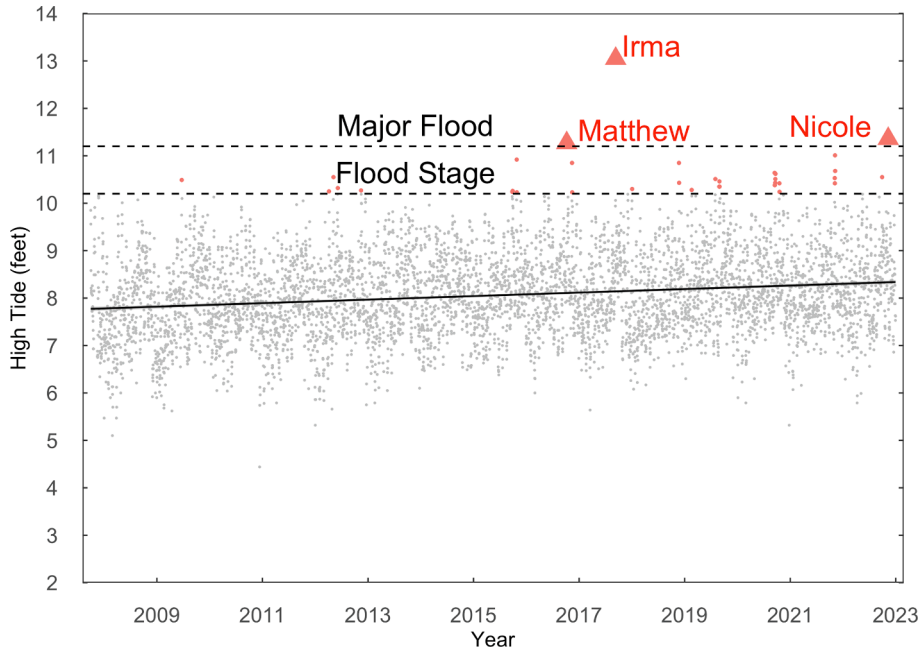

Fig. 1. Daily high tide trend for Meridian Landing near Sapelo Island, Georgia. Red triangles indicate major flood events. Data from U.S. Geological Survey. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

base flood elevation (BFE) between nine and eleven feet (Fig. 2).

Comparing the flood hazard exposure of descendant-owned land and structures to newcomer-owned land and structures shows very little disparity across these groups (Table 1). Notably, descendants have more land area, properties, and structures at risk to flooding. However, the percentage of these at risk (100%) are the same between the two groups suggesting no disproportionate burden and/or harms suggesting no distributive environmental justice concern.[3]

However, such a comparative framework is an a-historical environmental justice approach for examining flood risk in Hog Hammock. As Collins et al. (2018) clearly highlight in their review section drawing on critical hazards scholarship (Wisner et al. 2004), a social vulnerability perspective would recognize the likely differential capacity to prepare for, cope with, and recover from a major flood event. Likewise, such an a-historical and a-political perspective misses the legacy of power inequalities across racial difference that historically shaped – and continue to shape – this landscape. Flood waters are inundating a socio-environmental landscape shaped partially through histories of resistance to racial capitalism. Thus, I ask how would flood risk today be different if the culmination of those forces had not shaped it as it is now through forced relocations and closures of four historical Geechee descendant communities? What is Sapelo's counterfactual history for flood risk in this instance?

3.4. Counterfactual Flood Risk Results

Belle Marsh's area is estimated at 55 acres, which is close to the 50 acres reported to have been originally sold (Table 2). It is on average 4.8 feet (±1.9 S.D.) above high tide. Of the 55 acres, 37 acres are estimated to be in today's 100-year flood zone. Both households are located outside the 100-year flood zone, but in the 500-year flood zone. **Lumber Landing** is on average 4.2 feet (±1.3 S.D.) above high tide and 60 of its estimated 62 acres are within the 100-year flood zone (BFE 9), including both structures. **Shell Hammock** is on average 2.0 feet (±1.2 S.D.) above high tide with all its estimated 62 acres located within the 100-year flood zone (BFE 9–10), including all 11 structures in 1929.

