Water in the Caribbean in the Colonial Period

Caribbean Waterways and Colonial Regimes in the Anthropocene

Mark W. Hauser and Khadene Harris

Colonizing new lands was rarely abrupt. The expropriation of Indigenous lands by European empires was often preceded by moments of evaluation of the natural world. In the early colonial period, land and its affordances were a means to expand trade opportunities and strengthen one's political position. Water, along with what it allowed colonizers to achieve within a landscape, was often viewed through registers of private property and management. The process of land transformation necessitated the invention of a value system that became more entrenched as the plantation economy developed. Accounts of land transformation on various Caribbean islands are a reminder that this way of viewing the landscape resulted in patterns that elevated a combination of features such as access to water sources, flat cultivable land, and ease of transport to ports and urban markets. In this way, land transformation under colonial rule was always hierarchical, with water access and the technologies needed to control its use as one of the ways that, even among the white planter class, differences were instituted.

One of the features of the Anthropocene is the way its impact is felt unequally in a global sense. As other scholars have argued, one could trace this pattern historically to the colonial era and the expansion of European influence in the Atlantic World. In the present, water crises stemming from its privatization are only possible because the working class has historically been excluded from the infrastructure that disseminates this resource, such as cisterns and wells. Under slavery and colonialism, water quality and ease of access varied and highlighted differences that mapped onto colonial hierarchies. One way of apprehending these differences involves calculating distances from freshwater sources. Another way is to explore how the enslaved and later free people were able to store water for everyday use. Archaeological explorations of everyday life reveal that water access and storage were a central concern for the enslaved and later free people. The differences between enslavers and the enslaved that emerge show how people struggled and adapted to constantly changing conditions surrounding water, but working-class efforts were more time-

consuming and only one element in wider dehumanizing practices. Within enslaved domestic spaces, it meant repurposing wine and beer bottles or utilizing yard space to ensure water catchment during rain spells. Materially, there is a convincing body of evidence that shows that the laboring classes, especially in rural plantation settings, have a highly developed set of practices around water that is characterized not only by insecurity but also by a material exclusion from systems meant to ensure water access during periods of crisis or disruption. What has been recast as resilient practices in the present were borne out of the social inequalities typical of plantation societies in the past.

This chapter puts into conversation the work of scholars who question the premises of capitalism and its workings in the environment, historians concerned with the role of slavery and governance in colonial settings, and archaeologists engaged with spatial relationships inscribed into plantation economies. While contributing to a long-term conversation in which Caribbean scholars have centered these ecological relations in the making of social lives, it is the watery conditions of intense social inequality that show how environmental data can contribute to broader conversations about nature, culture, and place (Fanon 1963; McKittrick 2013; Wynter 1971). Caribbean historiography of the eighteenth century is useful when framed as a discourse between two priorities (DeLoughrey 2011; McKittrick 2013). One priority, that of the plantation fields, was framed in the idiom of property and improvement. Colonization was a process of alienation where humans were transformed into labor "and nature to land." Here, the enslaved were dually alienated. The process of colonization was a physical alienation by which people racialized as Black were held captive in the Americas. It was also a political alienation of the relationship between those people and the earth, which reshaped the social fields in which they operated. A second priority frames Caribbean history through idioms of reunion and cultivation. Within provision grounds, Africans reunited with the earth through growing food. In so doing, they cultivated relationships on "the plot of folk culture," which became another basis of social order (Wynter 1971: 99).

Rather than focusing on different island nations (Barbados, Cuba, or Haiti) or colonial regimes (French, Spanish, English, Danish, or Dutch), this chapter will be organized around the varied geographies of the insular Caribbean. As an assemblage of land masses with an equivalent area of the United Kingdom spread over an area approximately the size of Western Europe, the region contains enormous physical and cultural diversity in water availability and resources. Additionally, while the channels between islands have historically been used to define political boundaries between nations and imperial regimes, in the course of everyday practice, such channels are better viewed as conduits of ideas, things, and practices. That being said, the region can be usefully divided into four geographic regions: The Greater Antilles, including Cuba, Jamaica, Hispaniola, and Puerto Rio; The Eastern Caribbean; The Bahamas; and the Southern Caribbean. Importantly, each

of these regions is a multilinguistic space in which a combination of historical and geographic features creates a set of affordances that shape engagements with water.

Fluid Sources

Scholars examining the question of changing environmental engagements with water in colonial societies rely on a variety of sources that are not necessarily about water itself. As anthropologist Andrea Ballestero (2019) notes, "water's significance for the sustenance of life makes its symbolic meaning multiple," and these meanings emerge out of interactions with human and non-human actors (20). A review of the literature reveals that water concerns are often not about water itself, but about how water allows for the reproduction of life and the political systems that define legitimate forms of it. The work of the scholar is to trace the role of water in the transformation of land and people into "the colonized." This scholarly tracing unveils changing attitudes towards water as a resource that fully characterizes what has come to be called the Anthropocene. If this new geological epoch is characterized by an unpredictable yet complete dependence on water, then the early colonial period illuminates the attitudes, preoccupations, and predicaments that shape present vulnerabilities. The sources that allow scholars to trace the role of water in both sustaining and ordering colonial societies are varied and require an interrogatory comportment that goes beyond simply chronicling water access and use, to showing how power was wielded through water.

Water access has long been a site of power struggles, especially in the colonial period. Morgan et al. (2022) in *An Environmental History of the Caribbean,* for example, narrate almost two centuries of environmental transformation as the outcome of changing economic structures and power relations. In their account, the environment and the waters that flow through it constantly change meaning. The authors show how the biophysical transformation of the Caribbean happened alongside empire-making in the early Atlantic. They also show that the business of empire-making was neither uniform nor careful, but at the core, at least partially about how to shape environments. In the book, German naturalist Alexander von Humboldt appears frequently as an observer, a conservator, and part oracle. Von Humboldt makes no specific mention of water, its quality, or how to hoard it, but the excerpts of his descriptions that the authors use speak to the potential for its management and containment. For either of those things to happen, those in power had to have assumed the right to define both legitimate and dangerous waters.

