THE UNIVERSITY OF HULL

Coexisting with volcanoes: the relationships between La Soufrière and the society of St. Vincent, Lesser Antilles

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Abstract

Human population growth has resulted in increased numbers of people living in areas prone to disasters. Exploring the historical and social context of how volcanoes and their eruptions influence society in different socioeconomic and cultural ways over time helps us to understand the present-day challenges faced by those living in an active volcanic environment. La Soufrière volcano, on the island of St. Vincent, has erupted frequently in the recorded history of the Lesser Antilles. The three eruptions investigated (1812, 1902-1903 and 1979) occur at three distinct stages of societal development: during the slavery era, post-emancipation and on the eve of independence. These distinct stages enable the investigation of how eruptions of La Soufrière highlighted social issues relevant to each time period. A mixed methodologies approach was used to explore how the society of St. Vincent has come to coexist with the low-frequency, high impact events of La Soufrière through time. The impact of the eruptions was mainly dependent on magnitude and longevity. This study shows the differences between VEI 4 and VEI 3 eruptions on the island and the control of topography on PDCs and lahars. It presents the most detailed chronology of the 1812 event to date and reveals previously overlooked aspects of 1902 eruptive activity of inland-direct base surges and a volcanogenic landslide. The mismatch effect is explored in how people experienced and recollected the 1979 eruption. This study finds that the volcanic hazard impacts occurred in the same places for the three eruptions but, damage to the agricultural sector was not homogenous. The differences lay within the socioeconomic structure of the agricultural systems between each eruption and consequent recovery options available. Furthermore, the volcanic hazard impacts, St. Vincent’s smallness, social capital and opportunities influenced whether people returned to their homes, stayed in evacuated locations or migrated off island. The island also shares typical coping adaptive strategies of Small Island Developing States (SIDS) such as migration/resettlement within and off the island and, temporary and permanent abandonment, which evolved from the loss of indigenous knowledge. This study demonstrates the importance of combining physical and social science to understand the complex interactions between volcanoes and people that lead to coexistence.

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Territorial acknowledgement

This thesis has been conducted on the Caribbean country of St. Vincent and the Grenadines, that once belonged to the Kalinago, who call the island of St. Vincent Youloumain, and the Garifuna, who call the island Yurumei. They originally inhabited the coastal areas of the island, however, due to colonialisation they were forced inland and north near the volcano La Soufrière. This has placed the descendants of the two groups at higher risk of La Soufrière's explosive eruptions. At the end of the Second Carib War in 1797, many Garifuna were exiled to Roatán, an island part of present-day Honduras. Exiled descendants now live in Central America and continue to view St. Vincent and the Grenadines as their homeland. The indigenous knowledge of the hazards that the island is exposed to has been omitted from written historical records. This does not reflect the enduring sovereignty of the Kalinago and Garifuna people. The author has endeavoured to represent the groups' voice in the narrative of this thesis.

"*Sun gürigia nasíruati yuti lun, lidan úarani, lawiwanduní libágari kai le aubai labúsienra, gatu giñe lanagun lungua buidu hadan líbegu*"

"All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood" – Article 1 of the Universal Declaration of Human Rights (Translated from the Garifuna language)

Foreword

This thesis uses archival material originally written in the nineteenth and twentieth centuries during the colonial era. Many of the words used to describe the Kalinago, Garifuna, enslaved Africans and their emancipated descendants are considered offensive today. As this is a historical and social contextual study, the original names are used to provide context to arguments. For reference to social groups throughout this thesis, “Yellow/Red Carib” refers to the indigenous Kalinago, “Black Carib” refers to the Garifuna, “Coloured” refers to persons of mixed race and, “Negro” refers to enslaved Africans and their emancipated descendants.

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Chapter 1 – Introduction

1.1 Introduction

Human population growth over the last century has resulted in people increasingly inhabiting areas prone to disasters (Keller and DeVecchio, 2016). This includes Small Island Developing States (SIDS), which collectively suffer from a range of developmental challenges including smallness, limited available space, environmental degradation, species vulnerability and dependence on foreign markets (Briguglio, 1995). Fourteen SIDS, including St. Vincent in the Lesser Antilles, also have an additional challenge of being volcanic islands with one or more active volcanoes. This study emphasises the importance of investigating how volcanoes exacerbate social issues and SIDS issues of development. This introductory chapter outlines the justifications for undertaking this research, the research question, aims of the study, the thesis structure and lastly, an overview of the volcano La Soufrière and the island of St. Vincent.

1.2 Justification

Volcanoes are unique from other natural hazards due to the cultural "services" they provide: spiritual and religious values, social relations and cultural heritage values (Scarlett and Riede, 2019). Volcanic eruptions can exacerbate social issues such as discrimination against marginalised groups (Dominey-Howes *et al.*, 2013), offering crucial windows in time into underlying social issues in history. As volcanic SIDS comprise 46 % of all SIDS, examining volcanic risk highlights the physical development challenges that volcanic SIDS pose (Wilkinson *et al.*, 2016). The challenges faced necessitate an interdisciplinary approach to understand the complex interactions between volcanism and society.

The 1812, 1902-1903, and 1979 volcanic eruptions of La Soufrière investigated within this study occur at three distinct stages of St. Vincent's social development. The 1812 eruption occurred during the period of British colonialism at a time when much of the island's labour was supplied by enslaved persons, while the 1902-1903 eruption occurred after the Slavery Abolition Act of 1833 but whilst the island remained under colonial administration. Finally, the 1979 eruption took place as the island transformed from a colonial to a postcolonial society on the eve of political independence. The history of volcanic eruptions makes St. Vincent an ideal place to investigate how La Soufrière exacerbated the contemporary social issues of each period. The social problems, such as racial discrimination, also relate to volcanic vulnerability, risk and resilience factors that may have changed between eruptions. Compared to other Lesser Antilles volcanoes, such as Soufrière Hills Volcano on Montserrat and Mont Pelée on Martinique, La Soufrière has erupted the most frequently in the region's recorded history (Section 1.5). The volcano's current 'quiet' phase is the best time for research, public engagement and volcanic risk reduction to prepare people for the next eruption, which occurs approximately every 90 to 100 years (Robertson, 1995).

This study focuses on the three different eruptions using a mixed methods approach within the context of La Soufrière's eruptive history against a background of societal change. I include my personal perspective, as my family lived through the eruptions of 1902-1903 and 1979; sharing their experiences through storytelling has influenced this study's direction.

This study argues that 216 years of colonialism made the society of St. Vincent more vulnerable to La Soufrière. I show this by answering the following research question: how did the colonial society of St. Vincent adapt to the volcanic eruptions of La Soufrière?

The research question will be addressed by the following aim: Investigate how the colonial society of St. Vincent adapted to the volcanic eruptions of La Soufrière. The following objectives will be employed to answer the aim:

1. To determine the impacts of the 1812, 1902-1903 and 1979, eruptions of La Soufrière.
2. To determine the adaptations of the agricultural sector for each eruption.
3. To determine societal behaviour adaptations of each eruption.

1.2.1 Brief chapter overview

The thesis is structured into seven chapters. This chapter introduces the scope of the thesis and background information on St. Vincent and the La Soufrière volcano. Focusing on the idea that volcanic eruption impacts vary over time and place, Chapter 2 will cover key literature on SIDS, volcanic vulnerability, risk and resilience, and the impacts of volcanism. It introduces the idea of "coexisting with volcanoes" and how this may relate to St. Vincent in the context of the above issues. Chapter 3 details the methodology for this study by covering the theoretical background of a mixed methods approach and details data source locations, analysis and limitations, and additional methodological issues encountered in this thesis. Chapter 4 uses the historical archives to reconstruct the three eruptions in a detailed chronological sequence of events to inform the response, recovery and adaptations investigated in Chapters 5 and 6. Chapter 5 investigates the impacts of the three eruptions on St. Vincent's agricultural sector, the historical staple industry for the island's economy. Chapter 6 addresses how the physical presence and the eruptions of La Soufrière influenced how the society of St. Vincent responded, recovered, and adapted behaviours changed through time. Lastly, Chapter 7 synthesises the conclusions of each chapter to answer the research questions.

1.3 St. Vincent

The main island of St. Vincent is approximately 29 km long and 17.5 km wide with an area of 344 km^2 (Figure 1.1). The island has a central mountain range consisting of the extinct volcanic centres running south to the north: Mt. St. Andrew, Grand Bonhomme, Petit Bonhomme, Mt. Brisbane, and Richmond Peak. Located in the north is the active volcanic centre of La Soufrière. The mountain range separates the terrain of the Windward (east) and Leeward (west) sides of the island: the windward side is gentle sloping hills and mostly inhabited, while the Leeward side is deeply dissected and rugged (Robertson, 2005). The territory of St. Vincent also includes the northern portion of the Grenadines, consisting of an archipelago of 32 islands and cays, nine of which are inhabited: Bequia, Young Island, Mustique, Canouan, Union Island, Mayreau, Petit St. Vincent and Palm Island. The tropical maritime climate of St. Vincent and the Grenadines has variable annual rainfall and temperatures depending on altitude. Annual temperatures average 25.6°C, and range between 18 and 32°C in the capital of Kingstown. Annual rainfall is approximately 1500 mm in coastal areas and up to 3800 mm in the mountains (Mills, 2001). The dry season is from January to May, although topography and the El Niño Southern Oscillation form seasonal and microclimatic anomalies (Mills, 2001).

Figure 1.1. Map of St. Vincent and the Grenadines.

1.4 La Soufrière volcano

The island of St. Vincent is made up of Pliocene (5.3 to 2.5 million years before present) to recent basalts and andesitic basalts, with lavas predominating over pyroclastic deposits originating from largely unknown and strongly dissected centres (Robson and Tomblin, 1966). La Soufrière is the largest volcanic centre located in the northern portion of St. Vincent and has a 2 km wide semi-open caldera at its summit. The caldera formed from an eruption that produced extensive deposits of Pleistocene (2.5 million to 11,700 years before present) ashes distributed along the windward coast (Robson, 1968). These deposits are under late-Pleistocene subaerial ash deposits, which reach thicknesses of up to 40 m and form a layer across most of St. Vincent (Hay, 1959). Enclosed within the caldera are two craters. The "old" crater, still active, erupted in 1902-1903 and 1979. The "new" crater erupted once in 1812 (Fournier *et. al*, 2011). The "old" crater floor is 1200 x 1000 m wide with an elevation ranging from 700-730 m above sea level and partially covered by the 1979 lava dome which rises to approximately 850 m above sea level (Fournier *et al*., 2011). The Pleistocene was the last time that lava flows breached the crater rim of the volcano (Robertson, 2005). This is an important observation to make when interpreting written accounts for the three eruptions, as eyewitness accounts describe all volcanic flow phenomena associated with the volcano as lava. A recent study identified additional prehistoric eruptions occurring from 1157 to 1590 (Cole *et al.*, 2019), while the recorded eruptive history is from 1718 to the most recent explosive eruption of 1979, presented in Table 1.1.

Table 1.1. The eruption history of La Soufrière. 1157-1590 dates are radiocarbon dates adapted from Cole *et al.* (2019) and 1718-1979 dates adapted from Robertson (1995, 2005). Radiocarbon dates are precise within 30-40 (±) years. For 1157, 1426 and 1551, the only evidence to suggest of an eruption is charcoal fragments and stratigraphy information.

Date	Type of activity
1157	Possible eruption.
1426	Possible eruption.
1430	Scoria flow deposit in lowermost unit of Larikai sea cliff section.
1440	Collapse of a lava dome and generation of pyroclastic density currents.
1445	Block-and-ash flow deposit in lowermost unit of Larikai sea cliff section.

1551	Possible eruption.
1553	Pyroclastic density current deposits within the Wallibou sea cliff.
1560	Thick pyroclastic density current deposit midway up the Dry Wallibou Valley.
1566	Third deposit of a three-layered pyroclastic density current deposit in Dry Wallibou.
1580	Significant ash plume collapse and pyroclastic density current generation.
1590	Lowest pyroclastic density current fallout deposit on the southwest coast.
1718	Explosive eruption preceded by one month of earthquake activity. Ash fall reported on Martinique, St. Kitts, Barbados and Hispaniola.
1780	Increased fumarole activity.
1811	Strong earthquakes.
1812	Explosive eruption (Chapter 4).
1814	Small eruption.
1880	Crater lake temperatures increased with a major rise in water level, accompanied by an increase in fumarole activity.
1901	Strong earthquakes.
1902-1903	Explosive eruption (Chapter 4).
1945-1946	Local earthquake swarm accompanied by an increase in fumarole activity.
1948-1954	Increase in crater lake temperature.
1971-1972	An aseismic effusive eruption.
1978	Local earthquake swarm.
1979	Explosive eruption (Chapter 4).
1979-1984	Effusive lava dome building.

It was determined that Late Pleistocene deposits were formed during a few hundred years of extremely violent activity, during which time the volcano was in near constant activity. The activity took place in an open summit crater periodically blocked by lava domes during short quiet phases (Rowley, 1978). Little is known about the physical volcanology and social impacts of the 1718 eruption and a lack of archive sources prevents its further study and is therefore outside the scope of this study. The 1812 eruption's deposits have been briefly discussed within several geological and social volcanology investigations as background information to wider investigations of La Soufrière, and not gone into considerable detail (e.g. Sharp, 1890; Anderson and Flett, 1902; Dickson, 1902; Hay, 1959; Robertson, 1995; Pyle, Barclay and Armijos, 2018; Cole *et al.*, 2019).

The 1902-1903 eruption has had more in-depth geological investigations than the 1812 eruption. Dr. Tempest Anderson, Dr. John Flett and Dr. Edmund Hovey conducted the investigations in June and July 1902, soon after the eruption began. Their work examined the deposits of the eruption as well as obtaining eyewitness reports to understand how the volcanic eruption began (Anderson and Flett, 1902; Hovey, 1902b). Hay (1959) studied the 1902 eruption's chemistry, mineralogy and texture of pyroclastic density current (PDC) deposits. They concluded that the eruption's properties were like many pumice and scoria flow deposits found at Crater Lake in Oregon, USA, Cosegüina in Nicaragua, and Asama and Komagatake in Japan. They also concluded that the scarcity of volcanic bombs in deposits was the only major difference between St. Vincent and other volcanic scoria and pumice flow deposits found at Crater Lake and Komagatake (Lewis, 1973). Pyle *et al*. (2018) investigated the impacts, disaster relief, and response to La Soufrière's 1902-1903 eruption. That study demonstrated how a prolonged event challenged the authorities who managed the crisis and its aftermath. Furthermore, the study discussed planning for future eruptions and provided important empirical evidence for building effective responses in similar multi-hazard contexts. Anderson and Hovey returned in 1903 near the end of the eruption to piece together the most complete story of the eruption (Anderson, 1903; Hovey, 1904). A further trip by Anderson in 1908 examined areas the eruption impacted, specifically the vegetation recovery and the condition of deposits (Anderson, 1908).

The 1971-1972 period of unrest was largely subaqueous, taking place in a 180 m deep crater lake that resulted in the emergence of a steep sided "lava island" composed of 80 x 106 m^3 basaltic andesite (Aspinall *et al*. 1973).

The volcanology of the 1979 eruption has been well studied. Observations using remote sensing techniques (Shepherd *et al*., 1979; Fiske and Sigurdsson, 1982), the petrology of the ejected volcanic material (Graham and Thirlwall, 1981), the eruption's mechanism (Shepherd and Sigurdsson, 1982), plume dynamics (Sparks and Wilson, 1982) and, ash fallout and deposition (Brazier *et al*., 1982) all contributed to the present understanding of the eruption. A key paper by Shepherd and Sigurdsson (1982) determined that the vulcanian explosive phase of the 1979 eruption occurred when magma penetrated the waterlogged

1971-72 lava extrusion in the crater lake, meaning that the mechanism for the eruption was the interaction between the 1971-72 lava mass, crater lake water and magma. This was a consequence of net-veining and thermally induced hydraulic fracturing of the 1971-72 lava mass by new magma. Their conclusions helped scientists to understand La Soufrière's behaviour and that of other volcanoes with crater lakes, such as Mt. Ruapehu in New Zealand.