Raccoon Bluff is on average 5.9 feet (±1.9 S.D.) above high tide with 364 of its estimated 656 acres located within the 100-year flood zone (BFE 9–10); the remaining acres are in the 500-year flood zone. Two of its 24 structures on the 1929 map are on the edge of the 100-year flood zone with the other 22 located outside the flood zone. These outcomes may be a result of georectification alignment challenges, but also nearly a century of erosion along the bluff on Blackbeard Creek abutting the community for the two 1929 structures. I reported **Hog Hammock**'s elevation and flood zone statistics previously, but all 37 historical structures in 1929 are in the contemporary 100-year flood zone.

3.5. Legacy Vulnerability and Contingent Futures

Overall, the counterfactual results indicate a variable pattern for how flood risk of Geechee land holdings would be today if the four historical communities still existed and ownership categories had not changed in any communities. Shell Hammock and Lumber Landing are both nearly fully within today's 100-year flood zone, but Belle Marsh is only partially within the zone while its historic household locations are outside of today's 100-year flood zone. Approximately 55% of Raccoon Bluff is located within the 100-year flood zone while at most two of 24 structures are indicated to be adjacent to the zone.

Comparing contemporary Geechee flood risk to the counterfactual Geechee flood risk, the results show a pattern of increasing proportional risk over approximately 90 years of the study period. When looking specifically at structures in the five historical Geechee communities, 52 out of 76 (68%) of those in 1929 would be located within today's 100-year flood zone compared with 100% of today's Geechee structures in Hog Hammock. Total Geechee-owned acreage at risk to flooding has increased from approximately 71% (750 of 1062 acres) to 100% (191 acres) today.

In summary, regarding flood risk there has been approximately a one-third increase for Geechee-owned property (structures and land) due to the closure of four historical Geechee communities and their related relocations. Key here is that the contemporary vulnerability of Geechee property to increasing flood risk is a legacy vulnerability, at

[3] I note that this interpretation eschews uneven vulnerability and adaptive capacities necessary to respond to such exposure (see Collins, Grineski, and Chakraborty 2018; Thomas et al. 2019).

Fig. 2. Map of Sapelo Island flood risk showing four historical communities and one current community as well as the location of structures from 1929. Historical community boundaries are derived from historical surveyor maps as well as estimated (please see text for details). UGAMI = University of Georgia Marine Institute.

Table 1
Flood Risk for Contemporary Hog Hammock. Mean elevation is relative to local MHHW and includes standard deviation in parentheses.

Variable	Descendant	Newcomer
Land Area (acres)	191	64
Properties (#)	168	95
Structures (#)	75	40
Mean Elevation (ft)	3.1 (±1.1 S.D.)	3.3 (±1.1 S.D.)

least in part for families with historical ties to Raccoon Bluff and Belle Marsh. Both communities have land outside today's 100-year floodplain; 45% and 33%, respectively. Thus, vulnerability of the Geechee population to flooding is tied directly to the historical legacies of racialized land dispossession facilitated through mid-twentieth century race relations that made it easier for Reynolds to pressure Geechee landowners to relocate.

The closure of Raccoon Bluff plays the most crucial role, as it was the most elevated and second largest Black community in 1930 (see Table 2) and the last to be closed in 1964. Projecting flood risk into the future is also fraught with assumptions and uncertainty. However, despite these uncertainties, what is clear is that Reynolds' power to coerce Geechee

Table 2
Counterfactual flood risk. Table shows total acreage of land and number of structures for five historical Geechee descendant communities on Sapelo Island. The number in parentheses shows the percentage of each variable in the 100-year flood zone. Mean elevation is relative to local MHHW and includes standard deviation in parentheses. *See methods section for calculation and source details.

Variable	Hog Hammock	Raccoon Bluff	Belle Marsh	Shell Hammock	Lumber Landing
Mean Elevation	3.0 ft (±1.2 SD)	5.9 ft (±1.9 SD)	4.8 ft (±1.9 SD)	2.0 ft (±1.2 SD)	4.2 ft (±1.3 SD)
Total Acres	424	656	55	62	62
*Geechee Acres At-Risk	227 (100)	364 (55)	37 (67)	62 (100)	60 (97)
1929 Structures At-Risk	37 (100)	24 (8.3)	2 (0)	11 (100)	2 (100)

household relocations away from Raccoon Bluff – instead of *to* it – still has ramifications for many Geechee families on Sapelo now and will continue to do so into the future under climate change.