One critical source for understanding water during the Anthropocene is archaeology. For the most part, archaeologists focus on water as a medium through which to explore politics, ritual, land use, settlement patterns, and responses to and possi-

ble origins of change. These studies can be usefully summarized into three common themes. Water is a medium through which to explore human-environment interactions. The changes in patterns of precipitation, sea levels, and rivers create contexts through which to explore human settlement patterns, adaptation, and sustainability (Cooper and Peros 2010). Water is an element of the landscape that becomes overtly subject to human manipulation. Landscape features, infrastructures, and terrain modification are venues to explore food production, social lives, and the polities that employ them. Water is a tool of "management" linked to nation-states and a consolidation of power. Implicated in these very issues are the roles of infrastructure, the making of surplus, or modes of agricultural production (Wells et al. 2017). Since Wittfogel (1957), water "management" has long been a concern of archaeologists studying the flow of power. Commonly, archaeologists employing water tend to focus on regional landscapes – both in their interpretive goals and their scale of analysis. The tendency towards a regional analysis of water is unfortunate because it fails to take advantage of water's most important qualities – its immediacy in everyday life.

Landscape Transformations

Of the many epochs identified by Earth scientists, only one takes its name from a particular agent behind its cause. This is the Anthropocene, a coagulate of effects located in the twentieth century with far-reaching implications for the Caribbean that originate between the sixteenth and nineteenth centuries. Unlike more broadly based epochs typical of Earth histories (e.g., the Holocene or the Pleistocene), during which humans migrated to and developed a range of social forms, economies, and environmental engagements in the Americas, the Anthropocene points to the transformative power of a single species, resulting in what some soil scientists and archaeologists have identified as an *event*. An Anthropocene event would 1) cover a heterogenous array of cultural and environmental processes contributing to climate change; 2) allow for stratigraphic recognition of seemingly abrupt changes in the presence and density of synthetic materials, elements, and isotopes (sometimes called the Archaeosphere); and 3) acknowledge a "pre-history" to such interfaces that need to be studied through a variety of disciplinary practices (Bauer and Bhan 2018; Edgeworth 2018; Gibbard et al. 2022). At the same time, others have acknowledged that terms such as the Anthropocene lend themselves to an uneven framing of modernity, and have instead opted for terms such as Plantationocene, Capitalocene, and/or Cthulhucene to describe a very real spatial and temporal heterogeneity in terms of the Anthropocene's origins and impacts (Haraway 2015; Moore 2017; Wolford 2021). In the case of the Caribbean, the heterogeneous environmental and cultural processes surrounding water can be traced to the colonial

period, where a suite of agrarian and governmental technologies fundamentally transformed human relationships with water (Hauser 2021).

Most would acknowledge that the Anthropocene did not begin in the twentieth century, nor are its roots always evident in the facts presented in the archives. Michel-Rolph Trouillot (2002) famously noted that even though today's global flows have a genealogy that can be traced back to the fifteenth century, one of modernity's conceits has been an elaboration of its exceptionality through a silencing of the past. To fully understand the landscape transformations that have occurred in the Caribbean, one must begin with the environmental affordances of the land and how those who first arrived in the Caribbean operated within them (Newsom and Wing 2004; Wilson 2007).

The sea contains several island chains that are typically separated into four major groups – the Greater Antilles, Lesser Antilles, Bahamas, and those adjacent to the South American mainland, including Trinidad, Margarita, Curacao, Bonaire, and Aruba. The 115 islands (not counting islets or cays) comprise a total area of approximately 240,000 km^2. Most of that landmass (95 percent) makes up the Greater Antilles. Cuba, Jamaica, Hispaniola, and Puerto Rico have large interiors, long rivers with wide valleys, and diverse landscapes that approximate those on the continents that surround the sea (Lugo et al. 2012; Rodriguez-Silva and Schlupp 2021). Throughout history, these islands have been home to larger populations, which are supported, though not exclusively, by terrestrial resources (Rivera-Collazo 2022; Rosen and Rivera-Collazo 2012). The Lesser Antilles are smaller with a total land mass just under half the size of Hispaniola. These islands contain far less diverse landscapes compared to the Greater Antilles, though they can look quite different from one another.

In this tectonically active region, earthquakes and volcanic eruptions can dramatically change the amount of land, its relief, and the resources that it affords. Geologically, islands in the Caribbean can be broken down into fault block, carbonate, volcanic, and mixed. In the Greater Antilles, mountains forming Cuba's Sierra Maestra, as well as the central spines of Jamaica, Hispaniola, and Puerto Rico, are extensions of mountains also found in Belize and Guatemala. This chain was formed from the vertical displacement of land at the fault line of the Caribbean and North American plates. As such many of these fault block islands are prone to earthquakes. The majority of the lesser Antilles belong to one of two overlapping and parallel island arcs. These arcs were formed from the subduction of the Atlantic plate underneath the Caribbean Plate. The older, outer arc begins with Anguilla and St. Martin and extends in an irregular shape through to Grand Terre and Marie Galante in Guadeloupe. These islands are characterized by low relief and carbonate bedrock formed from marine reef deposits on sunken islands uplifted or left stranded by receding sea levels (Schubert and Szabo 1978). The younger inner arc begins in Saba and con-

tinues through Basse-Terre, Guadeloupe, and Grenada. These islands contain steep mountains, narrow valleys, and much less in the way of flat land.

This geological history is important because it informs, indirectly, the amount and kind of precipitation as well as the amount and volume of ground water. Not all islands offer the same relief, and this topography affects the intensity and location of rainfall. Climate specialists generally talk about three kinds of precipitation: convectional, orthographic, and cyclonic. Cyclonic precipitation results from high-energy events, including tropical waves, tropical storms, and hurricanes. This typically heavy rainfall is accompanied by high winds. People living in Dominica, for example, encounter hurricanes more frequently than islands to the south and less frequently than those to the north. Convective precipitation falls when moist air is warmer than its surroundings. Relatively short in duration, intensity varies depending on the speed of the wind, the differences in air temperature, and the moisture content of the atmosphere. On the Windwards Islands, at times, convective rainfall can happen with some regularity, though its intensity changes depending on the season. This is the wet season. At other points in the year, precipitation can be quite negligible. This is the dry season. Orthographic rainfall occurs when moist air near the surface is forced upwards into cooler layers of the atmosphere when prevailing winds reach tall mountains. Moisture in the atmosphere is released. The regularity and intensity of rainfall have changed since humans first arrived on the island.