The crater lake of La Soufrière usually replenishes within a few years of its eruptions. Nevertheless, an investigation of the groundwater of the volcano showed that the water table is 28 m above the pre-1979 lake level and reflects mass equilibrium in the system in which constant seepage underground balances the meteoric recharge rate (Fournier *et al*., 2011). According to the study, in 1979 the crater was filled with 10^8 m^3 of fragmented material and despite constant precipitation and has remained dry ever since apart from a small shallow pond. In the future, possible phreatic (magma heating surface or groundwater) or phreatomagmatic activity suggests that future activity may differ (Fournier *et al*. 2011) from the eruptions investigated in this study.

As part of a book of the volcanic hazard maps of the Lesser Antilles, Robertson (2005) combined all previous research on La Soufrière with his own to produce a comprehensive volcanic hazard assessment for St. Vincent, creating scenarios based on the 1902-1903, 1971-72 and 1979 eruptions. Robertson's work has been an essential source for future research focusing on the vulnerabilities, risks and resilience of La Soufrière. The book was missing a historical-social approach, that is the central part of this study.

1.4.1 Behaviour of La Soufrière

Based on Aspinall *et al*. (1973)'s work, the following is the "background" behaviour of La Soufrière determined from historical observations. Background activity is minor and localised fumarole activity. During times of heightened activity, fumarole activity increases, accompanied by earthquakes and changes in the crater lake's water level and temperature (if recorded/was sufficient). In the lead up to an explosive eruption, earthquakes become stronger and more frequent; the first phase of an explosive eruption consists of ejecting volcanic material blocking the pathways for magma. Next, an ejection of juvenile volcanic material pulses in heightened and slackened activity. Eruptions vary in length. For example, the 1812 eruption lasted six weeks, the 1902-1903 ten months, and the 1979 two weeks. In

1971-1972 and 1979-1984, the effusion of lava was “quiet,” or aseismic, with little to no detectable earthquakes preceding or during the event (Aspinall *et al*., 1973; Rowley, 1978). As no recorded details exist regarding non-explosive activity until the 1970s, it is not possible to indicate how the activity fits into La Soufrière’s cyclic pattern. Current knowledge about each of the eruptions and their social impacts will be explored in detail in chapter 2.

1.5 History of St. Vincent

The following brief historical account of St. Vincent includes key events leading up to each eruption investigated to provide the necessary historical and social context to understand this study. Volcanic eruptions, and indeed other natural hazard events, shaped the social, political, and economic life of the island (see Appendix F, Figure F1 for a visual representation of the brief historical account). The portion of St. Vincent’s history detailed below occurs alongside La Soufrière’s volcanic history. Understanding both kinds of knowledge is important in order to understand how volcanic eruptions exacerbated social issues.

Before European contact, the Caribbean received migrants from South and Central America that displaced and absorbed cultural groups. This included the Saladoid, a group that inhabited present-day Venezuela, the Lesser Antilles, and Puerto Rico from 500 BCE to 545 CE (Lawler, 2016). The Caribbean was then inhabited by the Arawak people, who spread across South America and the Caribbean. From approximately 1200 AD, the Kalinago society inhabited the Lesser Antilles (De Silva, 1998), and the Taíno were inhabitants of the Greater Antilles and northern Lesser Antilles. By 1635, the Kalinago encountered runaway enslaved Africans, from the nearby islands of St. Lucia and Barbados to Dominica and St. Vincent and the Grenadines (Adams, 2002; Sweeney, 2007). The enslaved runaways intermarried with the Kalinago, incorporating African and Kalinago cultural customs to become the cultural group known as “Garifuna” (Sweeney, 2007).

Both colonial French and British empires had vested interests in St. Vincent and the Grenadines but, due to Kalinago and Garifuna resistance, St. Vincent and the Grenadines became a designated “Carib Reserve”. In 1660, the British demanded the Kalinago Chieftains the return of runaway enslaved peoples (Palacio, 1987; Anderson, 1997). In 1718, La Soufrière erupted and in the following year, the French established the first colonial settlement of Barrouallie. However, because of the Seven Years War (1756-1763) between the French and British, the 1763 Treaty of Paris resulted in St. Vincent being ceded to Britain (Sweeney, 2007). The British expelled a small number of French settlers from the island, their plots of land converted into British plantation estates (Smith, 2012) and a “Reserve” for Kalinago and Garifuna territory was designated in the northern portion of the island (See Appendix G1, Figure G1, for a map drawn from this period).

With a new colony in their possession, Britain promoted St. Vincent as ideal for sugar production. The soil fertility of other British Caribbean islands cultivated for the previous 120 years was diminishing, and the fertile volcanic soil of St. Vincent was ripe for exploitation (Sweeney, 2007). Planters secured land through voluntary sale, military force and encroachment (Anderson, 1997). In retaliation and to protect their lands and identity, the Garifuna fought back, leading to the First Carib War (1769-1773). In 1780, a recorded tropical storm impacted the island (Shepherd, 1971) and 15 years later, after continued land conflicts, the Second Carib War (1795-1797) broke out. Over a thousand Garifuna were exiled to the island of Roatán, part of present-day Honduras (Anderson, 1997).

La Soufrière erupted again in 1812, and tropical storms hit the island in 1819 and 1831 (Shepherd, 1971; Adams, 2002). Under British rule, St. Vincent became part of the Windward Islands in 1833, which included Grenada, St. Lucia, Barbados, Tobago, and Dominica. In the following year, British enslaved persons were emancipated. To compensate for losses in labour, the first Portuguese and Indian indentured servants arrived on the island in 1840 (Fraser, 1975). Many natural hazards impacted the island in a short time: a tropical storm in 1886, drought in 1887 to 1888, flooding in 1896 and 1897 following heavy rainfall and tropical storms in 1897 and 1898 (dubbed “The Great Hurricane”) (Gittens, 1886; Anderson, 1938; Richardson, 1989, 1997; Fitzpatrick, 2001; Adams, 2002).

At the turn of the century and whilst the island recovered from the 1898 tropical storm, La Soufrière erupted for ten months in 1902. In 1935, a labour rebellion occurred on the island (Fraser, 2016) and 20 years later, a tropical storm hit (CRED, 2004). In 1958, a drought occurred, followed by heavy rainfall that caused widespread soil erosion and landslides (Boruff, 2005). In the same year, St. Vincent joined the Federation of the West Indies comprising Jamaica, the Cayman Islands, Turks and Caicos Islands, Antigua and Barbuda, St. Kitts and Nevis, Anguilla, Montserrat, Dominica, St. Lucia, Grenada, Barbados, and Trinidad and Tobago. The Federation continued until 1962. In 1969, the island becomes an Associated State. In 1977 the island flooded (CRED, 2004) and in 1979, six months before the country gained independence from Britain, La Soufrière erupted again, followed by the arrival of Hurricane Allen in 1980 (Appendix F, Figure F1). This study will focus on the 1812, 1902-1903, and 1979 eruptions to reconstruct the sequence of events that informs the investigation of the eruption impacts in their social contexts

1.6 Conclusion

St. Vincent is a volcanic Small Island Developing State (SIDS) and within this context, it is important to research past volcanic eruptions to investigate how historical and social contexts conditioned the island's people to adapt and coexist with volcanism. La Soufrière's volcanic history impacts a society against a background of an island that experienced significant changes in its governance and culture. This presents the opportunity to investigate how La Soufrière exacerbated social issues present in each stage of St. Vincent's societal development.

Chapter 2 – Literature review

2.1 Introduction

The island of St. Vincent has been identified by the United Nations as a Small Island Developing State (SIDS), first identified as a problematic category for sustainable development in the early 1990s (Griffith, 1996; Pantin, 1999). The island is susceptible to multiple hazards, namely tropical storm/hurricanes, flooding, landslides, earthquakes, but also the infrequent eruptions of the volcano La Soufrière. The following chapter will cover key literature on SIDS, vulnerability, risk and resilience, the impacts of volcanism, the approaches of researching volcanoes in historical geography and social volcanology and lastly, linking all these together for St. Vincent. In doing so, the chapter critically reviews the relevant literature in order to identify key gaps.

2.2 Small island developing states

There are 58 states classified as SIDS according to the UN of Sustainable Development (UNDESA, 2018). The term SIDS was first coined as an outcome of the Global Conferences on the Sustainable Development of Small Island Developing States in 1994 to promote action of SIDS vulnerabilities at the national, regional and international levels[1]. SIDs are defined as having a land area of less than 10,000km^2 and a population of less than 500,000 (Beller *et al*., 2004). SIDS are further categorised into High Income Countries (HICs) and Low-Income Countries (LICs). HICS are industrialised, high earning countries such as Barbados, whilst LICS are less developed and do not earn as much. Some are borderline LICs and Middle-Income Countries, such as St. Vincent and the Grenadines and Dominica. In general, these states are not distributed equally and vary in their physical, social, cultural, economic and political contexts. There are two main relevant concepts that arise from being a SIDS. The first is island development, which focuses on developmental and environmental issues. With this theory, SIDS share similar characteristics which constrain their sustainable development (Ghina, 2003). According to Mercer *et al.* (2007) and Wilkinson *et al.* (2016), sustainable development constraints are as follows:

- Geographical dispersion,
- Smallness,

[1] UN (2020) Decisions by topic: small island developing states [online] https://sustainabledevelopment.un.org/topics/sids/decisions [accessed 18/02/2020]

- Remoteness,
- Small populations,
- Ecosystem fragility,
- Lack of natural resources,
- Limited freshwater,
- Constraints to transport and communication,
- Isolation from markets and limited internal market,
- Heavy dependence on imports and limited commodities,
- Susceptibility to economic and natural hazard shocks and,
- Vulnerability to global developments.

It is argued that closed social, economic and environmental systems are the result of SIDS smallness and remoteness (Calado *et al*., 2007). These closed systems are believed to influence a population's dependency on natural resource-based livelihoods connected to the ocean (Kelman, 2010). However, the remoteness of the Caribbean islands to one another and the surrounding continents would be a typically "western" perspective of framing island vulnerability, as archaeological evidence suggests that the Caribbean Sea was an 'aquatic motorway' (e.g. Watters and Rouse, 1989; Berman and Gnivecki, 1995; Hofman and Bright, 2008; Hofman *et al.*, 2014). It is also important to point out that a small population and smallness can be advantageous. Inhabitants tend to have close kinship ties, strong cultural heritage, a sense of identity and place, and a long history of dealing with social and environmental change (Dolman, 1985; Lewis, 1999; Howorth, 2005; Kelman, 2007; Mercer, 2009).

The second strand of SIDS theory is island vulnerability that places emphasis on the factors of physical geography, the environment, and fragile economies. Island vulnerability literature largely focuses on economic or environmental vulnerabilities, as SIDS are classified as having small economies, which is the result of the "diseconomies of size" (Armstrong and Read, 1998). This is defined as the domestic demand for goods laying below the minimum efficient scale that leads to the limitation on large scale manufacturing and domestic competition (van der Velde *et al.*, 2007). Colonial policies that led to the emergence of single dominant sectors to remain competitive in an increasingly global environment generated the issue of diseconomies of size and a high dependence of foreign markets (Pelling and Uitto, 2001; Julca and Paddison, 2010). In this respect, the monoculture approach also contributed to this, as it led to a strong focus of exports on primary products, for example bananas and arrowroot for St. Vincent. During colonialism, this meant colonies were part of something bigger and revenues could withstand change. But post-colonialism, monoculture approach caused volatile import and export prices. The lack of diversification puts countries at a disadvantage compared to countries with a more diverse trade pattern (Santos-Paulino, 2010).

Remittance flows are a positive step in addressing island economic vulnerability. This is achieved in various ways including: business investments, social capital through increased schooling of children and reductions in transportation and communication costs which allow emigrants to maintain frequent contact with families in their communities of origin (Edwards and Ureta, 2003; Amuedo-Dorantes and Pozo, 2006; Gitter and Barham, 2007; Woodruff and Zenteno, 2007; Amuedo-Dorantes *et al*., 2008; Amuedo-Dorantes *et al*., 2010). Less positively, remittances can cause the increase of currency exchange rates and work disincentives (Funkhouser, 1992; Amuedo-Dorantes and Pozo, 2004, 2006b). Throughout recorded history, issues of island development and vulnerability have persisted in the Caribbean and it is therefore important to be aware of both theories. The SIDS issues provided a backbone for analysis and interpretation throughout this study.

2.3 Volcanic risk, vulnerability, and resilience

2.3.1 Risk

Risk has several definitions relevant to this study. At its most basic, risk is the likelihood of hazard occurrence and its negative consequences. The UN Office for Disaster Risk Reduction (UNDRR) (formerly known as UNISDR) (UNISDR,2009) developed this further by stating it is the probability of an event causing negative consequences. Introducing probability also introduces uncertainty, which is a usual justification for conducting volcanology research i.e. to increase the confidence in probability forecasting and therefore, reducing the uncertainty in the volcanic risk at a given volcano. This is where the importance of volcanic risk assessments is key in determining probable negative impacts of the event. A volcanic risk assessment was developed for La Soufrière by Robertson (1995) (see Section 2.6). Other considerations when defining volcanic risk include the consequences of both physical hazards and the social, economic and political landscape into which the volcano erupts (Barclay *et al.*, 2015). Some of these social factors include poverty, governance, and land-use planning that influence the risks to eruptions. These are certainly applicable when considering the historical and social context in which the eruptions of La Soufrière take place.

According to UNDRR, risk has a tolerance level, which is the level of acceptable risk an individual, household, community and society can take before suffering negative consequences of the hazard impact (UNISDR, 2017). The tolerance level can manifest in two ways (Barclay *et al.*, 2015). Firstly, intensive risk is based on the concentrations of people and economic activities exposed to hazards. The high concentration of exposure can lead to potentially catastrophic impacts involving high mortality and asset loss. Secondly, extensive risk is associated with the exposure of dispersed populations to repeated/persistent hazard(s) of low or moderate intensity and can lead to debilitating cumulative impacts.

However, volcanic risk is rarely investigated on its own and often research looks to identify not only factors of volcanic risk but also strategies of risk reduction. Volcanic risk reduction research integrates social science and physical science-based knowledge and approaches, which include communication methods (Barclay *et al.*, 2008). Volcanic risk reduction key themes are integrating traditional and indigenous knowledge (Cronin *et al.*, 2004; Mercer *et al.*, 2007; Donovan, 2010), the role of religion (Chester, 2005; Chester *et al*., 2008), risk and hazard communication (Haynes *et al*., 2007, 2008), strategies to increase community resilience (Paton *et al*., 2001), and building sustainable livelihoods (Kelman and Mather, 2008). Furthermore, volcanic risk perception studies have been undertaken with the aim of understanding populations' attitudes to volcanoes and awareness of preparedness strategies (Davis *et al*., 2006; Bird *et al*., 2009; Ricci *et al.*, 2013). Key findings from a recent masters project investigating the risk perceptions of La Soufrière included a low hazard saliency of volcanic hazards compared to the more frequent occurrences of meteorological related hazards, a strong belief in God being responsible for La Soufrière's activity, low self-efficacy (self-confidence in being prepared) but a high confidence in scientists and the

National Emergency Management Organisation to relay accurate information and help prepare communities (Scarlett, 2014).

The various approaches to researching risk combine vulnerability with the probable level of loss to be expected from a predictable magnitude of a hazard (Alexander, 2000). However, the magnitude of a volcanic eruption cannot be predicted most of the time. Nonetheless, through completing the historical and social investigation into previous volcanic eruption impacts, volcanic risk can be established before and after an event, to inform current volcanic risk, to demonstrate that societies do change and therefore, so does the risk. This approach was applied throughout analysis and interpretation of results.

2.3.2 Vulnerability

Vulnerability is the susceptibility to damage or injury. According to Wisner *et al.* (2004), the characteristics of a person or group and their situation influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. This involves the combination of factors that determine the degree to which someone’s life, livelihood, property and other assets are put at risk by a discrete and identifiable event in nature and in society, with some groups being more prone to damage, loss and suffering in the context of different hazards. Key variables include class (including differences in wealth), occupation, ethnicity, gender, disability and health status, age, immigration status (legal or illegal) and the nature and extent of social networks (Wisner *et al.*, 2004a). Due to the availability of data, the key variables addressed in this study were ethnicity, class, and occupation.