Looking forward and assessing future flood risk under various sea level rise scenarios, today's Geechee-owned land and structures are increasingly vulnerable to becoming permanently inundated. Historically the 100-year flood zone would have been smaller as climate-driven sea level rise this century has been approximately 1.1 feet for coastal Georgia (NOAA 2022), which will continue expanding the 100-year flood zone. A crucial point is that the historical community of Raccoon Bluff is rather resilient to inundation from sea level rise. Using sea level rise projection probabilities for the Sapelo region (Kopp et al. 2014), by the year 2100 there is a 50% chance that half of Hog Hammock will become permanently inundated compared to a 50% chance of less than one acre of Raccoon Bluff becoming permanently inundated (Fig. 3). What this final comparison suggests is that the legacy of Reynolds' forced relocations of Geechee households and dispossession of elevated Geechee land from 1950 to 1964 is still unfolding as increased vulnerability for current Geechee residents and landowners through climate-driven sea-level rise.

Central to my overall argument regarding legacy vulnerability is that the initial results comparing flood risk of Sapelo's Geechee descendant owners (Black and mostly low-to-middle income) to non-descendant, newcomer owners (mostly white and affluent) suggest that an environmental justice disparity in distributive burden in flood risk does not exist.[3] However, when total flood risk for Geechee property is assessed against historical injustices that led to the concentration of Geechee property in Hog Hammock, an environmental justice issue arises around flood risk due to past events. In other words, a substantial portion of the vulnerability of Geechee-owned property to flooding is a legacy. This legacy vulnerability becomes much more apparent when a counterfactual flood risk assessment is conducted that analyzes changes in patterns over time and interprets those changes through the social processes driving them. Efforts to mitigate flood risk in underrepresented communities must necessarily align with ongoing efforts to resist land loss and dispossession and work to not reproduce that loss through incidental – and traumatic for those affected – outcomes of green or climate gentrification.

This study's results suggest that the social processes of racial capitalism have shaped much of the landscape on Sapelo today through racialized uneven development. However, they have done so only in relation to Gullah/Geechee resistance to the processes of racial capitalism, specifically through the dialectical forces of Black land retention and dispossession efforts. While Gullah/Geechee populations on other sea islands of the southeastern United States have long been dispossessed of their lands and the places have been transformed into gated communities or state-owned nature preserves (e.g., Skidaway Island and Ossabaw Islands in Georgia, respectively; Fertig and Hendricks 1998), the resistance to dispossession is ongoing for places like St. Helena Island in South Carolina where its Gullah/Geechee people are actively fighting to protect their lands and culture from developer interests as well as on Sapelo Island where its Gullah/Geechee people are resisting dispossession of control over state-owned cultural heritage lands (Brown 2023; Earley 2023; Hall 2023).

Acknowledging, recognizing, and collaborating with such resistance is paramount to mitigating future flood risk and to achieving equitable adaptation to climate change in marginalized and underrepresented communities. The legacy vulnerability concept not only identifies the disproportionate burdens of flood risk as rooted in historical geographical processes, but it also makes space for highlighting the contingency of alternative futures. Future flood risk will be shaped through the exploitive processes of racial capitalism, but it will also be articulated relationally through the resistance processes that seek to undermine that exploitation.