This precipitation also informs both surface and groundwater availability. Groundwater that permeates into the soil and porous rock varies considerably. Layers of the soil that are saturated with water are the land's aquifer. The barrier formed between saturated rock and the non-saturated rock above is the water table. These water tables are rarely horizontal and often reflect the topography of the underlying geology. Different geologies have different levels of porosity and permeability, which means that water does not move around the same way, nor is it captured to the same degree. Carbonate bedrock, found in the islands of the outer arc and Barbados, is both permeable and porous leading to significant aquifers that feed springs or can be reached by digging wells. Weakly cemented volcanic ash, which underlies many of the dispersed soils in the younger inner arc islands, is permeable but has low porosity. This means that it drains well but cannot capture the water. "Perched" water tables can form but only when the underlying rock is impermeable, creating subterranean basins. The water generally drains laterally from these basins into springs (Hauser 2021: 51). In some cases, these interfaces are near active volcanic zones creating hot springs. Aquifers are recharged through precipitation. Therefore, the depth of the water table can lower during dry seasons or droughts, or if more water is being removed from the aquifer through wells than can be recharged by rainfall (Hauser 2021: 38).

Indigenous Waterways in the Colonial Caribbean

The advent of European colonialism did not completely annihilate Indigenous peoples in the region. As such, we have some idea about the centrality of water in everyday life for the Indigenous inhabitants. For example, in Dominica, Raymond Breton, in his *Dictionnaire caraïbe-français* , documented that the Indigenous Kalinago had a highly complex taxonomy of water. The relationships with water in this document parallel some taxonomies found in French but with a few significant differences (Breton 1999[1665]). Breton explains that the Kalinago word *Tona* could be used interchangeably for both river and water (Breton 1999[1665]: 121). As a liquid, this term could be contrasted with *Arágoni* (urine), *Araógane* (sweat), *conóboüI* (rain), *Inhali* (manioc juice), *Ira* (juice or liquor), among others. As an element of the Indigenous landscape, it could be contrasted with *Acoúllou* (pond, pit, or abyss), *Balánna* (sea), and *Icópoui* (brackish pond). Water, as a substance, could also be qualified. It could be a fishy river, *Káricheti tona*. But the word could also be combined to create something different than the sum of its parts. The word *Amoyen* means cold, but when used in combination with *Tona*, means fresh water. The prefix *Bácha* signifies heat, but when combined, *Báchuetitona* means both stomach fluids and/or brackish water. *Inchiali* means to smell bad, but *Inchiénli tona* means salt water or troubled water. Such terms are useful in reconstructing some of the taxonomies that might have been salient for the Indigenous people during the seventeenth and eighteenth centuries.

For Indigenous peoples, water could purify. According to this taxonomy, water is defined narrowly. Liquids holding these latent qualities must come from the river. The act of bathing, *Nicobi niabou*, was a way for water to wash away other kinds of liquids (Breton 1999[1665]: 223). Breton comments that every morning, Kalinago men "go to wash at the river (women and children go there at another time)," especially in the places where the river is "heated" from sulfur springs. He goes on to say, "If they are wet with seawater, rain, or if they are dirty, or if they are too hot from some work, they return to wash" (Breton 1999[1665]: 191). From this description, one can surmise that different qualities of water mattered for the Kalinago, though it cannot be assumed that baths were required for the same reasons, as Breton describes these qualities in relation to health. Work brought about *Araógane* (sweat). Sea water carried with it a connotation of dirt. Rain was thought to chill the body too much.

Water carried with it important symbolic significance for Indigenous peoples. For example, children called the wife of their father who was not their mother their *Noucouchoutonarou*. This roughly translates to "my mother by water" (Breton 1999[1665]: 243). This presumably references two aspects of Kalinago kinship. First, that consanguinity, relatedness by blood, did dictate some of the terms under which family was constructed. Second, that family structure was polygamous. Finally, that many of the members of the family were brought in from other places by canoe.

Objects in a landscape are important elements in understanding such taxonomies. A clue to the ritual significance of water and precipitations in early and late ceramic ages are etched into portable objects and stationary rock surfaces. *Atabey*, the frog lady, for example, is one avatar of the apical female deity of Taino cosmology. She is also the mistress of the wind and the destructive force of hurricanes. The location and alignment of petroglyphs reveal that their carving was a largely political act, aligning living descendants with ancient ancestors of a particular deceased *cacique* or *caciques* (Oliver 2009). Rock art, depicting frogs, has been found throughout the Windwards including Grenada (6), St. Vincent (13), St. Lucia (5), Martinique (3), and Guadeloupe (12). The presence and frequency of rock art could be an indication of the anxiety over water security and an attempt to control it through spiritual means (Petitjean Roget 2008).

This art's recurrent themes – the fruit eating bat and the tree frog – reflect Kalinago concerns about the annual cycles of precipitation and its ritual management. The Coki, or tree frog, "comes from beneath the surface of the water," and is linked to the destructive hurricane season. The fruit eating bat "lives out of the water […] and is a dry animal" linked to the equally destructive dry season when many islands can best be described as a green desert (Petitjean Roget 1997: 105). Petijean Roget argues that these two motifs reflect attempts on the part of ritual specialists to influence the regularity and intensity of dry and wet seasons. He argues the rock art is present in areas where people would want to ensure the safety and security of water sources. On dry islands, like Anguilla, petroglyphs are located near the few water sources on the island. In the Windwards, petroglyphs tend to be located on boulders in riverbeds where annual cycles of wet and dry seasons affect the safety and security of the water.