The time dimension is especially relevant to this study: vulnerability can be measured in terms of the damage to future livelihoods, and not just what happens during a hazard event. Vulnerable groups also find it hardest to reconstruct livelihoods following disaster. This in turn makes them more vulnerable to the effects of further disasters. With the combination of the above factors, disaster occurs when a significant number of vulnerable people experience a hazard and suffer severe damage and/or disruption to their livelihood in a way that physical and psychological recovery is unlikely without external aid.

Wisner *et al.* (2004b) developed the Pressure and Release (PAR) and Access Models to have a systematic investigation into a specific societies’ vulnerability to natural hazards. The model states that a disaster is the intersection of three opposing forces – processes that generate vulnerability, the natural hazard event as a dimensionless concept, and time. This is also related to the risk equation (Figure 2.1).

Figure 2.1. The risk equation (Wisner *et al.*, 2004b). This relates to the PAR model as the progression of vulnerability is divided into root causes, dynamic pressures and unsafe conditions on one side of the model, a disaster is expressed as risk = hazard x vulnerability in the middle, and on the other side, the natural hazard (Figure 2.2).

The release aspect is incorporated to conceptualise the reduction of disaster: to relieve the pressure, vulnerability must be reduced. The access component expands analysis of principle factors in the PAR model that relate to vulnerability and exposure to hazards, and focuses on the social, environmental, economic and political processes by which the event impacts upon people and their responses (Wisner *et al.*, 2004a).

A PAR model for St. Vincent was developed by Lowe (2010) using the 1979 and 1902-1903 eruptions, but it was unclear if the 1812 eruption was used in its development (Figure 2.2). Whilst environmental conditions as specified in the discussion about SIDS was not detailed, in terms of dynamic pressures, the diseconomies of scale leading to fewer job opportunities and a lack of a diverse economy, pushes the reliance on agriculture and fertile soil near the volcano, which inevitably results in the occupation of hazardous areas, translate to the results of this study.

Unsafe conditions

Economic
- Unemployment
- Agriculture as a vulnerable livelihood
- Vulnerable agricultural crops such as bananas
- Lack of skilled workforce

Social
- Large dependant population
- Ill health and disabled population
- Poverty
- Vulnerable buildings
- Lack of education
- Lack of access to resources such as transport

Geographic
- Geographical isolation of areas in the north
- People living in hazardous areas – in particular high population centres of Chateaubelair and Georgetown

Dynamic pressures

Economic
- Diseconomies of scale leads to fewer job opportunities and a lack of diverse economy
- World economic markets force prices down for agricultural products
- Reliance on agriculture and fertile soil near volcano leads to occupation of hazardous areas

Political
- Previous volcanic activity used as a political tool
- Past governments focused on response and evacuation rather than preparedness

Social
- Colonial history led to north/south divide with lower development and resources in the north
- Slavery led to limited access to land for certain social groups
- High rates of HIV lead to ill health – effects working population and puts pressure on social services
- Trend of migration removes educated and skilled populating, leaving women, children and dependent population (remittances from abroad)

Root causes

Colonial history
- Slavery
- Emancipation
- Indentured labour
- Land ownership

Carib Wars

Migration

Figure 2.2. The Pressure and Release Model of St. Vincent and the Grenadines adapted from Lowe (2010).

As illustrated, the PAR model links to SIDS (migration in root causes, diseconomies of scale in dynamic pressures and geographical isolation of areas in the north in unsafe conditions) as well as colonialism across the three areas of the PAR model, for the root causes. The root causes, dynamic pressures and unsafe conditions together showcase the current state of volcanic vulnerability on St. Vincent and helps to pinpoint the social issues identified for the eruptions investigated for this study. However, what is not known is the extent to which the PAR components of St. Vincent relate to how effectively or ineffectively the colonial society adapted to living with La Soufrière. This is precisely what this thesis will address.

2.3.3 Resilience

To ecologists, where the origins of the term in disaster literature can be traced, resilience is the ability of an ecosystem to absorb an impact without meaningful change in function (Holling, 1973). By contrast, psychologists place emphasis on individual psycho-social strength (Bonanno *et al.*, 2007), whilst engineering scholars state that resilience is the ability for systems to absorb shocks before needing to be altered in some way (Thomas *et al.*, 2011). Some definitions of disaster resilience integrate these three disciplinary definitions to refer to restoring the impacted society back to its original state before the disaster, whilst other definitions consider the transformation of societal systems to make them more prepared for the next disaster event (Manyena, 2006, 2014). Shocks and disturbances can build resilience provided there is "system memory" (Lambert, 2014). Whilst ecological memory is contained with the composition and functioning of species assemblages (Berkes and Folke, 2002), social memory is the "long-term communal understanding" that captures the experience of past changes, achieved through community debate and decision-making processes that enable appropriate strategies for ongoing change (Berkes *et al*., 2003, pg. 15). Thus, resilience is interlinked with adaptation as social memory accumulates over time as a society experiences hazardous events. It can be framed by pre-existing community connectedness, infrastructure, participation in disaster response and recovery, engagement in official decision making and gaining external support from outside the community (Thornly *et al.*, 2013).

Resilience is here defined following Barclay *et al.* (2015) as the capacity of a society to absorb and recover from the impacts of a hazard in a timely and effective manner. Resilience for an individual or group of people can take multiple forms, such as through social networks and social capital that can be relied upon before, during and after a disaster (Torrence, 2014). For example, following the Christchurch earthquakes in New Zealand of 2010 and 2011, Māori organisations such Māori Wardens helped to undertake rapid assessments of public health and other needs, whilst the Māori Women's Welfare League became a key agency for other Māori health organisations for logistical and supply support from the Canterbury District Health Board (Anderson, 2012; Lambert, 2014).

Adaptation plays a central role in the context of resilience when there is consideration of a society transforming themselves to be "better" through social learning. It implies that adaptation influences resilience and that resilience is due to adaptive measures that anticipate and reduce further harm (Kasperson *et al*. 1995; Folke *et al*., 2002). The ability of a society to adapt to natural hazard risk can be limited in SIDS. Barriers to adaptations in small islands include: inadequate access to financial, technological and human resources, issues related to cultural and social acceptability of measures, constraints imposed by the existing political and legal framework, emphasis on island development as opposed to sustainability, a tendency to focus on addressing short-term climate variability rather than long-term climate change, and community preferences for hard adaptation measures such as seawalls instead of soft measures such as beach nourishment (Sovacool, 2012; Nurse *et al*., 2014). Owing to the high costs of adapting on islands, it has been suggested there will be a need for migration (Biermann and Boas, 2010; Gemenne, 2011; Nicholls *et al*., 2011; Voccia, 2012). Temporary or permanent migration in response to limited local resources may also occur, either to pursue education, employment or healthcare elsewhere (Mortreux and Barnett, 2009; Lazrus, 2012). Remittances from friends and family abroad are an important source of revenue for many island states and contribute to local resilience by diversifying income sources and paying for adaptation measures at home (Mortreux and Barnett, 2009; Connell, 2013; Campbell, 2014). Thus, migration may be part of local-level adaptation, rather than the result of failed adaptation (Betzold, 2015).

One key facet to adaptations in island states is indigenous/traditional knowledge. Modernisation however, has impacted indigenous practices for disaster reduction (Campbell, 2009). For example, positive actions in maintaining food security, inter- and -intra-community cooperation and protecting settlements and their inhabitants influence societal norms such as skills, abilities, knowledge and the willingness to use these tools to reduce disaster impacts (Campbell, 2009; Manyena, 2014). Inter- and -intra community cooperation on the small Indonesian volcanic Archipelago islands of Siau Tagulandang Biaro has allowed for the sharing of food resources, job opportunities and knowledge exchange of adapting to volcanic and meteorological hazards (Rampengan *et al.*, 2014). However, the processes of contact, colonisation, and independence in the context of globalisation have caused many of the facets of resilience that once existed to decline. This is attributed to three processes (Campbell, 2009):

1. The provision of relief food reduced the need to store famine food. For example, in the 1910 cyclone on Mota Lava in Vanuatu, people were able to process sago and there was little need for externally provided food as aid. The next cyclone was in 1939 and food relief was supplied by the New Hebrides government and Anglican Mission. By 1980, only a small number of elderly people knew how to extract the starch from a specific tree (Campbell, 1990).
2. Diminished need to store food and the introduction of the cash economy and imported foods. Colonial governments and missionaries worked to reduce the significance of traditional ceremonies and rituals that were viewed as "wasteful" or un-Christian.
3. As more cash crops were planted, the amount of land set aside for subsistence food production was reduced. Rotation periods dropped, soil fertility decreased and therefore leading to increased dependency on remittances and imports.

The notions of resilience and adaptations discussed provide a backbone to the analysis and interpretation of data in this thesis. Specifically, how the ending of the Second Carib War and resultant exile of Garifuna people (Section 1.6) signalled the point where indigenous knowledge of La Soufrière was silenced. The removal of indigenous knowledge left a gap in resilience measures and adaptation strategies to coexist with the volcano and had to be developed anew as part of the colonial society.

2.4 Impacts of volcanism

2.4.1 Volcanic eruptions as disruptions

Volcanic eruptions are unusual among other natural hazards due to their wide range of hazards and impacts, that occur simultaneously or sequentially over different time and place scales (Wilson *et al.*, 2014). The impacts of a volcanic eruption can be global or local.

Local effects are the direct impact of lavas, lahars, and PDCs. Ash fall can have a regional impact, and volcanic gas and aerosol dispersal can affect global temperatures and climate.

Between 1600 AD and 2010, 5,815 volcanic eruptions are known to have occurred globally. But only 533 out of the 5,815 eruptions have caused a total of 278,880 recorded deaths (Auker *et al.*, 2013). For example, an estimated 24 % of Iceland's population and thousands elsewhere across Europe were killed by contamination of crops, death of livestock, famine and drought brought about due to temporary sulphur dioxide induced climate change during the 1783-1784 eruption of Laki (Witham and Oppenheimer, 2004). PDCs from the 1902 eruption of Mont Pelée killed 28,000-30,000 people in St. Pierre, Martinique (Blong, 1984; De Boer *et al*., 2002) and, the 1985 lahars from Nevado del Ruiz killed approximately 25,000 mainly in Armero, Columbia (Voight, 1990; Mileti *et al.*, 1991).

Impacts are greater for SIDS and other developing countries compared to larger and richer countries. This is due to the high density of vulnerable populations concentrated in high risk zones. For example, the high concentration of people in the town of Rabaul in Papa New Guinea meant that economic activities were severely impacted following the eruption of Rabaul in 1994 (Chester *et al.*, 2001). For some volcanic islands with high density populations, an eruption can severely limit post-disaster recovery through the destruction of a relatively large area of land in comparison to the smallness of the island. For example, the eruption of Niua Fo'ou on Tonga (population of 2,500 people) in 1946 forced the evacuation of the entire island but led to no deaths and only extensive damage (Lewis, 1979). Another example was a fissure eruption on the archipelago island of Heimaey in Iceland (population of 5,300 people) in 1973, led to the entire population being evacuated to the Icelandic mainland within six hours of the eruption beginning approximately 1,090 yards from the town centre of Vestmannaeyjar (Williams Jr. and Moore, 1976).

Viewing volcanic eruptions as disruptions and how eruptions can lead to greater impacts on SIDS, provided the backbone of understanding, analysis, and interpretation for this study, particularly for chapter 5.

2.4.2 Societies coexisting with volcanism

For better or for worse, societies affect the environment around them (Cooper and Sheets, 2012). There is a large body of literature which has researched the cause and effect of societies affecting the environment (e.g. Popper, 1972; Latour, 1993; Zierhofer, 2002), whilst another body of research view human and environmental systems as inseparable and interlinked by diverse processes (e.g. Fischer-Kowalski and Weisz, 1999; Wardenga and Weichhart, 2006).

Decisions regarding the location of social development have reflected the association between natural processes and resources, such as fertile soils, natural harbours, wood and water supplies, that facilitate the creation of societies (Paton, 2017). The activities societies do to gain benefits from their environment contribute to their ever-growing risk (Paton, 2017). Therefore, linking coexistence and resilience is fundamental. The linkage between coexistence and resilience views risk as a process of accounting for the gains and losses that arises from natural hazard impacts (Dake, 1992), whereby resilience provides more gains (from environmental situations and characteristics) than losses (when environmental processes turn hazardous). If the potential gains and losses can be anticipated, societies can take actions to minimise loses and optimise gains, thus, a "coexistence framework" provides opportunities to reconcile the benefits of sustainable societal development with hazard management activities (Tobin, 1999; Paton, 2000).

Volcanoes and humans are understood as a dichotomous system (Bachri *et al.*, 2015) whereby the volcano and its hazards influence societal behaviour. Research to date has tended to focus on investigating the negative and threatening impacts of a volcano on society and how people live and cope with this situation holistically according to Bachri *et al.* (2015). With this perspective, the human-volcano system must be viewed as both driving forces and being driven by one another at the same time. For example, Mt. Bromo in Java (which has erupted 29 times between 1804 and 2012) has communities living around it that have evolved a unique culture that is inspired by the volcano as a central symbol and deity (Bachri *et al.*, 2015). Approximately 600,000 Tenggerese (named after the Tengger Caldera) live around it and even severe eruptions like in 2010 have not deterred people from returning and continuing to live with considerable volcanic risk. The Tenggerese have a strong faith in the benevolence of the volcano and interpret its eruptions as a gift from God, in return for which there must be a positive attitude toward the volcano. This has led to an intricate local knowledge of the environment that facilitates the interpretation of an early warning system of an imminent eruption. For the Tenggerese, land, water and forest of the mountain are the very source of their life, and thus the behaviour of Bromo is intricately linked to their life (Bachri *et al.*, 2015).

In terms of the notion of “coexisting” with volcanoes, the “Sustainable Livelihood Approach” first introduced by Chambers and Conway (1992) and recently applied by Mercer and Kelman (2010) is perhaps the most applicable concept when researching the relationships between humans and volcanoes. The approach encompasses the capabilities, assets and activities required for a sustainable means of living. The livelihood must cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation by contributing net benefits to other livelihoods at the local and global level in the short and long-term. The approach can be applied in four ways (Mercer and Kelman, 2010):

1. Understanding, communicating, and managing vulnerability and risk and local perceptions of vulnerability and risk beyond immediate threats to life.
2. Maximising the benefits to communities of their volcanic environment, especially during quiescent periods, without increasing vulnerability.
3. Managing crises.
4. Managing reconstruction and resettlement after a crisis.

Mercer and Kelman (2010) applied the Sustainable Livelihood Approach to Manam Island Volcano in Papua New Guinea. Villagers on the island recalled the volcano erupting in 1937, 1957, 1992, 1996, and 2004-2006. During these years, villagers had strategies in place to reduce the volcanic risk to themselves and their livelihoods often drawing on extensive indigenous knowledge. The knowledge included building methods that were easily accessible, replaceable, simple to build and dismantle and having long sloping roofs to eliminate the potential for collapse under the heavy weight of ash. They also had social links, land-use planning, food strategies, and an in-depth knowledge of their environment and volcano. However, this was threatened in 2004. The villagers were forced by the Papua New Guinean government into an unfamiliar environment on the mainland of Papua New Guinea without adequate planning or forethought. The locals remembered the evacuation as a forceful process without any community consultation. While the evacuation led to no deaths, it resulted in the loss of livelihoods and there was no plan in place by the community or the authorities to reconstruct and resettle after the event. This meant that the in-depth knowledge of the environment was not suited to where the villagers were evacuated to, which reduced their adaptations to Manam.

History has shown that humans have persisted in living with active volcanism, despite repeated catastrophes caused by eruptions (Cashman and Giordano, 2008). This suggests that past societies had no choice but to live with volcanoes, developing long-term physical and psychosocial resilience, to establish permanent settlements near natural resources that would aid in development. In modern societies adaptations to volcanoes have led to a range of coping practices. Historically it has been engineering solutions (e.g. sabo dams in Japan and lava flow barriers for Mt. Etna in Italy) (Cashman and Cronin, 2008). More modern forms of coping practices are monitoring systems (Fearnley *et al.*, 2018), evacuation plans (e.g. Leone *et al.*, 2019) and land-use restrictions (e.g. Jiménez *et al.*, 2019). These are all physical manifestations of coping, mostly readily available for richer countries but nonetheless still prone to critical failure because of technological and/or human error.