4. Conclusion

What can this study's findings do for the local Geechee population, and more generally, hazard mitigation and climate adaptation policies? First, the results provide evidence for what caused increases in flood risk of Geechee property over approximately the past 90 years, at least in part. But, perhaps more importantly, the results shine a light on where relocations might occur. As the case of Sapelo's history of forced relocations is evidence in and of itself, relocation of entire communities is fraught with cultural implications beyond Sapelo (see Maldonado et al. 2013; Jessee 2020). However, under climate change induced sea level rise, coastal communities will by necessity have to take some sort of action. The only land on Sapelo that is outside the 100-year and 500-year flood zones is near the state-run mansion (built on the site of the former plantation owner's residence) as well as three larger tracts near the north end. Despite this, conversations about relocations, if and when they occur, would benefit from recognizing the historical geography of

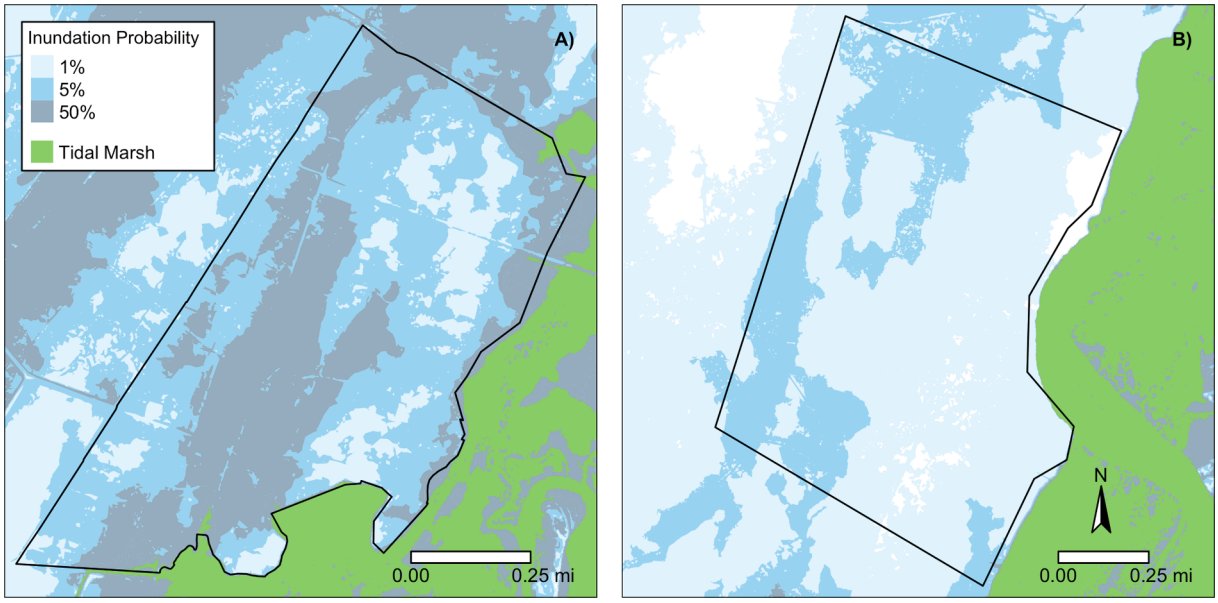

Fig. 3. Map of sea level rise inundation probabilities for the year 2100 for (A) contemporary Hog Hammock and (B) historical Raccoon Bluff.

Geechee relocations in relation to flood risk.

There are of course limitations to this type of historical geographical analysis, namely the assumptions about how Geechee property holdings would have evolved to the present under a more equitable socio-economic structure. However, what analyzing Sapelo's empirical history of flood risk through a lens of critical race theory suggests is that the history of race relations in America had a direct effect on where Geechee property is located today on Sapelo Island. I suggest that hazard mitigation and disaster response as well as climate change adaptation policies that account for such histories would be more likely to overcome systemic barriers to equity through disrupting the perpetual cycle of marginalization across social difference. Moreover, such research gives weight to the argument that climate change mitigation strategies need to address such historical inequities if and when relocations occur for marginalized coastal communities.

While Hog Hammock has never been incorporated officially, thinking through the importance of it as a "Black town" helps understand the weight of what it will mean to lose it to rising seas. In her work on flood histories of Princeville, NC, Danielle Purifoy (2018) argues that Black towns are "Black family legacies; they are monuments to Black freedom struggles. They are already invaluable to Black futures." Imagining a just and sustainable future for Hog Hammock on Sapelo Island requires recognizing its place in a broader history of American race relations as one of the last Gullah/Geechee sea island communities remaining. That description matters for environmental justice, but also for broader racial equity in America.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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