The quantity of water available was affected not only by the annual cycles of wet and dry seasons, but so also by the quality of water. Perhaps those events most linked with the wet season were hurricanes (Ortiz 1947). Stuart Schwartz, in his discussion of the impact of these storms in shaping circum-Caribbean societies, notes that the storms were an ever-present fact of everyday life (Schwartz 2015). Specifically, during a hurricane, water sources might often become contaminated, making them unsafe to drink and potential carriers of disease. Coastal storm surges and rising rivers mix with brackish water, rendering it unfit for consumption. Stagnant floodwaters and standing pools provide breeding grounds for mosquitoes, which spread mosquito borne diseases (McNeill 2010). In Puerto Rico's historical hurricanes, the deterioration of water quality led to outbreaks of deadly illnesses such as measles, smallpox, and typhus, worsening the already dire conditions of hunger and sickness among the affected populations (Schwartz 2015: 41). That being said, eighteenth-century observers had come to think of hurricanes as part of a larger ecology that had a positive effect on the land (Ortiz 1947: 6), fertilizing "the earth and purg[ing] the atmosphere from the lent vapors and bring[ing] with them a healthy season" (Long

1774: 22). Writing at the century's end, the French jurist Moreau de Saint-Méry, however, remarked that those directly affected by hurricanes found it hard to see them as contributing to the universe's admirable order. Indeed only a few decades earlier, it was widely reported that hurricanes experienced in Jamaica and Barbados led to civil unrest where victims were "simply trying to survive the lack of food, shelter, and water" (Schwartz 2015: 103).

The vegetation present can also affect the amount of groundwater. A combination of plants with shallow root systems and intensified precipitation cycles can lead to soil erosion destabilizing permeable layers of soil that contain water. Mono-culturing plants in areas where aquifers need constant rainfall to recharge can have the effect of lowering the water table, putting plants and animals in competition for the same resource. Plants are not agnostic when it comes to aquifers, for example, cotton, which prefers "dry feet." That is, the plant prefers to grow in areas with well-drained soil where the aquifer is relatively deep (Nijland and El Guindi 1984). Other plants are more tolerant. Rice yields do not suffer as much from having waterlogged soils (Armstrong 1978). Sugarcane is somewhere between the two. Yields increase significantly when the water table is deeper than sixty centimeters (Rudd and Chardon 1977). It is thus no surprise that sugarcane can affect the amount of groundwater present in perched landscapes.

Geographer David Watts' study of how environments and landscapes were altered in the wake of European colonization demonstrates that deforestation and dramatic erosion occurred in the wake of the establishment of plantations, leading to a notable ecological break (Watts 1966; Watts 1990). Atwood insisted that "to render Dominica a good sugar country […] extensive forests had to be cleared" (Atwood 1791: 81). Atwood, who admired the "uncommon" size of the trees of Dominica argued the forests they populated were responsible for the excessive fog and rainfall on the island which rotted canes and created pools of standing water on the "stiff clay" which in turn would "chill the soil" (Atwood 1791: 80). Mangroves, a predominant tree taxon in the north of the island, were seen as detrimental to sugar colonies. Thomas Jefferys' *The natural and civil history of the French dominions* (1761) provides some insight about how land might be improved. In this account, Jefferys describes Guadeloupe, which "abounds in great quantities of mangroves and palmettoes, by which the free course of the air being interrupted […] generates tedious and often fatal disorders." He argued that if the mangroves and palmettoes were cut, "the air would be much more wholesome, and the inconveniences arising to the people from the number of trees would be removed by a constant supply of fresh air" (Jefferys 1761: 80).

At the same time, Jefferys recognized drawbacks to deforestation. Later in the treatise, he describes the commune Vieux-Habitants, which at the time of his visit was characterized by sandy soil. This parish that once, "appeared as beautiful as any other part of Basse-Terre," was subject to frequent floods and landslides precipitated by "cutting trees that consolidated [the] banks" of the River de Plessis (Jefferys

1761: 83). Soil that was "taxed" or "worn out" could also be employed to grow cotton, manioc, maize, and potatoes [most likely yams] (Jefferys 1761: 83). Add to that, many observers began to draw connections between deforestation and water availability. They speculated that two severe droughts earlier in the eighteenth century were made especially harsh by the lack of foliage on Antigua and Barbados. So, while clearing the land was important, it had to be done with great care. The effect of early settlement on water supplies was dramatic. Watts noted that as early as the seventeenth century on St. Kitts and Barbados, the two English islands first to be transformed to sugar cultivation, settlers began to rely on rain after tanks and cisterns, because springs had been quickly contaminated (Watts 1990: 166). By 1650, these cisterns and tanks could not be relied on to supply the much-increased populations on both islands. In Barbados, wells were sunk to supply water for plantations residents and dew ponds, or clay lined ponds, were dug to capture rainwater for plantation livestock (Watts 1990: 196).

For Watts, European settlement and its impact on biodiversity could not be uncoupled from the very crops to which the land was put to task (Watts 1990). While Europeans were engaged in a number of agricultural activities concerning commercial crops, including tobacco, cotton, and indigo, the two crops which caused the greatest amount of alteration to the landscape were coffee and sugar (Morgan et al. 2022). Both coffee and sugar have specific water demands that require intense dry periods followed by consistent irrigation. The role of water in the development and yield of the coffee crop (*Coffea arabica L.*) is critical. A period of water stress, induced either by dry soil or air, is needed to prepare flower buds for their blossoming, which is later stimulated by rain or irrigation (Carr 2001). Sugar itself is a thirsty crop, requiring a large amount of water (1,250 mm per year as a minimum) for its main growth period, and then a dry, sunny season to encourage the relatively slow natural process of cane sweetening. The World Wildlife Fund identified sugarcane, along with cotton, rice, and wheat, as among the world's thirstiest monocultures. In a study documenting water usage in the Niger and Chad basins, researchers found that one hectare of sugarcane required 55,000 m^3 of water as opposed to rice, (31,000 m^3), wheat (21,000 m^3), and vegetables (18,000 m^3) (Davis 2003). Indeed, contemporary histories and treatise speak to the centrality of water in both the settlement and operation of sugar estates (Belgrove and Drax 1755; Diderot 1762; Leslie 1740; Ligon 1657; Moreton 1793; Trapham 1679; Young 1764).