In conducting the literature review, the following research gaps have been identified. The literature until now, has not fully explored the relationships between coexistence with natural hazards on small island developing states. Plus, the role of dynamic risk, vulnerability and resilience, and the influence of historical and social contexts in directing the course of adaptation has not been thoroughly investigated. This study will address this by focusing on how the society of St. Vincent has come to coexist with La Soufrière volcano. This thesis will investigate how social issues, particularly surrounding colonialism, are key determinants in shaping how a society adapts to and coexists with an active volcano. In doing so, it will also open the discussion about exploring these issues in relation to other natural hazards.

2.5 St. Vincent in context

2.5.1 SIDS

St. Vincent, with a population of 109,803 including the Grenadine islands,[2] is a small island developing state. A few regional issues affect St. Vincent's development, common to several Caribbean islands. Neoliberalism and the attendant liberalisation of the global political economy has led to a dramatic narrowing of development space. For the Lesser Antilles, this

[2] Statistical Office (2019) Population estimate of St. Vincent and the Grenadines for 2017. Kingstown: Ministry of Finance, Economic Planning, Sustainable Development and Information Technology [online] http://stats.gov.vc/stats/

has manifested itself in the decimation of export agriculture and pushed them towards adopting tourism as the centrepiece of their development strategies (Bishop, 2010).

St. Vincent and the Grenadines' economy is still considered "underdeveloped" and is vulnerable due to the smallness of its economy and heavy dependence on agriculture.[3] Up until 2007, St. Vincent's exports of banana were sold to the EU under preferential arrangements and in turn saw positive gross domestic product (GDP) growth with 3.5 % in 2007.[4] Since the arrangement ended, banana producers faced tougher competition and economic growth decreased from 2008-2010 (1.4 % to 3.4 % of GDP). In response, the government has been encouraging diversification into other sectors, namely tourism, manufacturing and the private sector.[5] Economic growth for the island today, as with in the past, fluctuates with agricultural output, demand and prices on the world markets. With new investment in tourism infrastructure by the mid-2000s, economic growth was averaging at 5.6 % from 2004-2008 but, the world economic downturn of 2008-2009 also contributed to the slowing down of the growth until 2011.[6]

As SIDS criteria in determining who is 'vulnerable' is mainly based on economic factors, other factors and even factors that could counteract vulnerability and improve resilience is lacking. So, while St. Vincent and the Grenadines is classified as a SIDS mainly based on its economy, it serves as an injustice that the historical reasoning behind current circumstances is not fully explored.

In this regard, little research has solely focused on St. Vincent within its SIDS context. Research has focused on SIDS economic vulnerability and development with St. Vincent being part of a wider dataset (e.g. Encontre, 1999; Ghina, 2003; Kelman and West, 2009; Blancard and Hoarau, 2013). For example, as an alternative assessment for the conventional economic criteria of per capita income and GDP by country developed by Turvey (2007). Turvey determined that St. Vincent has a medium geographic vulnerability. This means that St. Vincent has a medium susceptibility to physical and human pressures, risks and hazards in temporal and spatial contexts. These kinds of assessments are best to utilise existing

[3] Commonwealth Secretariat (2019) St Vincent and The Grenadines: Economy. The Commonwealth [online] https://thecommonwealth.org/our-member-countries/st-vincent-and-grenadines/economy [accessed 11/11/2019]

[4] See footnote 3.

[5] See footnote 3.

[6] See footnote 3.

government coordinated disaster impact assessments to generate a detailed understanding of natural hazards impacts, with emphasis on the need to integrate natural hazards research within a sustainable development context (Méheux *et al*., 2007).

The SIDS characteristics that St. Vincent has are: 1) small size that limits natural resource endowments, small domestic market, high import content and dependence on export markets. 2) Proneness to disasters as a result the smallness exacerbating the damage per unit of area and costs per capita. Lastly, 3) environmental factors related to development pressures, fragile ecosystems, and high-net emigration. This means that St. Vincent is particularly vulnerable to the many natural hazards it faces.

2.5.2 Natural hazards

St. Vincent faces a multitude of natural hazards, including: wildfires, drought, high winds, tropical storms/hurricanes, storm surge, landslides, earthquakes, volcano-originating tsunamis from submarine volcano Kick em' Jenny as well as eruptions from La Soufrière (Central Planning Division, 2014). From 1970-1999, nine disasters impacted the island, at a rate of 0.3 per year with five total fatalities per 1000 people and at an approximate rate of 47 % GDP loss (Charvériat, 2000).

St. Vincent's population is disproportionately at risk from natural hazards. Many people (78.5 %) are susceptible to landslides, and 5 % are susceptible to a 100-year storm surge (Boruff and Cutter, 2007). However topography, annual precipitation, population density and the El Niño Southern Oscillation are emerging to be key controls in susceptibility to some hazards (Sepúlveda and Petley, 2015). The most frequent natural hazards experienced on the island are storms and floods, with nine of these events combined generated a total approximate cost in damages of US$ 18.6 million. This is compared to the 1902-1903 eruption of La Soufrière alone causing approximately 1,300 deaths (See Section 4.3), whilst the five most deadly storms and floods caused a total of 143 deaths (CRED, 2004). Therefore, despite storms being more common, in terms of deaths they are less damaging: volcanic eruptions are less frequent but are more catastrophic. However, the higher frequency of storms means that there is a high perception of knowledge about its risks (Armijos and Few, 2016). This is a crucial point and one that will be investigated more fully elsewhere. St. Vincent is a dynamic environment and these numbers are likely to change as both the population and hazards evolve.

2.5.3 Risk, vulnerability, and resilience

The volcanic risk assessment for La Soufrière stated that areas neglected in the past (notably in the north) are now being developed due to socioeconomic pressures on the government to enhance the quality of life throughout the island (Robertson, 1995). People and settlements exposed to the risks of La Soufrière have benefited from improved services and substantial investments in infrastructure in recent years supported by government efforts to decentralise growth away from the crowded capital and to reverse years of stagnation in the rural economy in the north (Wilkinson *et al.*, 2016). Therefore, the number of properties and people put at risk by La Soufrière has increased as the exposure to the volcano and other hazards has not been thoroughly addressed. For the "high-risk" volcanic zone (closest to the volcanic crater), many households have underlying livelihood difficulties (e.g. securing livelihoods, difficulties accessing markets, and theft) which make them prone to impacts from multiple hazards (Armijos and Few, 2016).

In addition, factors related to a small island developing state have made it difficult to reduce risk. Low development and employment opportunities, negative population growth and out migration to look for better opportunities were found to hinder risk reduction on St. Vincent. However, positive factors include an active community disaster response team, the Red Cross, and a farmer's cooperative (Ferdinand *et al.*, 2012). The positive factors can be viewed as a type of resilience, by counteracting the barriers of low development, low employment opportunities, negative population growth, and migration.

The physical vulnerabilities of settlements and geography are combined with socioeconomic factors that include access to resources, impacts from other disasters, education attainment and employment status, in addition to poor access to markets limiting income security, which in turn undermines resilience (Armijos and Few, 2016). The presence of La Soufrière and its hazards are critical factors in shaping development of St. Vincent by constraining options for physical development, the extension of economic growth and sustainability due to limited land-use options. The volcano and steep landslide prone slopes combined with limited coastal areas at risk from storm surge and flooding, severely restricted locations suitable for safe or low-risk development (Wilkinson *et al.*, 2016).

The effects of a disaster and the (in)ability of the household to recover from them reveals that household vulnerability in the high-risk volcanic zone is high (Kaira Consultants Ltd., 2008). Looking in more detail, in 2008, 30.2 % of the population were deemed poor and 2.9 % deemed indigent, in addition to 18 % are at risk of falling into poverty in the face of an economic or disaster shock, resulting in 48.2 % of the population being under the vulnerability line (Kaira Consultants Ltd., 2008). The vulnerability line is defined as the difference between a poor population and a population that is not poor but faces the risk of falling into poverty (Dang and Lanjouw, 2017). This would relate to the Pressure and Release Model for St. Vincent under social and economic dynamic pressures and unsafe conditions (Figure 2.2).

Prior to this study, the 1812 eruption of La Soufrière has been researched only within an economic history context by Smith (2011). The impact analysis on the economy of the eruption and the vulnerability of the enslaved African population through *gedanken. Gedanken* in this instance, involved the construction of a counterfactual society consisting of free peasant independent cultivators. Whilst the thought experiment proved inconclusive, Smith's findings found that output losses from sugar plantations were approximately 14 % of the island's GDP and infrastructure damage was at 7 % of physical capital invested in the sugar estates (Smith, 2011).

Resilience is relatively constrained for most of St. Vincent, and recovery processes are based on the continuation of daily routines, accessing assistance from the state, and using savings or relying on family and friends (Armijos and Few, 2016). In relation to climate change, climate variability perception and response in Sandy Bay, Owia and Fancy - the three most northern and closest settlements to La Soufrière - perceptions are based on a mixture of religion, misinformation, experience, and knowledge, which can be applied to different hazard contexts. However, it was found that decisions made at household and social group levels in response to climatic stress were mainly reactive, which is also evident for other hazards across the island (Smith, 2018). These perceptions may influence reactive or proactive forms of adaptation and therefore, coexistence.

2.5.4 Coexistence

There are things we do and do not know about how St. Vincent society has, over time, come to coexist with natural hazards. For St. Vincent, living with meteorological and climate-related hazards, namely tropical storms/hurricanes and their associated hazards, the hazard awareness, preparedness, response, and mitigation is very much ingrained within the society (Scarlett, 2014; Armijos and Few, 2016; Wilkinson *et al.*, 2016), albeit larger events such as Hurricane Tomas in 2010, can still catch the society “off guard”.

This study seeks to address this gap in knowledge by looking at how the Vincentian society has come to coexist with La Soufrière. The study will inform how various societies, within their complex historical and social contexts, connect to risk, vulnerability, and resilience.

2.6 Conclusion

SIDS have sustainable development constraints which can exacerbate disaster impacts. St. Vincent shares with other SIDS the characteristics of smallness, proneness to disasters, and environmental factors that affect development. The island’s volcanic risk is historically rooted, and social factors such as poverty, governance, and land-use planning influence St. Vincent’s risk to La Soufrière. This is coupled with the physical vulnerabilities of settlements and geography impacting socioeconomic factors that influence the degree to which someone’s life is put at risk. Resilience on the other hand are strategies to minimise risk, such as utilising social networks and interlinks adaptation, as social memory accumulates over time as the society experiences hazards. Resilience in relation to St. Vincent and La Soufrière is constrained and is based on the continuation of daily routines, accessing assistance from the state, and the reliance on family and friends. Research gaps identified are the relationships between coexistence with natural hazards on small island developing states, the role of dynamic risk, vulnerability and resilience, and the influence of historical and social contexts in directing the course of adaptation. This study will address this by focusing on how the colonial society of St. Vincent has come to coexist with La Soufrière volcano.

Chapter 3 – Methodology

3.1 Introduction

Mixed method approaches are increasingly being applied in order to address questions and problems related to the interaction of people and natural hazards. There is a need to combine social and physical science methodologies in order to further understand the complex issues identified in the previous chapter. The following chapter will detail the theoretical background of using a mixed methods Approach, the data sources used and how they were collected and analysed, and their limitations. It will also address the additional methodological issues of using partial records, dealing with "silenced voices", and "decolonising science".

3.2 Theoretical background

The method used in this study follows the mixed methods approach, which is underpinned by the pragmatism paradigm. To avoid the use of metaphysical concepts such as truth and reality, pragmatism can be used to circumvent truth and reality by accepting that there are multiple realities open to empirical inquiry toward solving practical problems (Dewey, 1925; Howe, 1988; Rorty, 1991; Tashakkori and Teddlie, 1998; Creswell and Plano Clark, 2007). The pragmatism approach provides freedom from forced dichotomy between post-positivism and constructivism, allowing for more mental and practical freedom to conduct research that is not confined by a singular research method or technique (Robson, 1993; Creswell and Plano Clark, 2007).

Pragmatism therefore supports the use of both qualitative and quantitative research methods in the same research study (Table 3.1) by providing a problem-focused approach to research (Cherryholmes, 1992) and allowing the research question to have greater importance than the method used (Tashakkori and Teddlie, 1998).

Table 3.1. Qualitative, quantitative and pragmatic approaches to research. Adapted from Morgan (2007).

	Qualitative approach	**Quantitative approach**	**Pragmatic approach**
Connection of theory and data	Induction	Deduction	Abduction
Relationship to research process	Subjectivity	Objectivity	Intersubjectivity
Inference data	Context	Generality	Transferability

Abduction combines induction and deduction through observations that are first converted into theories, and then assessed through action, which can be used to evaluate results from prior inductions through their ability to predict future lines of behaviour (Crosweller, 2009). Intersubjectivity or interdisciplinarity, places the emphasis on the processes of communication and shared meaning, and the pragmatic response to issues of having no common stands of measurement and therefore, harder to integrate (Crosweller, 2009). Transferability allows what has been learned with one type of method in one specific setting and makes the most appropriate use of that knowledge in other circumstances (Lincoln and Guba, 1985).

Contemporary mixed methods research combines qualitative and quantitative research approaches such as viewpoints, data collection, analysis, and inference techniques. These are combined for broadening the corroboration and understanding of the research (Johnson *et al*., 2007). This leads to the creation of complementary and robust results that are quantifiable and comprehensible from different perspectives (Rohrmann, 1998; Bird *et al*., 2009).

3.2.1 Mixed method approaches applied to volcanology

In volcanology, mixed methods research is increasingly being applied to investigate the relationships between volcanoes, their hazards, and societies. This is generally known as "Applied Volcanology". It is interdisciplinary by design and increasingly uses mixed method approaches (e.g. Bird *et al*., 2009; Lowe, 2010; Usamah and Haynes, 2012) in creative ways with other disciplines. For example, two key areas in Applied Volcanology research that use mixed methods are volcanic risk perceptions (e.g. Davis *et al*., 2006; Bird *et al*., 2009; Ricci *et al*., 2013; Scarlett, 2014) and volcanic vulnerability and risk assessments (e.g. Haynes *et al*., 2008; Crosweller, 2009; Lowe, 2010; Jenkins *et al.*, 2013).

A common path to interlink disciplines into volcanology are forensic investigations into the disaster management process following a volcanic crisis, which highlight the benefits of including the social issues and actions that can lead to a disaster and therefore, the role of institutions in the impacts of volcanism. For example, the Strengthening Resilience in Volcanic Areas (STREVA) project took the forensic approach for several volcanoes around the world, including Soufrière Hills Volcano on Montserrat (Hicks and Few, 2015).[7] Columbia's Nevado del Ruiz volcano, which erupted in 1985, was reconstructed in chronological order by Voight (1990). The reconstruction detailed the volcano's activity leading up to the eruption and actions taken by organisations and individuals. Similarly, Voight *et al.* (2000) highlighted the importance of the reconstruction of a volcano's history to establish a chronology of events, detailing recurrence frequencies and changes in eruptive style, and searching for evidence of cyclicality to create volcanic hazard evaluations.

Recently, the development of "Social Volcanology" encompasses social science approaches to understanding how volcanism impacts societies by focusing on culture (e.g. Grattan and Torrence, 2007; Donovan, 2010; Bachri *et al.*, 2015). One approach to social volcanology is linking volcanology, archaeology, and anthropology in order to study prehistoric and historic volcanic eruptions, with the goal of evaluating the impact of past eruptions on human populations to better prepare for future events. Cashman and Giordano (2008) provided a good overview of how each discipline can be integrated. According to the study, volcanology studies aid archaeological investigations by providing stratigraphic markers and information about the nature and timing of specific volcanic events. Archaeology on the other hand, provides physical evidence of the direct impacts of volcanic eruptions, such as site abandonment and human migration as well as indirect impacts on local cultures as reflected in human artefacts. Meanwhile, anthropological studies of societal responses to past and recent volcanic eruptions pay attention to psychological impacts and records of the impacts within oral traditions.