Historian Barry Higman (2000), a pioneer of the spatial-relations-of-colonies approach and slavery and plantation studies, defined the sugar revolution in a way that encompassed these concerns, i.e., as an ecological-socio-spatial process of agricultural extensification and intensification. In a systematic comparison of plats drawn depicting sugar and coffee estates in eighteenth and nineteenth century Jamaica, Higman noted that proximity to water was key in settlement patterns and organization of sugar estates and coffee estates in Jamaica (Higman 1986; Hig-

man 1987; Higman 1988). Coffee requires water for processing when using the wet method. First, ripe coffee cherries are hand-picked and then sorted and cleaned. Next, a pulping mill driven by a mule removes the outer skin and pulp. The beans, still covered in mucilage, are then soaked in water for fermentation, which breaks this substance down. After fermentation, the beans are thoroughly rinsed to remove any of the remaining mucilage. They are then spread on drying tables or patios to dry until they reach the desired moisture content. Once dried, the parchment layer is removed from the beans through hulling (Ellis 1774). Sugarcane, on the other hand, needed more water to process the grass into syrup, molasses, sugar, and rum (Deerr 1905). The amount depended on the method of juice extraction, crystallization, and distillation employed. For example, approximately 180 liters of water were required daily just in the boiling process to clean and season the cauldron used to concentrate cane juice (Browne and Blouin 1907: 276). Distillation of molasses into rum required additional water to cool the evaporate into rum (Porter 1830: 252).

It is important to distinguish, as Guy Lasserre (1978) does, between the different relationships through which capital was deployed to cultivate, transport, and process sugarcane between the seventeenth and nineteenth centuries. For Laserre, such environmental relations can be broken down to the kinds of engagements described by Higman above in the seventeenth and eighteenth centuries and those that accompanied the steam engine and novel modes of production in the nineteenth century. The introduction of the steam mill revolutionized the production of sugar in two ways. It powered mills that no longer relied on cattle, flowing water or consistent prevailing wind. It also enabled greater distances to be negotiated after the cutting of cane (See also Engerman 1983). The effect was a change in settlement patterns where independent boiling houses attached to different properties were absorbed by *les centrales* (centralized sugar factories fed by a combination of canals and railroads) (Buffon 1987). Importantly, the demands that sugar had on ground and surface water did not disappear with these novel technologies, rather they both intensified and became more unevenly distributed across the landscape.

Perhaps the landscape where these two revolutions (sugar and industrial) and their implication of water are best exemplified is in Cuba, where the growth of sugar exports in the seventeenth century led to widespread deforestation on coastal plains as planters cleared land for cane fields and used wood in the *ingenios* (water-powered mills) (Funes Monzote 2009: 31). Importantly during this early colonial regime, the transformation of the landscape did not encroach on heavily forested interiors. Timber was a resource, but one that could be managed. Political conflict over forests erupted in 1748 when the Spanish navy established a shipyard in Havana, prompting regulations to conserve timber, much to the dismay of sugar planters. Cuban timber created ships that lasted twice as long as those made in Europe because of its quality. After the Haitian revolution in the nineteenth century, Cuba became the world's top sugar exporter (Funes Monzote 2009: 35), leading Spanish authorities

to issue decrees in the 1810s granting them authority over private property, including forests. The advent of steam engines in the same period increased the demand for wood, enabling unprecedented scale in sugar processing and transport (Funes Monzote 2009: 267). According to one planter, unabated deforestation stemming from clearing for cane fields would lead to a double calamity "of shortages of fuel and scarcity of water" (Funes Monzote 2009: 151). Funes Monzote notes that twentieth-century engineers observed that nineteenth-century deforestation had not only immediate impacts but also long-term consequences for watersheds and aquifers, causing upstream flooding and riverbank erosion (Funes Monzote 2009: 152).

The predicaments of plantation slavery and imperialism impacted all parts of colonial societies, although the impact of water disruptions was felt unequally. Reports of droughts or disruptions caused by earthquakes and hurricanes often detailed how disastrous the effects were, especially for the enslaved population who already lived with water scarcity. Smaller islands struggled even more than their neighbors because the needs of plantations were always privileged, even during disasters. This resulted in landscapes that were vulnerable and characterized by long-term water insecurity. Droughts were especially prevalent where there was excessive deforestation. Research shows that during droughts, the enslaved population suffered even more than the white populations in the Caribbean. Floodings after hurricanes also reinforced the racialized distinction in water access. The lack of potable water in the aftermath of devastating weather events meant that the mortality rate of the enslaved shot up during these disasters. The resulting pattern was the normalization of water insecurity among the enslaved population.

Politics of Everyday Water Usage

Colonial regimes in the insular Caribbean had major impacts on landscapes and their affordances for precipitation, surface water, and groundwater. The effects of changes to the land in the region, including deforestation, soil erosion, and the amount and quality of ground and surface water, unfolded slowly and without spectacle. They may have been glossed over as a consequence of intense wet seasons, harsh dry seasons, and unpredictable weather events like hurricanes. Similarly, the population explosion, while sudden, would have been difficult to see in its entirety from the perspective of any one place. Ultimately, few people on Dominica would have lived long enough to see the development of the sugar revolution and feel its effects. Instead, the slow violence was embodied in the changing quality of water and the greater distances people had to travel to get it. These changes would have affected those who were bound to the land through enslavement more severely than those who they labored for.

Scholars who have interrogated slave life have argued that it is intellectually short-sighted to ignore differences between slave-holder ideology and the everyday lives of people categorized as slaves (Brown 2009). The sugar and industrial revolutions marked the intensification of exclusionary relations of markets, regulation, force, and legitimation. These relations were assembled in the socio-ecological form of the sugar plantation (Mintz 1985). On these plantations, enslaved people racialized as Black lived in denser settlements and struggled in fields devoted to monocultural output for higher capital gain for owners. Concomitant with this emerging socio-ecological form was a transformation of the landscape that impacted the availability of water for those living under the condition of slavery (Hauser 2017). Waterways were not free of charge.

Hauser's (2021) study of slavery on the island of Dominica shows that the region was exceptional for its late engagement in the plantation economy and the continued presence of an Indigenous population. Hauser investigates how space mediated social and political relationships, water being central to the ways in which power and nature came to constitute each other through the predicament of slavery. Plantation agriculture made water – in one of the Caribbean's wettest islands – scarce, forcing people to compete with industry over this abundant resource. More ordinary day-to-day uses of waterways were the norm, actions to meet basic needs but also to develop commensal relations in unexpected ways. Overall, environmental health, water's moral and cultural centrality, and enslaved laborers' situated knowledge were at the core of strategies for survival and resilience.

Indeed, landscape transformations brought about to cultivate sugar and coffee were just one of the many interactions shaping water and its uses. The plantation indexes just one of many relationships between humans and water in the Caribbean. Africans brought to Dominica would have had equally complex ways of managing water to promote cultivation. Intercropping and enhancing landscape features would have been strategies practiced by African farmers thrust into slavery. Though sometimes depicted as a state of "permanent cultivation" that is less elaborate than hydraulic systems, which support monoculture, intercropping can support large urban centers, cohorts of artisans and merchants, as well as long-distance trade (McIntosh 2005). The retreating waters exposed clayey soils that trapped water in back swamps and ponds. Farmers sowed more land with plants in close proximity that had different water tolerances, including rice and sorghum. To create high yields, these farmers also enhanced banks to create terraces that would hold water through the dry season. They also became adept at judging which crops would be suitable for their respective locales.

Judith Carney, for example, documented three different water regimes associated with rice cultivation in twentieth-century Guinea (Carney 2001: 57). The first, used in drier climates, was a rain-fed system. The second, used in inland swampy areas, relied on groundwater collected from artesian wells, freshwater springs, and

wells dug into perched water tables. The final water regime, used on tidal waterways and floodplains, had to retain freshwater and keep brackish and saline water from entering fields. The floodplain system of growing rice required thorough manipulation of water flow through floodgates, canals, and ditches. These strategies involve planning that would consider the investment of time and labor, accounting for variations in wetness and dryness of soil over the year. Those who were thrust into slavery were unable to bring a water regime with them to the Caribbean.

Raised fields would have been another technique available to manage water for farmers in the Caribbean during the centuries before Columbus (Rostain 2016). Wetlands in the tropical Americas were, on the one hand, rich in fertile soils; on the other, these soils could be waterlogged (Rostain 2008). In an environment that experiences both drought and flooding, growing maize (which prefers drier soils) and manioc (which prefers wetter soils) presented a particular challenge. Farmers on the Caribbean's South American coastline created raised fields to regulate water during annual heavy rains and dry spells. Farmers there constructed small agricultural mounds with wooden tools (McKey et al. 2010). These raised fields provided better drainage, soil aeration, and moisture retention. They also benefited from increased fertility from the muck continually scraped from the flooded basin and deposited on the mounds. The farmers limited flows, preserving soil structure and conserving soil nutrients and organic matter. While there have been no documented archaeological examples in the insular Caribbean, such techniques have been documented in contemporary Puerto Rico (Pagán-Jiménez 2013). Given this and their use in deep history, it is not unreasonable to argue that raised fields were a strategy farmers used to manage water.

In contrast to the massive irrigation works employed by Europeans to make land suitable for crops such as sugar, the modifications the Indigenous peoples and Africans employed may have seemed humbler. They were, however, no less complex. These strategies involved a level of planning that would consider the investment of time and labor, accounting for variations in soil moisture throughout the year. These strategies entailed calculations of risk about the possible catastrophic consequences. Investment of time, matter, and energy did not always yield in ways that the farmers had intended. Finally, these strategies required communal labor to create the earthworks responsible for retaining or draining fields. This would include earthen ditches and embankments to drain water from fields, ponds that would capture fresh water in the wet season and retain it during the dry season, alignments of stone that might have acted as dikes, and terraces with stone retaining walls that could capture or slow the movement of water downhill. These are the archaeologically visible features that reflect strategies of substance where water is concerned.

The increased dependence of island denizens on captured water for everyday water uses introduced a predicament for the health of some. Human waste, drowned

animals, and even everyday activities such as bathing contaminated the water supply and made slaves vulnerable to waterborne diseases (Handler 2006). Fouled water was, in many places, the only water available to slaves (Kiple 1984: 145). Waterborne illnesses such as typhoid and dysentery stressed organs and often resulted in death (45). By 1750, a combination of town planning that included paving streets, building stone and brick housing, and the passing of a number of local statutes related to drainage, rubbish removal, the provision of water, and new hospitals had shown a decreased death rate in in England (Buer 2013: 35). Abolitionist Robert Nikolls invoked pond water to make the point that slavery deprived people of basic needs. As such people had to develop ways to make water potable (Nickolls 1788: 17). In the last quarter of the eighteenth century, there was a decline in mortality associated with the slave trade. Robin Hayes and Ralph Schlomowitz link this to the greater attention on public hygiene in the Atlantic world, where "the life-saving effectiveness of adequate accommodation including isolation of the sick, improved hygiene, sanitation, clean water, and diet, was demonstrated long before the germ theory of disease" (Haines and Shlomowitz 2000: 285). As such, by the last quarter of the eighteenth century, naval and civilian physicians began to pay careful attention to hygiene and fresh potable water (272).

The importance of safe and clean drinking water was at least a part of town administrators' calculations. Belisario describes the attempt of Falmouth, a town on the north coast of Jamaica, to build main and service pipes as in "those adopted in the Mother Country." Likewise, colonial administrators in Point-a-Pitre and Basse Terre, Guadeloupe, would provide safe water for town residents (Arcangeli 2012: 190–200). Belisario continues with a detailed description of Kingston's water supply: "there are pumps in every street and wells in almost every yard, but so strongly are their waters impregnated with salt [with few exceptions], as to be totally unfit for culinary uses" (Ranston 2008: 264). The jars, according to Belisario, would be used to carry water in water carts on the tops of the heads of the servants that "traversed the city." Belisario goes on to describe how homes should have a "water pantry, in which jars of large dimensions, serving as reservoirs, are deposited." There, a "trusted" slave would clean and resupply the vessels. It appears, therefore, that such vessels were important for transporting and storing water.