In terms of historical methodological approaches, multiple datasets have been used to reconstruct eruptive events and their impacts. For example, an investigation into the impacts of the 1783 Laki Fissure eruption on Western Europe's weather used various observational archival documents to investigate how people outside of Iceland perceived and responded to and made sense of the environmental phenomena (Grattan and Brayshay, 1995). Similarly, archival documents, meteorological data, and interviews were used to develop a descriptive chronology of the 1944 eruption of Vesuvius's impacts on the local

[7] See the STREVA for more information about the project and the volcanoes used as "forensic" volcanoes: https://streva.ac.uk/

population and the role of the military in responding to it by Chester *et al.* (2007). On the other hand, Chester *et al.* (2015) focused on a descriptive chronology of responses from the household to international level and short to long-term recovery to Vesuvius's 1906 eruption within its cultural and political contexts. Alternatively, natural proxy sources such as tree ring data were used in tandem with archival material such as tithe records and land registers to investigate the distal impacts of Huaynaputina volcano's 1600 eruption in Peru on Finland's agriculture (Huhtamaa and Helama, 2017).

Smith (2011) conducted an impact analysis on the economy of La Soufrière's 1812 eruption from an economic history perspective. The paper did use similar archive data sources to this study, but these were interpreted differently. A hazard vulnerability assessment was made using the disaster vulnerability index and vulnerability of the enslaved population was conducted via *gedanken*. Hazard-of-place was assessed by comparing settlements patterns with the 2005 volcanic hazard map. The hazard map is based on the 1902 and 1979 eruptions, not 1812. Hazard impacts may have been similar, but they occurred in different, socioeconomic, political and cultural contexts that make the impacts slightly different.

This thesis draws on pragmatism by focusing the research topic on a problem-focused approach. The question can be posed - has the society of St. Vincent come to coexist with the volcanic eruptions of La Soufrière? The mixed methods approach for this study focused on data collection from six different archives as well as data located on the internet. These were combined into multiple datasets to gain various experiences of the eruptive events across different social groups. Furthermore, the analysis and inference of the combined datasets used the combination of qualitative and quantitative techniques. Using the mixed methods approach is appropriate for this study as the large collection of multiple qualitative and quantitative datasets encompassing three eruptions over a 167-year period were combined to capture the multiple experiences generated by each volcanic eruption. In some cases, reduced data availability initially restricted analysis and interpretation and therefore, the reliance on the mixed methods approach was vital in combining the datasets available to develop the eruption impact maps (Section 3.3).

3.3 Source materials

It is recognised that historical research can only ever approach the past through highly selective accounts of it (Wischart, 1997). Not only do surviving sources describe just a fraction of what took place, but such accounts also inevitably reflect the attitudes and opinions of those who constructed them (Section 3.4). Using multiple and highly fragmentary sources to reconstruct life worlds and answer big questions referring to specific places, use various media and document types. For example, by using cultural productions such as paintings, maps and literary accounts, they are social constructed forms of knowledge which, in their conscious or unconscious manipulation of knowledge, have helped to shape the features they portray (Harley, 1988; McDonagh, 2007).

Archive data was collected and transcribed or digitised as appropriate. Newspaper articles were coded in SPSS for further analysis. The main source of correspondence between the British and colonial governments was kept at The National Archives as part of the Colonial Office. A full list of archival data used can be found in Appendix A-D.

3.3.1 Historical maps

Several historical maps were available at The National Archives in London and six maps relevant to 1812 and 1902-1903 and one map series for the whole island relevant to 1979 were obtained from the British Library, also in London. These maps were mainly for surveying purposes and used by the (post)colonial government in relation to land-use planning. The maps were digitised for this study and used for general background reading into the history of the island, inputted into the chronological narrative of the three eruptions, and to understand the location of settlements and land-use for the eruption impact maps presented in Chapters 4 and 5.

3.3.2 Letters and reports

Held at The National Archives, a total of 61 letters and reports were located and consulted. Much of the correspondence was from the Governors Sir Charles Brisbane (for 1812) and Sir Robert Llewellyn (for 1902-1903) and the Administrators of the Windward Islands, Joseph Chamberlain and Edward Cameron (1902-1903) to the British Colonial Office. Reports of volcanic activity, physical and financial impacts, and other forms of information such as the status of displaced persons and requests to migrate to other British West Indie islands were detailed within these letters and reports. These sources provided data which was used for the chronological narratives and eruption impact maps and provided detail for the agricultural sector damage and social behaviour interpretations. Most documents were written at the authority/colonial government level, therefore only a selective number of individual's attitudes and opinions were present in the narrative of the volcanic eruptions.

In addition, The National Document and Archive Service of St. Vincent and the Grenadines, located in Kingstown, had several documents available for this study. There was one severely damaged letter written by Sir Charles Brisbane (unfortunately the letter's recipient was not specified) writing in 1813 about disaster relief related to the 1812 eruption. There was also a letter related to an engineer investigating the Wallibou River following the 1812 eruption, as well as a letter requesting financial assistance and addressed to the House of Commons and King George IV from a collective of merchants whose business was impacted by the 1812 eruption. Sources for 1902-1903 were correspondence relating to the volcanic eruption, colonial reports for 1898, 1899, 1902 to 1909 which detailed economic performance, Executive Council Minutes discussing matters related to the management of the volcanic crisis and several letters related to handling compensation paid to large landowners. The sources provided a limited perspective on who and what was impacted in 1812 and 1902-1903, but nonetheless supplemented information within the detailed chronological narrative. Lastly, several reports by various British colonial individuals located in St. Vincent and other British West Indie islands to the Royal Society regarding the 1902-1903 eruption were available to provide additional detail to the chronological narrative by collecting documents from John Flett's collection at the Royal Geographical Society (with IBG).

3.3.3 Newspaper articles

The British Newspaper Archive was used, this is an online database of newspapers originating across the UK dating back to the 1700s. As St. Vincent was a colony of Britain and many individuals across the UK were present in the British West Indies, it was of great interest to the population 'back home' to know important events occurring. 25 articles for 1812 and 43 articles for 1902 were collected. The articles were coded within SPSS software to identify information on location, time and/or date, the author, description and type of volcanic hazard phenomena, and other sources of information such as financial consequences or disaster relief. This information helped develop the eruption impact maps and provide data on the impacts on the agricultural sector and societal behaviours relevant to the two eruptions. Using these sources, there had to be an acknowledgement that many articles sensationalised the descriptions of volcanic activity, scenes of damage, and impacts on the society as this was the nature of reporting, typical of the style of writing at the time. Lastly, 12 articles regarding the 1902 eruption from the online New York Times newspaper archive were collected, transcribed, coded, and used similarly to other newspaper articles (see Section 3.5 in regarding reducing bias).

In addition, The National Document and Archive Service of St. Vincent and the Grenadines had 101 newspaper articles written in either St. Vincent or Barbados regarding the 1979 eruption. Whilst reporting was more factual and investigative for this period compared to 1812 and 1902, inherent bias was to be expected. This was more apparent for those reporting in Barbados articles, as the main issue was how the eruption was affecting them and not their Vincentian neighbours.

3.3.4 Photographs

At the Yorkshire Museum in York, the collection of local volcanologist Dr. Tempest Anderson survives. He – along with geologist Dr. John Flett - was tasked by the Royal Society to investigate the 1902 eruptions of Mont Pelée on Martinique and of La Soufrière. The collection is a rich library of photographic plates and negatives taken by either Tempest or by Dr. Edmund Hovey (Assistant Curator of the American Museum of Natural History), in 1902, 1903, 1905, and 1917 on several trips to sites across the two islands. The photographs were used for their research and in Tempest's public lectures on volcanism. The author assisted Yorkshire Museum curators to digitise 84 photographs in high resolution and these were made available to access through an online Cloud service (Google Drive) as part of the preservation project at the Yorkshire Museum. The photographs used within this study were scenes identifying settlement and landscape impacts of volcanic hazards, as well as general scenes of living conditions of people displaced by the eruption. These were analysed to provide visual aids for describing and locating volcanic hazard phenomena for the eruption impact maps. There was inherent bias in what was photographed, in terms of what was deemed interesting enough to photograph. Therefore, some areas and settlements impacted would not have been recorded which may have provided a broader perspective of the damage caused (see Section 3.5 regarding reducing bias).

In addition, 24 copies of photographs were donated for use from local St. Vincent geologist Mr Lance Peters showing various locations impacted by the 1979 eruption and conditions of the crater during and after the 1971-1972 effusive eruption event. These were used to understand the impacts of the eruption on the landscape and for the eruption impact map.

3.3.5 Agricultural production records

The recording of all the plantations at the micro-level in St. Vincent and the Grenadines for the years 1801 to 1824 was obtained from the British Library. The names, owners, acreage, number of enslaved persons, sugar, molasses and rum production were recorded and used in this study to identify the impacts on the sugar cane industry of the 1812 eruption in terms of production. The high detail provided from the document was beneficial for gaining a more in-depth analysis of impacts on the crop production. The limitation of this dataset was in the statistical analysis, due to the patchiness of the information such as the fact that some estates (particularly of those nearer to La Soufrière) did not start production until after 1801, or did not cultivate sugar cane, or that a small number solely grew coffee and cocoa, which was not comparable due to the small quantity produced.

Furthermore, crop production records in terms of value were available for 1978-1981 from The National Document and Archive Service of St. Vincent and the Grenadines and were used mainly in the analysis of the impacts of the 1979 eruption on the agricultural sector. Information was generalised for the whole island and not specific in the location of any damages and methods to recover losses.

3.3.6 Field notebooks

While the field notebooks of Tempest Anderson have been lost, the collection of Edmund Hovey at the American Museum of Natural History, in New York City, is available as an alternative source of information. The collection consists of photographs (like Tempest's collection), field notebooks and artefacts brought back from St. Pierre in Martinique, and a small collection of volcanic rocks and ash from St. Vincent.

A total of three notebooks were digitised and transcribed, providing further detail on the landscape, settlement and social impacts of the 1902-1903 eruption for the chronological narrative and eruption impact maps. The notebooks were hugely beneficial in gaining first-hand accounts from a geologist's perspective. Edmund's collection of eyewitness accounts, however, was biased by mainly speaking to white men about their observations and experiences, and by the timing of his visits after the initial May 7th explosion. Thus, it only provides limited perspectives of how people experienced the eruption.

3.3.7 Semi-structured interviews

Fifteen people which self-identified as seven of women and six were men, were interviewed about their individual and household experiences of the 1979 eruption. These were conducted across the island, but interviewees were not necessarily at these locations at the time of the eruption (Figure 3.1). Most were recruited through the "Volcano Awareness Week" (11^{th}-22^{nd} April 2016), an annual outreach project in collaboration with the National Emergency Management Organisation (NEMO), St. Vincent and the Grenadine's Red Cross and the Seismic Research Centre of the University of the West Indies to communities and schools teaching about volcanoes and La Soufrière. Initial contacts were obtained from people who are engaged in volunteering about raising awareness and sharing their experiences of the 1979 eruption. However, five people were through the "snowball effect" whereby initial contacts directed me to neighbours who were also willing to share their experiences. The first portion of the interview questions were kept general, asking what people could remember about the eruption and what they did. The second half of the interviews then asked more in-depth questions in order to extract further detail about their individual and household response and recovery. The semi-structured interviews, in full verbatim, can be found in Appendix E.

The limitations of conducting interviews were the fragmented locations and availability of interviewees, the reliance on memory, distractions to the interviewee in terms of unannounced visitors, and that the interviews only provide detail of individual and household level behaviours in reaction to the eruption but do not provide a generalisation of behaviours for the whole society. Furthermore, the acknowledgement of the 'Interviewer Effect', which is the distortion of response to an interview which results from differential reactions to the social style and personality of the interviewer, or their presentation of particular questions. It is also related to the researcher also being the interviewer, which affects any data gathered from interviewing people that is caused by the behaviour or characteristics (real or perceived) of the interviewer (Jäckle *et al.*, 2011). However, the benefit of these interviews is gaining an understanding in how each person experienced the same event depending on their circumstances and location to the volcano.

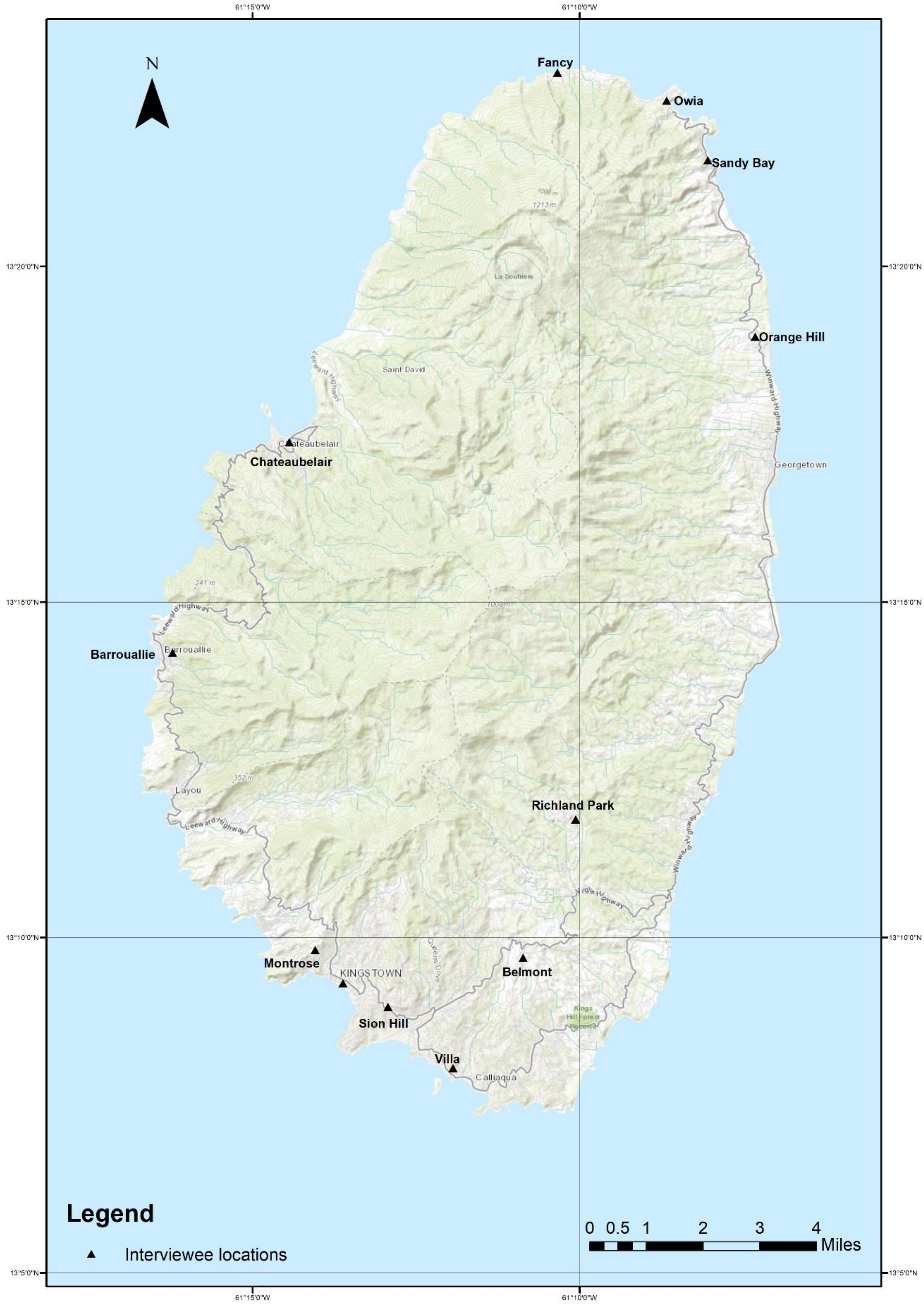

Figure 3.1. Map of St. Vincent with the locations of the 15 interviewees remembering their experiences of the 1979 eruption of La Soufrière. Three out of the 15 were in Chateaubelair at the time, two were in Sandy Bay, two experienced the event in Fancy and one was in Richland Park.

3.3.8 Other sources

Additional minor sources of data were obtained for this study. Two academic texts and an almanac for 1911 that recalled the impact of the 1902-1903 eruption were viewed in the British Library. Two additional sources of information were available from The National Document and Archive Service of St. Vincent and the Grenadines. A few press releases by Premier Milton Cato addressed to the nation throughout the 1979 eruption contained information such as communication by volcanologists in charge of observing the volcano and with officials in Trinidad and Tobago and Barbados who were the immediate responders in disaster relief assistance. Secondly, there were daily, weekly, and monthly reports from volcanologists at the Belmont Volcano Observatory regarding the 1979 eruption. These reports provided scientific information of observed activity that in some instances was not written in other documents, or how this information was communicated to Premier Milton Cato and his government.