There were additive methods that made water palatable. Archaeological evidence exists of some of the crafted beverages they might have drunk, including water flavored with fennel and coffee (Oas and Hauser 2017). Slave apologist Thomas Atwood states that a daily ration in the rainy season would be a "pint of rum and water, sweetened with molasses" (Atwood 1791: 257). This method was not unique to the Caribbean or to slavery. While today grog is considered a type of alcoholic drink, in the eighteenth-century Caribbean, it was more associated with water. Rum was a way to make fetid water stored in barrels palatable on long naval voyages. In many West Indian islands, water for grog came from ponds, which were easily polluted.

During the decades when the plantations in the Caribbean proliferated, colonial governance expanded its reach. In addition to acquiring territories and transforming them into productive colonies, European powers were doubly committed to creating and maintaining the socio-political conditions that would be conducive to and supportive of slave-based plantation agriculture. This meant reinforcing racial differences in all facets of colonial life, especially in the use of space. In this moment of expansion, landscapes were deforested, boundaries were invented, and monuments to plantation agriculture dotted the landscape. On plantations where water access proved a challenge, water infrastructure prevailed. Mills, reservoirs, dams, and duck ponds became prominent features of plantations. Their presence in the landscape narrates a story about legitimate uses of water in a society driven by slave-based plantation agriculture. Water access and storage for enslaved laborers were rarely priorities for colonial authorities. The outcome of these patterns casts the Caribbean as a space where water was a tool of violence that created frequent conflicts over resources. Ryan Fontanilla's Waters of Liberation (2023) shows us how white Jamaicans especially used the law to dispossess Black farmers in the post-emancipation period. He cites the *Public Water Supply Law* of 1889 that enabled the state to seize any fresh water supply it deemed necessary for the establishment of water and irrigation companies in the future anywhere in the colony as emblematic of the overreach of colonial governance as it regards water (346).

Water as a Medium of Movement

In the face of widespread privatization of water and waterways, the laboring classes in colonial societies have used the centrality of water and its affordances as a way to create possibilities away from the plantation and provide alternatives to imported food. With dependency on imported goods, a marked feature of Caribbean colonialism, there were efforts to increase food supply from marine resources to support their resiliency in a global system that has only ever sought to extract. Both freshwater and deep-sea fishing have been important subsistence practices among the laboring classes. Studies of fishing villages or communities that have access to terrestrial ecosystems like rivers and ponds have shown how reliant the laboring classes are on these food sources, their proximity becoming, over time, a core part of community identity. Access to resources that were outside of the purview of the plantation meant that despite efforts to police water access, there were moments when water and a political will to transgress became central to liberation efforts and challenging the reach of colonial officials. Studies of this kind reveal that when water access was not impeded, the laboring classes would find ways to use it to aid in liberation.

Water was not just a concern for rural communities. In urban spaces, an entire industry sprang up around sourcing water for the residents of major towns. Water carriers were key to water supply in places like Spanish Town and Kingston in Jamaica. They would sometimes travel long distances over impractical terrain to sell water to an ever-available market. As Fontanilla's research shows, "independent enslaved water-gatherers could turn immense profits" (Fontanilla 2023: 243), especially in drier towns with fewer freshwater sources. During the dry period or in times of drought water prices would skyrocket in urban contexts. Much of that was because the labor of water gatherers was both physically taxing and time-consuming (245). The prevalence of water gatherers was so pronounced that it facilitated the rise of what Fontanilla calls "swamp suburbs," communities that existed on the fringes of dryland so that Black Jamaicans could be close to work opportunities. While these dense wetlands sometimes served as a deterrent to white surveillance in post-emancipation Jamaica, they also exacerbated the need for freshwater that only an industry of water-gatherers could supply.

Waterways, as a means of travel, have a long history in the Caribbean. The islands in the Caribbean were first inhabited by seafarers who had perfected long-distance travel by canoes. The various groups who settled in the region both maintained and challenged political and economic relationships via these watery networks. In the colonial period, both oceanic and inland waterways were conscripted in the efforts of empires that sought mainly to extract. Most notably, the Atlantic Ocean and the Caribbean Sea were crucial for trafficking enslaved Africans and expanding European political power. Inland waterways were no less important as they offered more direct routes into difficult-to-access landscapes and, particularly in South America, opened up access to peoples who had better experience living in these watery landscapes. Natural waterways in Caribbean landscapes were imbued with layers of meaning. While these resources were conscripted into the slow violence of colonial life, they also provided pragmatic solutions to the predicaments of life in the Caribbean.

Vikram Tamboli's "Black Water Politics" (2024), for example, explores how the Pomeroon River in Guyana fomented an ethno-racial politics. The Pomeroon River is the deepest in the country, with a glossy black surface that hides what lies beneath. Because of its location and depth, the riverine communities that emerged in the colonial period were caught up in centuries of geopolitical conflict that brought together Indigenous groups, enslaved Africans, maroons, indentured laborers, and Europeans. Tamboli's works show that "waterways provided freedom – power through access, ability, and mobility – for distinct people at distinct moments in time" (302). The Pomeroon here, like other waterways, are not simply canvases for history to play out. Instead, rivers and the like are crucial to the creation of a sense of community and are thus part of the creation of a Caribbean political consciousness that remains fluid. Tamboli reminds us that these waterways "allowed

people to transform lineages, and in turn, the socio-cultural history of the Guyanese northwest" (302).

These natural waterways were not only places of travel, but also spaces of extraction. The Pomeroon facilitated industries like logging and gold mining that were fundamentally export oriented. The actors involved in these endeavors, however, would change over the course of the eighteenth and nineteenth centuries. Tamboli reminds us that while in the eighteenth century, the Pomeroon riverine landscape fugitive peoples were hunted as they sought freedom, in the nineteenth century, the formerly enslaved found moderate success in small-scale mineral mining that was able to sustain life in the free villages of coastland Guyana (302).