Lastly, The Virginia Historical Society, located in Richmond, Virginia, USA had a collection of diaries belonging to the Keane family, who were present in St. Vincent from approximately the 1780s. Hugh Keane specifically, was a barrister who kept several diaries and was present on the island for the 1812 eruption. One diary, covering 1812 to 1813, was digitised and transcribed, and his observations used to inform the chronological narrative of the volcanic activity. The limitation for using the diary was the illegibility of the handwriting and the absence of entries for several days. This affected how much detail the diary provided to the chronological narrative.

3.3.9 Interpretation of terms in contemporary descriptions

The term "lahars" is used to describe a process of slurry mixtures of rock debris and water, with material mainly of volcaniclastic origin (Gary, McAfee and Wolf, 1974; Lavigne and Thouret, 2003), that can occur before, during, and after a volcanic eruption. The term "pyroclastic density currents" refers to superheated mixtures of gases and volcanic material from fine ash to boulders and other debris, travelling at high velocities down the flanks of volcanoes, and this term is used following (Druitt, 1998; Branney and Kokelaar, 2002) in place of the terms 'pyroclastic flow' and 'surge' to recognise the broad spectrum of flow phenomena that are possible.

The descriptive language used when observing the volcanic hazards slightly differed between eruptions. In the 1800s, the discipline of volcanology was not yet established, therefore scientific terminology describing “lahars” and “pyroclastic density currents” were not used. Lahars were mainly referred to as “mud lava” or “mudflows” within the archive material. Confusingly, the processes of PDCs in the archive are described as “lava.” From all geological studies on La Soufrière, it has been concluded that lava flows have not breached the crater rim since the late Pleistocene (Robertson, 2005), whilst PDCs are more common for this volcano. Thus, it is here that when people refer to “lava” they are referring to what we now call PDCs. “Ash fall” was generally known to be “ash” and sometimes called “sand,” “dust,” “stones”, or “cinders” to describe the size, texture, or temperature of the particles that fell. “Earthquakes” were referred to as such, and sometimes also “vibrations” or “concussion of the earth”.

In 1902, the eruption of Mont Pelée on Martinique (located north of St. Vincent and St. Lucia), erupted a few days apart from La Soufrière and was the first scientific documentation of *nuée ardente* – a French term meaning “burning cloud”. The term was coined by volcanologist Dr. Alfred Lacroix to describe the pyroclastic density currents that destroyed the town of St. Pierre (Lacroix, 1908). At the time of the event however, the lay-public continued to refer to PDCs as “lava,” “red hot lava/matter,” or “clouds of black smoke/huge rolling black cloud.” Lahar descriptions remained like those described in 1812, as “streams of mud/hot water” or “boiling mud/water”. Ash fall descriptions remained the same, using grain size, texture and colour (fine dust to stones), to describe the deposits. However, there are larger particles described such as “…large as one’s head” (Hovey, 1902), which are here classified as volcanic ballistics or bombs. Lastly, earthquake terms had remained the same as 1812, but were also referred to as “shocks” or “rumblings”.

Lastly, terminology remained constant from 1902 to 1979. Ash was described based on grain size, colour, and smell, such as “sulphurous talc” and “sand”. On the other hand, descriptions of the ash plume were based on its appearance. Interviewees described the rising ash plume as a “cauliflower”, emphasising the patterns it was creating, and not the processes behind the phenomena. Earthquake descriptions remained the same to the previous two eruptions, using words such as “shock” and “tremor”. PDCs continued to be called "lava" and, in one instance an interviewee for this study described a PDC as "the mountain came tumbling down". However, volcanologists from the Belmont Volcano Observatory, refer to them as either pyroclastic flows or glowing/hot avalanches (nuée ardente). Lahars, like the previous two eruptions, are referred to as mudflows.

3.4 The method

The following methods were used to reconstruct the narrative of the eruptions, generate the hazard impact maps, and assess the impact of the eruptions.

Geographically located descriptions and observations of eruptive activity and/or reports of destruction from archival material and the semi-structured interviews were used to construct eruption impact maps for the 1812, 1902-1903, and 1979 volcanic eruptions of La Soufrière by mapping recorded occurrences of lahars, pyroclastic density currents, felt earthquakes and ash fall. Typically, volcanic hazard maps rely upon geological investigations to pinpoint where, what and possibly when a volcanic hazard were produced by a volcano. However, this study uses detailed narratives as its source data and did not map the volcanic deposits. Therefore, an approach which allowed one to convert the archive information, such as eye-witness accounts and records of damage, into a visual representation of the eruptions needed to be developed.

Converting the information required an understanding of how eyewitnesses described volcanic hazard phenomena without using the scientific terms. Many of the descriptions are based on what was seen, heard, felt, and smelt. For example, one eyewitness described ash falling west of La Soufrière's crater in the direction of the settlements Wallibou and Morne Ronde for the 1812 eruption as follows:

> *"…driven before the wind towards Wallibou and Morne Ronde, darkened the air like a cataract of rain, and covered the ridges, woods, and cane-pieces with light grey-coloured ashes, resembling snow when slightly covered by dust".* [8]

Archive accounts were catalogued in a table detailing the written description, the hazard phenomena, location of where the hazard impacted, date and time, origin and date of the source (e.g. Leicester Chronicle, 19th June 1812), a data point number for each eruption appearing in order of appearance in the data, then rearranged in chronological order. Each

[8] Public Ledger and Daily Advertiser, "Volcano at St. Vincents", 1st July 1812

description was coded (for example, AF1 for ash fall data point 1, PDC1 for pyroclastic density current 1, L1 for lahar 1 and EQ1 for earthquake 1) and initially colour coded (for example, ash fall data points were brown, PDC data points were red, lahar data points were orange, and earthquake data points were black). Next, locations were pinpointed on a paper-based copy of the relevant historical map for each eruption as circles with its appropriate code and colour. The maps were repurposed as a contextual map of actual settlement locations and how people in 1812, 1902-1903, and 1979 would have viewed the maps and the hazard information. Based on the available topographic information on the maps and triangulating all the observational data for each hazard and each eruption, the extent of the eruptive products was extrapolated. For example, if it was reported that a lahar impacted the Rabacca Estate, which is located on the Windward coast of the island near the Rabacca Dry River, it was extrapolated to have descended the whole river valley.

After this paper-based exercise, the information was reviewed before digitising the historical maps for analysis in ArcGIS. The maps were georeferenced and the data points for each eruption were put onto the map. Lastly, the impact areas for each of the four volcanic hazards (volcanic earthquakes, lahars, ashfall, and PDCs) were drawn by hand onto the maps.

Using archival sources to reconstruct impact maps had two specific benefits, allowing one to recover information unavailable using geological sources. Firstly, volcanic deposits are not well preserved so cannot be mapped geologically. Therefore, this approach captures events that did not leave a deposit in the geological record, e.g. earthquakes, ash fall, lahars, and PDCs. Secondly, individual perspectives and the language used to describe volcanic activity are integrated into the narrative of the eruptive history to showcase the various ways in which people live with active volcanism.

Creating hazard impact maps using historical archives rather than mapping geology is relatively novel. Historical data is used to guide geologists (e.g. at Mt. Ruapehu and Mt. Tongariro in New Zealand),[9] but to date, only Pyle *et al*. (2018) outlines a method where only archives are used. This study has encountered some limitations to this approach. Three main limitations arose from utilising the large collection of sources and incorporating them

[9] Brad Scott pers. comm, 2020

into eruption impact maps. Firstly, whilst the eyewitness accounts were rich in detail and provided the needed lay-person perspective, there were clearly instances where stories were embellished for dramatic effect. This was particularly the case for newspaper articles collected from the British Newspaper Archive for the 1812 and 1902-1903 eruptions (Smith, 2011). Secondly, the semi-structured interviews relied upon interviewees remembering an event that occurred 37 years previously to when the interviews were conducted (in 2016). Whilst all interviewees had a good recollection of events, it was still probable that some detail was missed, particularly in remembering what happened before and after the eruption. The eyewitness account limitations were reduced by using the other data sources such as photographs, governmental correspondence, and geological investigations. Lastly, using the historical maps as the basis of constructing the eruption impact maps had limitations in the low resolution of topographic information which was key for extrapolating PDC extent. In addition, georeferencing the historical maps within ArcGIS had to be manually matched up by the outline of the island base map within the program, therefore an amount of human error was present within the metadata of the digitised maps. This was reduced by referring to the most modern and up-to-date topographic information of St. Vincent on ArcGIS.

3.4.1 Field data collection

Data collection took place in 2015-2016. The British Newspaper Archive's collection is online. For the 1812 and 1902-1903 eruptions, searches included key words such as "Saint Vincent", "Volcano" and "Soufriere". Each article was read before deciding its relevance to the study before being saved as a PDF and written up in a word document.

The Tempest Anderson Collection was accessed in collaboration with a curator at the Yorkshire Museum. The collection's scrap notebooks with newspaper clippings were read over (which were identical to ones identified in the British Newspaper Archive), and three boxes of camera plates of photographs were examined. Images showing volcanic hazard damage to the environment, settlements and people were cleaned and a high-resolution digital copy made.

Data sources in the British Library and The National Archives in London were already identified through online searches of the archive's websites and individually read through to determine relevance. Sources deemed relevant were photographed and catalogued by the archive code and date written.

Additional potential sources were identified at the Virginia Historical Society and the American Museum of Natural History. Three days in October 2016 were spent at the Virginia archive and another three days were spent at the Natural History Museum, both using the same method as other archives visited.

Fieldwork in St. Vincent was conducted from March to May 2016. The archives in Kingstown were accessed in collaboration with the librarian who helped source archives related to the 1812, 1902-1903, or 1979 eruptions. Sources were read in full before determining their relevance, and relevant sources were photographed and catalogued by archive code and date written. Furthermore, during this time fifteen semi-structured interviews regarding the 1979 eruption were conducted. Initial contacts were given by a member of NEMO, and individually called providing details of the project, to arrange a date and time to visit and conduct the interview. Due to the Feminist Standpoint Theory used (Section 3.5.2), location and gender of interviewees was selective. Some additional interviews were conducted based on suggestions made by interviewees. These were recorded using a dictaphone and stored by last name and location.

3.5 Methodological issues

3.5.1 Partial records

The use of archival documents in this study introduces the challenge of dealing with partial records. All data used within the study are limited in quantity and quality by a "cultural filter" that affects their reliability, availability, and completeness. This is due to the records having various biases associated with the time periods and locations in which they were taken (Swetnam *et al*., 1999). This is important to consider, as the majority of archival data were written during the colonial era by certain members of the society whilst excluding others (See Section 3.3.2).

Whilst the written observation of volcanic eruptions dates back as far as Pliny the Younger and the 79 AD eruption of Vesuvius, observational records are typically incomplete, making it difficult to construct a continuous record (Jeffrey *et al*., 2001). Historic observational records of volcanic activity can miss the recording of discrete activity, contain random or systematic errors, and/or have spatial distribution issues (Peck, 1997; Jeffrey *et al.*, 2001). The records can also be affected by "fading", whereby the reliability of the time series decreases the further back the data goes (Swetnam *et al*., 1999). This was certainly the challenge for collecting data for the 1812 eruption and resulted in the exclusion of the 1718 eruption from this study because the archive data was too sparse.

In volcanology to counteract the issues of partial records, the geological record would be used as a proxy to supplement volcanic observations. However, this is beyond the scope of the thesis but to overcome the challenges of partial records, an extensive amount of data was collected and combined with multiple lines of inquiry (Whitney, 1994; Zhan *et al.*, 2013); a benefit of the mixed methods approach.

3.5.2 Silenced voices

Feminist Standpoint Theory (FST) addresses the analysis of "voice" as a concept, which rationalises the voicing of women's insight into the nature of society. The theory states that members of marginalised groups (in the case of this study any person of colour or not part of the colonial "elite"), can become subjects and authors of knowledge that speak from a certain location, experience, and standpoint (Harding, 2004; Arnot and Reay, 2007).

Surviving sources underrepresent some social groups as well as being socially selective in the interests they serve (Dyer, 1988). This is important in the field of social volcanology as no society is homogenous and their interactions to volcanism vary within and among the various social groups that make up the society. For this study, this theory is more applicable to 1812 and 1902-1903 eruptions because enslaved Africans, their free descendants, women, children, the disabled, and other marginalised groups have either been omitted from the written record or their voices manipulated. It is stressed that there is another story to the narrative of this thesis however, due to the silenced voices, there is not enough data to tell it.

The framing of individual and collective identities, subjectivities and positioning are part of the "identity work" of studying voice (Lather, 1991). In the study of voice, it is believed that there is no one authentic voice of a single social category, with the appreciation that voices are differentiated by space, time, relation and place (Arnot and Reay, 2007). Indeed, people affected by a geohazard event (e.g. volcanic eruption, earthquake, or tsunami) have different experiences based on their location and this is termed the “mismatch effect” (Cashman and Cronin, 2008).

The study of “voice” has been criticised in being “unscientific”, as it constructs a weak knowledge edifice (Moore and Muller, 1999). But Moore and Muller’s argument is a “western” perspective of science, which only relies on one type of methodology. The acknowledgement of all voices (present or absent) links the pragmatism of a mixed methods approach with FST, by adding value and relevance of this type of “data” to this study.

3.5.3 Decolonising science

Acknowledging the voices that have been silenced from the narrative of a historical event enables the consideration of “decolonising” science. European colonists, adventurers, and travellers researched the indigenous “Other” and other persons of colour through a biased and subjective lens (Smith, 2012). The representations of indigenous persons (and others) through the subjective lens were encoded as the authoritative representation of the Other, thereby framing the wider discourse and attitudes towards indigenous persons. The encoded representations became accepted as universal truths and marginalising the stories of the Other through imperial eyes (Wilson, 2001).

Data collected for the 1812 and 1902-1903 eruptions of La Soufrière show that the colonial government, the colonists, British and American newspaper reports, and scientific fieldwork manipulated, minimised, or silenced the voices of the indigenous population, women, enslaved African/creole/freed persons and former indentured Portuguese and Indian communities. For the 1979 eruption, data gathered was more representative and the semi-structured interview sampling consciously chose to buffer the issues of historically marginalised voices by choosing women and men descendants of indigenous, enslaved, freed, indentured, and colonist persons that largely make-up the Vincentian demographic today.

Even today, any research done in the “west” conveys a set of conceptions and values of knowledge, gender relations, time, space and subjectivity, which are encoded in colonial and imperial discourses which influence the gaze of the researcher (Wilson, 2001). The idea of decolonising science strives to remove such western biases when researching another culture. Therefore, the researcher needs to critique their own gaze and reflect upon how their representations of voices and disaster events of another culture could subsequently lead to reinforcing imperial subjectivity (Wilson, 2001).

3.6 Conclusion

Mixed method approaches employ both quantitative and qualitative methods to broaden the understanding of a series of events, leading to the creation of complementary and robust results by using a pragmatic approach. This study used multiple datasets found in different archives and semi-structured interviews to reconstruct the chronological order of La Soufrière's 1812, 1902-1903, and 1979 eruptions, develop eruption impact maps and to inform details on the impacts of the agricultural sector and societal behaviour, whilst considering the additional methodological issues of using partial records, handling silences voices and decolonising science, acknowledging that there is another story to tell but due to the silenced voices, the data available could not tell it.

Chapter 4 – Reconstruction of the 1812, 1902-1903, and 1979 eruptions of La Soufrière

4.1 Introduction

Reconstructing volcanic eruptions is a key investigation that volcanologists undertake to better understand the volcano in question. Previous studies of La Soufrière, St. Vincent, have focused on the geology (Section 1.5) and only recently focused on aspects of risk and vulnerability (Section 2.5.3). These narratives have neglected the holistic view of the volcano's eruptive history taking all available archival sources, interviews, and geological research into consideration.

Here I mapped different volcanic hazards using qualitative sources of data, such as newspaper articles and photographs. The descriptive approach for this chapter reflected similar approaches of eruptive history reconstructive studies (e.g. Voight *et al.*, 2000). This chapter is important to know what happened in each event before analysing response, recovery, and adaptation in Chapters 5 and 6. As a result, the 1812 eruption was reconstructed in detail for the first time and alluded to new details of the 1902-1903 and 1979 eruptions. This study enabled the enrichment of examining the event from the personal experiences of people living through the eruptions, demonstrating how different people experience the same event. The following chapter reconstructs the three eruptions by detailing precursory activity, the onset of eruption, and intermittent activity. Since 1800, the same areas on the island have been impacted by eruptions of La Soufrière, therefore these areas have persistently been at risk to La Soufrière. The chapter ends by comparing the similarities and differences of the three eruptions.

4.2 Methods

Narratives of the 1812, 1902-1903, and 1979 eruptions are here reconstructed by collating all available archival sources and geological research into a thorough reconstruction of the occurrence of ash fall, lahars, and pyroclastic density currents, and where earthquakes were felt (See Appendix G, Tables G1-G3 for all sources consulted). Lava flows were found to have not occurred based on available literature on the eruptions (Section 1.5).

The volcanic processes were diverse in the eruptions and interacted differently with the environment. Figures G1-G3 in Appendix G show the locations referred to in the narrative of the three eruptions. Using these as a base map, data from the narratives were mapped to produce an eruption impact map for each eruption. It is acknowledged that there are limitations of using the historical base maps, as topographic detail is not sufficiently high to map precise courses of volcanic hazard flow paths (e.g. lahars); however, they showed historical locations of settlements and river valleys.

4.3 Reconstruction of the 1812 eruption

The earliest reports of an eruptive activity for the 1812 eruption were published by the British newspaper "Public Ledger and Daily Advertiser" on the 1st July.[10] It described ash falling at approximately 12:00 on the 27th April at Wallibou and the Kalinago village of Morne Ronde, both located on the western flank of La Soufrière (Figure 4.1):

> *"…with a severe concussion of the earth and tremulous noise in the air…driven before the wind towards Wallibou and Morne Ronde, darkened the air like a cataract of rain, and covered the ridges, woods, and cane-pieces with light grey-coloured ashes, resembling snow when slightly covered by dust".*

On 30th April 1812, observations of activity had increased. In the morning, earthquakes were felt in the capital Kingstown[11] and Morne Ronde (Figure 4.1). This was described as "the noise was incessant and resembled the approach of thunder still nearer and nearer, with a vibration that affected the feelings and hearing…" and at this point, the residents of Morne Ronde self-evacuated towards Kingstown.[12] Later that day, approximately at 19:00,[13] a description indicated that "lava" (which is how the population described the processes of PDCs, see Section 3.3.9) flowed towards Morne Ronde:

> *"In a short time, the lava poured out on the northwest side. It was opposed there by the acclivity of a higher point of land, but being driven on by fresh accessions, it ascended and surmounted the obstacle, forming the figure V in a torrent of fire, plunged over the cliff carrying down rocks and woods in its course, and finally precipitating itself into a vast ravine at the foot of Morne Ronde".*[14]

Furthermore, a newspaper article published on the 18th July stated that the flow took about four hours to reach the sea. [15] From their own research 90 years later, Anderson and Flett (1902) concluded that this current originally was channelled down the Larikai River (located

[10] Public Ledger and Daily Advertiser, "Volcano at St. Vincents", 1st July 1812

[11] Morning Chronicle, "Volcano at St. Vincents", 1st July 1812

[12] See footnote 10.

[13] See footnote 11.

[14] Anderson R.M., "The Saint Vincent Handbook, Directory and Almanac for the year 1911 (1914)", British Library (BL): General Reference Collection X.808/9862.

[15] Oxford University and City Herald, "The following letter we have received from a gentleman of this University, giving a further account of the late dreadful eruption in the island of St. Vincent", 18th July 1812

on the northwest flank) but parts of the current also blanketed the western side of the volcano's flank. Previous investigations have found that a new crater was formed during this eruption (Sharp, 1890; Aspinall *et al*., 1973; Robertson, 2005; Smith *et al*., 2010); however, it is uncertain from their investigations where the eyewitness accounts for this were. Due to the position of the "New Crater" and Duvallie's Estate (Figure 4.4), this was the source of the current that impacted the estate. This resulted in 9 deaths out of a population of 68 enslaved persons on the estate.[16] Two other PDCs descended the Rabacca Dry River on the eastern flank (Figure 4.1) and the northern flank towards Duvallie's (Figure 4.1) on the same day.[17]

Reports from three newspaper articles state that ash was observed falling on St. Lucia, Martinique and Dominica from 02:30 to 15:00 on the 1st May 1812, 218 km north of the volcanic crater.[18] Barbados recorded ash fall at 18:00, the ash described to have darkened the sky as "…the stormiest night".[19]

> *"The armed ship Emma arrived [at Barbados] this day at noon…30 miles to the eastward of Point Saline, Martinique a dreadful explosion was heard, and the vessel was shortly after completely enveloped in clouds of the same [sandy] matter. This was also experienced by the schooner Peggy from Dominica, which also states that total darkness had prevailed from two o'clock morning until three in the afternoon".*[13]

On the north-to-north eastern flanks of La Soufrière, the settlements of Fancy and Owia (4 km northeast of La Soufrière) were essentially cut off during the eruption. First contact of the settlements was made on the 2nd May, with reports that the area "presents nothing but objects of desolation". The region was buried by tephra (volcanic ash, ballistics, and bombs) and the provision grounds (subsistence farms) of the Kalinago at Owia were destroyed.[20] No records of PDCs or lahars were observed in this area. Ash was reported to have fallen on

[16] The Gazette Office (1801-1825) "An account of the number of slaves employed, and quantity of produce grown, on the several estates in the Island of Saint Vincent and its dependencies", BL: Document supply MFR/8397; TNA CO 260/29, 35; Smith (2011)

[17] Morning Chronicle, "Volcano at St. Vincents", 1st July 1812; Oxford University and City Herald, "The following letter we have received from a gentleman of this university…", 18th July 1812; Oxford University and City Herald, "The following letter we have received from a gentleman of this university…", 18th July 1812.

[18] Perthshire Courier, "Miscellaneous – Further particulars of the eruption of the Souffrier Mountain, St. Vincent's", 2nd July 1812.

[19] Worcester Journal, Untitled, 25th June 1812.

[20] Perthshire Courier, "Miscellaneous – Further particulars of the eruption of the Souffrier Mountain, St. Vincent's", 2nd July 1812. ; Fraser S. *et al*. (1813) "Petition to the House of Commons", National Document and Archive Service of St. Vincent and the Grenadines (NDAS-SVG): AA4.1.1.

northern Lesser Antilles islands, [21] so the ash cloud, must have spread in a north to northeast direction, and likely would have deposited ash across the north of the island.

Reports of activity diminished from early May, indicating that volcanic activity was waning. By the 7th May it was reported that volcanic material in the Rabacca and Wallibou Rivers, both important for the agricultural sector, had dammed the river courses.[22]

> *"…continued to be agitated up to the 7th but had since shewn scarcely any signs of commotion. By the eruption, the large rivers of Rabacca and Wallibou were dried up, and in their places was a wide expanse of barren land".*

There were also 34 deaths recorded at Wallibou Estate, but the exact cause of their deaths is unknown.[23] During the same period of diminished activity, there was a report of a lahar in the Morne River[24] that originated from remobilised pyroclastic deposits by rainfall, typical for a volcanic environment in a tropical maritime climate, despite being before the rainy season.

Unfortunately, most of the archival data does not specify a date, but Robertson (2005) states that 1812 volcanic activity continued up until 6th June. It is known that from Grand Sable (approximately 10 km southeast from the volcanic centre) to Tourama (approximately 4 km east from the centre), there were several inches of ash accumulation (Anderson and Flett, 1902). This accumulation of ash caused the manager's house on the Grand Sable Estate to collapse,[25] suggesting that there was a dominant easterly wind.

> *"The manager's house on Grand Sable Estate…was thrown down by the weight of matter that fell upon it, consisting of stones and sand".*

However, Tourama was part of the area impacted by PDCs, therefore the deposits were a mixture of pyroclastic and tephra material. Furthermore, there were reports of additional damage caused by undated PDCs to five estates in the parish of Charlotte: Rabacca, Lot No. 14, Tourama, Waterloo, and Langley Park,[26] all located at the base of La Soufrière's eastern flank that has a gentler slope than the western flank, and the Wallibou Estate located on the western flank. Additional currents occurred in the Larikai River and destroyed the small

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[21] Perthshire Courier, "West Indies: Volcanic convulsion in St. Vincent's", 25th June 1812

[22] Suffolk Chronicle, "St. Vincent's volcano", 18th July 1812.

[23] The Gazette Office (1801-1824), BL: Document supply MFR/8397; TNA CO 260/29, 35; Smith (2011)

[24] See footnote 22.

[25] Fraser S. *et al*. (1813) "Petition to the House of Commons", NDAS-SVG: AA4.1.1.

[26] See footnote 25.

plantation estates of Thomas Fraser and Duvallie's,[27] located on the north-to-north western flank.

> *"…The Rebecca [Rabacca] River, which turned the mills on my estate, with that of Messrs. Sutherland, Cumming, Cruikshanks and Smith, is completely dried up in consequence of the lava, which has descended into the bed of the river".[28]*

> *"The cliff [at the mouth of the Larikai] consisted of a material so exactly similar to the ash that overlay it that, if it had not been for the old burnt soil, it would have been hardly possible to find a line of demarcation between the two deposits…we came to the conclusion that here was the evidence of a dust avalanche"…[29]*

After the event, a Royal Engineer investigated the Wallibou River Valley and noted the saturated pyroclastic deposits: "…mud beds that have covered the Wallibou Valley…after 45 minutes the mud being soft and very much inclined to slip".[30] Similar to what the engineer described, rainfall-induced lahars commonly deposit variable sized clasts in a muddy to coarse sandy matrix (Keigler *et al*., 2011; Uesawa, 2014). The lahars had high sediment loads making them highly erosive where primarily, intense erosion takes place in the upper catchment (Carrivick *et al*., 2010). After the eruption had ended, the hazards did not stop. In 1813 or 1814, a number of enslaved persons' homes were swept away by a lahar caused by the destruction of a "sandy barrier" from heavy rainfall in the Wallibou River (Shepherd, 1831).

Figure 4.1 maps the locations and deposition of reported ash fall, lahars, pyroclastic density currents, and earthquakes on St. Vincent for the 1812 eruption of La Soufrière. Appendix G, Figures G4 and G5 provides a timeseries of PDC flow paths. An ash isopach map could not be created due to the lack of data on the thickness of ashfall deposits.

[27] Anderson and Flett (1902); The Gazette Office (1801-1825) BL: Document supply MFR/8397; Shepherd (1971)

[28] Fraser S. *et al*. (1813) "Petition to the House of Commons", NDAS-SVG: AA4.1.1.

[29] Anderson and Flett (1902)

[30] Lt. Robinson, A.C. (1812) "Extract on observations in the Soufriere district", NDAS-SVG: Volcanoes VI.

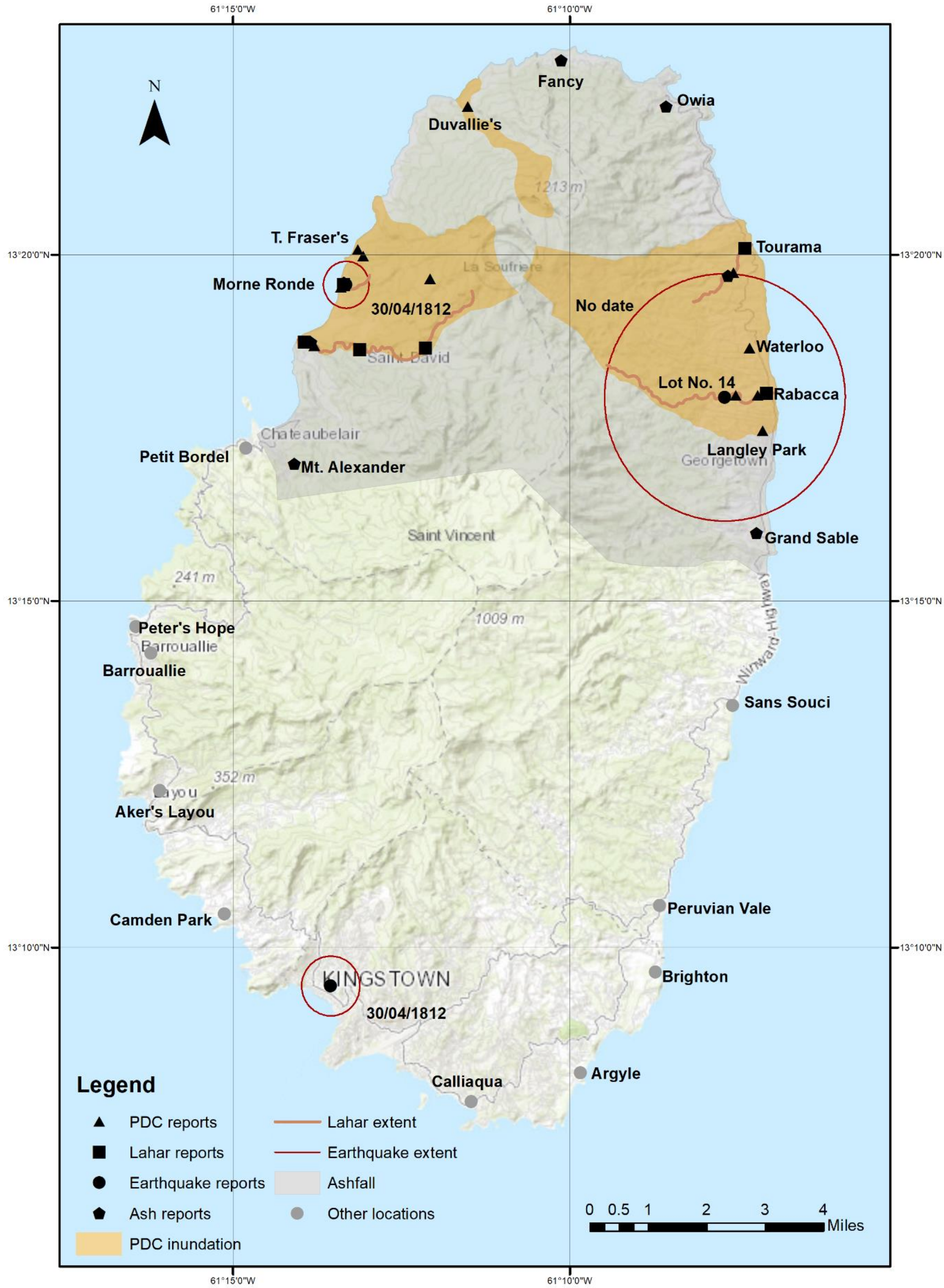

Figure 4.1. The 1812 eruption impact map depicting all locations which reported activity. "Other locations" are of settlements/plantations that existed at the time but did not have any reports of activity.

The activity at the beginning of the eruption was an initial "vent-clearing" phase at the crater related to the presence of a lava dome. For volcanoes that have not erupted for a certain length of time, the vent-clearing phase is to remove a 'plug' (in this instance a lava dome) and/or expel gas-poor material before the onset of explosive activity (Hoblitt, 1986). For the Lesser Antilles volcanic arc, it is characteristic to have a lava dome present destroyed during the vent-clearing phase. A recent example in the Caribbean is the 2004 eruption of Soufrière Hills on Montserrat, whereby the lava dome was destroyed by an explosion and produced ash fall only on the western side of the island due to the dominant easterly wind direction (Linde *et al*., 2010).

Based on available data, ash fall deposits were confined to the northern end of the island and Barbados. Observations of lahars were seen in the Morne Ronde, Wallibou, Tourama, and Rabacca Rivers (Figure 4.1) – the base map provides enough detail to fully chart the course of the lahars, as the flows follow the thalweg of the channel and are valley confined. There is a possibility that more lahars occurred before, during, and after the event but no one was present to witness them. The time-series of lahars are in Appendix G, Figure G4.

Three instances of earthquakes being felt have been mapped. Firstly, the earthquake at Morne Ronde (Figure 4.1), occurred before the eruption and therefore was a precursory earthquake related to magma movement. The second reported earthquake occurred on the eastern flank that damaged five estates. The third was felt in Kingstown, and despite the approximate 20 km distance from the vent, this is associated with ground motion caused by an explosion, all earthquakes reported on the 30th April 1812. Whilst the timings are unknown, it is highly likely the earthquakes were caused by volcanic activity. PDCs were concentrated to a portion of the northern flank, the western and eastern flanks (Figure 4.1) and a time-series of the PDCs can be found in Appendix G, Figure G5.