One obvious use of natural waterways in the colonial period was to facilitate inter- and intra-island travel. Especially in the eastern Caribbean, where smaller islands could be separated by as little as twenty miles, mobility was far less constrained than it is in the present. Travelling south against the current was often challenging but experienced sailors knew to hug coastlines on the windward side of the islands. How individuals traveled by water depended on their relative position in colonial society. In the Eastern Caribbean, both enslaved and free Afro-Caribbeans regularly traveled between the colonies for a variety of reasons. The relationship between Martinique and its neighbors in the eighteenth century serves as an example. In Martinique, it was common for smallholders to abandon attempts to transform peripheral parcels of land where it was difficult to grow food or source wood, instead focusing on more fertile lands freely available on nearby Dominica and St. Lucia. In Dominica, smaller plantations in the southernmost enclave of Soufriere, like Morne Patate, grew provisions that were transported by water to larger estates in Martinique. This facilitated the creation of social and economic ties across colonial society that deepened over time. In the Creole Archipelago, historian Tessa Murphy writes, "in addition to selling their ware in Martinique, residents of St. Lucia regularly traveled to the colony's southwest to partake in religious celebrations" (2016:37). Murphy's research underscores the centrality of water travel not just for the transportation of goods like food and water, but also for creating and maintaining social ties. Contrary to its post-independence portrayal as a barrier between nation-states, the Caribbean Sea has long been a conduit for the region's formation.

Grace Turner's (2006) work on ship graffiti in the Bahamas offers some archaeological insight into the ways humans took advantage of waterways and how such practices were incorporated into everyday life. At the time of Turner's research, nearly one hundred incised drawings of ships had been identified. Their repeated occurrence highlights the economic importance of seafaring and shipping to the island and the region. Turner rightly contends that these drawings ought to be understood as part of a larger landscape that incorporates both land and sea. Earlier studies show that about 16 percent of enslaved males in the Bahamas were employed in shipping – the highest in the region.

While shipping and seafaring in service of the plantation economy and British imperial interests dominated the accepted uses of natural waterways, these practices were also used to enact maritime marronage. As Singleton and Landers (2021) note, liberating oneself from slavery by escaping on the water was no easy feat and involved much planning in order to decrease the likelihood of capture. Maritime marronage carried a greater risk of being captured on the open sea or getting shipwrecked. Still, it was one of several ways that the enslaved were able to escape captivity. Knowledge of the practices and networks necessary for success were intentionally kept hidden and are still only accessible through brief mentions in historical records and, more commonly, through oral traditions. More recently, archaeologists working on St. Croix using ocean current modeling have pointed to ways in which those escaping enslavement would have relied on both an intimate knowledge of weather patterns and clandestine networks to successfully reach Puerto Rico.

It is tempting to view natural waterways in a purely pragmatic sense, as resources that were molded into a preexisting colonial agenda. This chapter cautions against such a position. Determining how various waterways were used is but one part of the equation. Borrowing mostly from anthropological studies that conceive of water as always more than itself (Ballesteros 2019), a consideration of how waterways could have been used in the colonial period is an invitation to consider the semiotic, historic, political, and material underpinnings of their use. This section considered how specific waterways were relationally understood. Ballesteros urges – even challenges – scholars to extend their inquiry beyond the liquid form. In the colonial Caribbean, this involves considering how water bodies were drawn into the broader process of colonization and, beyond that, the limits of its conscription.

Conclusion

Taken together, this survey of water and its uses during the colonial period in the Caribbean suggests that not all appropriations of the same matter harness the same strategies of explanation. One of the oft-repeated critiques of the Anthropocene is the extent to which the term collapses overlapping and concurrent themes and enacts a form of conceptual violence to a far more nuanced argument. What this chapter has shown is that individuals in colonial societies, differently positioned based on race, class, or gender for example, engaged with the substance differently and so valued its possibilities differently. The persistence and universality of the gap between wealth extracted through commercial agriculture and mining in the Caribbean and the reality of increased water insecurity for many of its denizens demands that the validity of any approach that fails to consider the historical particularities that have given rise to the Anthropocene be questioned.

There are three overarching messages in this chapter. First, scholars should make more of an attempt to familiarize themselves with work in the field of environmental studies and science that is being done in and on the pan-Caribbean region beyond the past colonial points of reference. More recent work done by soil scientists, archaeologists, and other biophysical scientists has made the theoretical leap to consider the highly extractive nature of the colonial period in the context of a longer-term environmental history. This is important because, as learned from the field of archaeology on the pre-colonial past, the Amerindian deeper histories continue to inform the present. Second, it is important to consider scholarship beyond the particular insularity of the places studied and view the challenges of the Anthropocene as regional in scope. Research from the Anglophone world often dominates these intellectual explorations, and at the same time, if scholarly work finds its way into translation, it is often into English. Despite this, the field at large would be best served by incorporating insightful work printed in French and Spanish that have carried on much longer engagements with topics such as physical geography, history, and its impact on the present. Third is that the scope, complexity, and novelty of an interdisciplinary approach to Caribbean environmental history are such that scholars must remain committed to thinking beyond the confines of their disciplinary allegiances. The attempt to apply a historical analysis of water to the Caribbean by various fields, such as anthropology, sociology, political science, and literature, has been an added strength, introducing novel questions that the field might not have thought to ask before. This commitment has produced innovative, well-documented, and thought-provoking works that historians would do well to take note of. To advance beyond broad generalizations and a slippery conflation of environment ecology and landscape, all of which are commonplace and contradictory, there remains the need for a body of scholarship that is not only sensitive to the theory of the environment, ecology, and the past but also grounded in the limits and constraints of the sources studied.

On balance, all such interventions represent a welcome response to the predicaments represented by rematerialized histories and archaeologies. While questions remain about what the Anthropocene is, when it began, and the degree to which it can be associated with particular technological interventions, a focus on the predicaments associated with everyday water and its uses provides a pragmatic and future-oriented lens from which to clarify the term.

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