4.4 Reconstruction of the 1902-1903 eruption

On the 13th April at 12:20, eight "sharp" short tremors occurred within 24 hours in Owia,[31] (Figure 4.10). On the 29th, three "well marked shocks" were felt at Windsor Forest and Campobello, 3 km north of the volcano (Figure 4.10) and, 18 earthquakes at Morne Ronde (Anderson and Flett, 1902). The Kalinago population of Morne Ronde at this stage self-evacuated south of the settlement into Chateaubelair,[32] 9.5 km southwest of the volcano

[31] Anderson and Flett, 1902; Lew E. (1902) "Royal Commission on the eruptions in the West Indies: Owia", British Geological Survey Nottingham (BGS-N): John Smith Flett - GSM/DR/Ft

[32] The Western Times, "Official news. Anxiety for our island of St. Vincent. 1,000 whites killed", 10th May 1902; Pyle *et al*. (2018)

(Figure 4.10). The largest and strongest earthquakes were reported on the 6th May in Owia[33] and in Georgetown, 9 km southeast of the volcano (Figure 4.10). A person described 60 earthquakes felt within four hours in Georgetown as "so terrible…as to give the impression that the end of the world had come", whilst a similar number was felt in the capital Kingstown (20 km south of the volcano) (Figure 4.10) and in Chateaubelair.[34] On the same day, three instances of ash fall were reported at Chateaubelair, Kingstown and Barbados.[35] The ash fall at Chateaubelair was first fine black ash, but then fell as "mud" and stones at approximately 15:00. However, by 17:00, Barbados (172 km east of La Soufrière) was "shrouded in the darkness of night". [36]

On 7th May 1902 earthquakes were reported by Mr. Dun of Owia, who reported hearing "noises" and feeling earthquakes at 10:15, 12:30 and 12:45 (Anderson and Flett, 1902). At 11:00 on the same morning, there was simultaneous production of ash fall, lahars and PDCs. Ash fell on Owia for approximately an hour, whilst at Fancy (located 3 km north of La Soufrière) (Figure 4.10) an earthquake was felt and accompanied by "flashes of lightning".[37] The first lahars were observed discharging from the two main river channels Wallibou (western flank) and Rabacca (eastern flank) that drain La Soufrière (Figure 4.10) (Anderson, 1908; Roobol and Smith, 1975). These were described as large and continuous "…raging floods of boiling water" 50 feet or more high, reaching the coast and trapping people north of the Rabacca River.[38]

There were multiple observations of simultaneous PDC generation on the northern and western flanks on this day. A survivor who was in a boat near Windsor Forest, located northwest of the volcanic crater (Figure 4.10) stated to Anderson and Flett (1902) that other people were several miles out from the shore between Windsor Forest and Baleine (Figure 4.10) and were "enveloped in dense darkness". There was also a separate larger PDC that descended the western flanks within the Wallibou and Larikai River Valleys (Figure 4.10).

[33] Lew E. (1902) "Royal Commission on the eruptions in the West Indies: Owia", BGS-N: John Smith Flett - GSM/DR/Ft

[34] Morris C. (1902)

[35] Anon. (1902) "Royal Commission on the eruptions in the West Indies: Chateaubelair", BGS-N: John Smith Flett – GSM/DR/Ft; Hodgson F.M. (1902) "Letter from Governor Sir F.M. Hodgson to Administrator Joseph Chamberlain", The National Archives (TNA): CO 28/257

[36] Hodgson F.M. (1902) "Letter from Governor Sir F.M. Hodgson to Administrator Joseph Chamberlain", The National Archives (TNA): CO 28/257

[37] Flett J.S. (1902) Untitled, BGS-N: John Smith Flett – GSM/DR/Ft (A1902-F68); Anderson and Flett (1902)

[38] Knowledge, "The eruption of the Soufriere", December 1902, pg. 266-269; Hovey (1902b)

The simultaneous activity of an ash plume and energetic pyroclastic density currents maybe indicative of partial ash plume collapse.

Eruptive activity continued until another PDC at 13:30 was observed on the eastern flank towards Lot 14 and the Rabacca Estate (Figure 4.10) (Huggins, 1902). An eyewitness account by Mr. Durant later given to Edmund Hovey was particularly complicated and explored in more detail in Section 4.4.1. The PDC "left" a dense ash column then a portion of the current disconnected, with one half continuing to descend the eastern flank and the other "coming back onto the island"[39] towards the Orange Hill estate (Figure 4.2). Edmund Hovey stated that the Orange Hill house (Figure 4.3) was somewhat protected by the topography of the immediate vicinity.[40]

Figure 4.2. Orange Hill photograph taken by Tempest Anderson and held at the Yorkshire Museum (TA123). The damage caused by the PDC to the surrounding property was buried by pyroclastic deposits and trees and bushes being stripped of their leaves. The current was not forceful enough to uproot the trees and bushes, and they do not have much of a tilt to suggest which direction the current travelled.

[39] Hovey E. (1902) Field notebook of St. Vincent: Eyewitness account from Mr. Durant, American Museum of Natural History (AMNH): Edmund Hovey Collection, Box 2, Item 17, Pg. 3
[40] Hovey E. (1902) Field notebook of St. Vincent, AMNH: Edmund Hovey Collection, Box 2, Item 17, Pg.14

Figure 4.3. Untitled photograph taken by Tempest Anderson and held at the Yorkshire Museum (TA124). The house looks intact, the timber walls, doors, railings, steps and tile roofs appear relatively unscathed and not warped by heat. The window glass behind the woman and men, however, appears to be missing. This suggests that the de-coupled portion of the PDC was considerably diluted by the time it reached the estate: heavier material had been deposited, the temperature of the current was not hot enough to impact but there was still dynamic pressure present to shatter the window glass.

Fifteen minutes after the descent of the eastern flank PDC, observers near Chateaubelair reported another large current descending the western flank,[41] indicative of another partial collapse of the ash plume. Ten minutes later, the same current was observed to overcome a topographic barrier and engulf the Richmond Estate (Figure 4.10 and 4.4) and also spread around a headland, nearer to Chateaubelair (Anderson and Flett, 1902). The Richmond Estate was already vulnerable, as the main house was destroyed in the 1898 Great Hurricane and only partly rebuilt by the time of the eruption.[42]

[41] Huggins P.F. (1902) "An account of the eruptions of the Saint Vincent Soufriere with woodcuts"

[42] Hovey E. (1902) Filed notebook of St. Vincent, AMNH: Edmund Hovey Collection, Box 2, Item 17, pg. 12

Figure 4.4. Titled "St. Vincent, site of Richmond Village, 30 July 1902" taken by Edmund Hovey and given to Tempest Anderson, held at the Yorkshire Museum (TA015). The landscape is buried in pyroclastic material as well as vegetation stripped and buried. This suffocated the plants and prevented regrowth immediately afterwards. The dynamic force of the PDC at Richmond was strong enough to destroy the masonry of the small property's walls and roof but leave some of the foundations intact and buried. Pyroclastic deposits show signs of erosion.

This was just the beginning of several observed PDCs and several partial ash plume collapses. At 14:00, at least six PDCs were channelled down the Wallibou, Wallibou Dry River, Rozeau Dry River, Larikai, Grand Baleine, and Rabacca Dry River valleys (Figure 4.10). An observation from Cumberland Bay (Figure 4.10) of a PDC descending the Wallibou area (Figure 4.5 and 4.6) was described as "…a tremendous cloud of black smoke… thick with volcanic ash, stones and scorae, came down the mountain side into the sea".[43]

[43] Graves C.B., "A visit to St. Vincent. How the warnings of the volcano were acted upon – story of the man who saw the first eruption – queer volcano theories – relief measures", The New York Times, 23rd May 1902

Figure 4.5. Titled "Wallibou Works 1902" taken by Tempest Anderson and held at the Yorkshire Museum (TA037). The photo appears to have been taken facing up a valley, likely the Wallibou River Valley – here PDCs funnelled down the valley and blanketed the western flank. The hill on the right-hand side of the photo had a mixture of buried, flattened and broken trees, whilst the foreground shows the landscape entirely buried. The masonry foundations of the sugar factory "works" are intact but the force of the moving current has swept everything else of the building away. The water wheels appear to be of reinforced wood and are partially buried but otherwise intact.

Figure 4.6. Titled "Wallibou June 1902" taken by Tempest Anderson and held at the Yorkshire Museum (TA042). A large area of vegetation was stripped of its foliage, flattened and buried by pyroclastic deposits. The direction of the flattened trees suggests the current was moving from left to right. The way the deposits are settled around the structure behind the man in the photograph shows that material was mainly deposited on the sides, partially burying it.

The PDC that descended the Rabacca Dry River Valley damaged the estates of Tourama, Lot 14, Rabacca Estate, Langley Park, and Mount Bentinck and the settlement of Overland Village, leading to an unspecified number of deaths (Anderson and Flett, 1902). The reports of damage to several estates around the same time indicate that the PDC that was concentrated down the Rabacca valley also blanketed the eastern flank.

Soon after the 14:00 PDCs, ash began to fall across the island. Areas closer to the volcano also experienced the fall of larger volcanic clasts, notably in Georgetown and Fancy until midnight,[44] and at Richmond Estate and village (approximately 5.7 km southwest from the volcano).[45] Whilst farther still at Layou, a village 19 km southeast of the volcano (Figure

[44] Flett J.S. (1902) Untitled, BGS-N: John Smith Flett – GSM/DR/Ft (A1902-F68); Hovey (1902a)
[45] Hovey (1902a,b)

4.10), experienced the fall of large pumice stones "…great numbers of the friable stones…some the size of a youth's head".[46]

At 07:00 on the 8th May 1902, a lahar was observed to descend the Wallibou River and at the same time, an earthquake was felt in Chateaubelair (Anderson, 1908). Reports of ash fall in Fancy, Owia, Georgetown, Chateaubelair and Kingstown between 07:00 and 09:00 indicate a sudden explosion interacting with crater lake/or groundwater.[47] Communication from Windward Island governmental despatches indicated that communities north of the Rabacca Dry River were isolated and cut-off from the south of the island by a lahar or PDC, described as "a lava stream",[48] which descended the valley on this day.

Intermittent and scarce reports occur near the end of the month, an indication that activity was waning, or that there was a lack of people in the area to make observations. On the 24th May, a lahar was triggered in the Rabacca River and streams near Georgetown due to a thunderstorm, whilst a "boiling" lahar occurred at Morne Ronde on the same day.[49]

Increased activity occurs next in early September. It was reported at Richmond Vale (Figure 4.10) on the 3rd September that the roof of a building had collapsed under the weight of ash.[50] On the same day, a lahar was observed to descend the Larikai River[51] and flowing in the Rabacca Dry River on the 6th, described as a "stream of fire" with "mimic eruptions" occurring along the river bed.[52] One of the "mimic eruptions", now termed secondary rootless explosions, was photographed by Edmund Hovey (Figure 4.7).

[46] Huggins P.F. (1902) "An account of the eruptions of the Saint Vincent Soufriere with woodcuts"

[47] Anon. (1902) "Royal Commission on the eruptions in the West Indies: Chateaubelair", BGS-N: John Smit Flett – GSM/DR/Ft; Lew E. (1902) "Royal Commission on the eruptions in the West Indies: Owia", BGS-N: John Smith Flett - GSM/DR/Ft; Anderson and Flett (1902)

[48] Anon. (1902) "Offices and Individuals, letters from various government offices (departments)", TNA: CO 321/214

[49] The New York Times, "Terror in St. Vincent – second eruption caused panic at Chateaubelair", 26th May 1902

[50] MacDonald D. (1902) Letter from Mr Duncan MacDonald to the Royal Societies Club, 27th October 1902, TNA: CO 321/214

[51] Witnessed by Mr. Huckerby and recorded in Anderson (1908)

[52] Lancashire Evening Post, "St. Vincent's volcano. A stream of fire. Many estates destroyed", 9th September 1902

Figure 4.7. Titled "St. Vincent, secondary eruption, Wallibou" photograph taken by Edmund Hovey and given to Tempest Anderson, held at the Yorkshire Museum (TA008). This secondary "eruption" is due to the interaction between rainfall/bodies of water and the still hot volcanic material, causing hydrovolcanic explosions. The entire area is completely buried under pyroclastic material with vegetation stripped of their leaves in the foreground. Although it is unclear when the material was deposited, it has not been washed away by rainfall by the time of the photograph – leading to water collecting in pockets and interacting violently with the still hot pyroclastic material.

Reports about La Soufrière's activity decline from October until January, when it is reported that a lahar had destroyed the Rabacca Estate.[53] From the 22nd to the 23rd March 1903,

[53] Dasent J.R. (1903) Untitled, 2nd January 1903, TNA: CO 321/214

there were reports of ash fall in Kingstown, Chateaubelair, and Georgetown, where many glass windows in Georgetown broke, and three persons were slightly wounded by falling stones[54]. This was the last known report of activity.

As the eruption was longer and more severe compared to the 1812 eruption, vast amounts of reports went undated. There was a variety of reports of ash fall covering the eastern and western sides of the island. At Fancy, ash "…had stopped the water supply".[55]

Just south of the Rabacca Dry River from Langley Park to Mt. Bentinck (Figure 4.10), there were reports of damage from ash and volcanic ballistics to properties. However, Langley Park (being closer to the river) suffered greater agricultural production disruption than Mt. Bentinck.[56] In Georgetown, there were a considerable number of ash reports of up to 15 inches in depth.[57] Figure 4.8 shows a group cleaning up ash in an enclosed courtyard, at a depth of several centimetres.

Figure 4.8. Titled "Cleaning hotel yard, Georgetown" taken by Tempest Anderson and held at the Yorkshire Museum (TA101). The volcanic ash accumulated in the town without people around to remove it for days, weeks, or even months to generate deposit depths metres thick.

[54] Anon. (1903) Untitled, BGS-N: John Smith Flett – GSM/DT/Ft (JF-050)

[55] The Barbados Diocesan Magazine and West Indian Guardian, "The eruption of Soufriere, St. Vincent", June 1902

[56] The Barbados Diocesan Magazine and West Indian Guardian, "The eruption of Soufriere, St. Vincent", June 1902; Anderson and Flett (1902)

[57] Cpt. Campbell F.L. (1902) "Admiralty: volcanic eruption", TNA: CO 321/214

Noticeable lahars occurred in the Wallibou, Rabacca, and Rozeau Rivers (Figure 4.10), as well as an unnamed river near the Windsor Forest Estate. It was described that a lahar in the Wallibou River "…came down in pulsations of variable intervals…" (Hovey, 1902a). Whilst a natural dam near Windsor Forest Estate formed over a few months, with accumulation of water resulting in a "small lake" behind it that subsequently burst and buried the estate and killed several people.[58] The lahar in the Rozeau River (Figure 4.9) was reported by Dr. Alfred Lacroix (French volcanologist also studying Mont Pelée's eruption) which occurred suddenly "…[in] a torrent of mud" (Anderson, 1908).

Figure 4.9. Titled "Crossing river of boiling mud" taken by Tempest Anderson and held by the Yorkshire Museum (TA098). Tempest Anderson's expedition party dangerously crossed a small volume lahar on tree trunks/branches swept up by a PDC or a larger lahar that flowed down the Rozeau River. The completely barren landscape in this part of the valley would suggest the party are further up the river, where a PDC would have had the most destructive high temperatures, velocity, dynamic pressure, and density to strip and bury vegetation.

Interestingly, it was stated by Hovey (1902b) that all rivers and streams between Black Point and Chibarabou Point (Figure 4.10) experienced lahars of varying intensities as the result of

[58] Huggins P.F. (1902) "An account of the eruptions of the Saint Vincent Soufriere with woodcuts"

heavy rainfall during the rainy season. Once ash and pyroclastic deposits had settled, it only took heavy rainfall to remobilise them into lahars.

Overall, the 1902-1903 eruption caused between 1,327[59] deaths as reported by the Registrar General in 1903 and 1,365[60] deaths as reported by Governor Llewellyn in 1902 – with 1,295 bodies found, 70 dying in hospital from injuries, and 200 people missing at the time of his writing.

With the combination of the chronological narrative and undated reported phenomena, Figure 4.10 shows the eruption impact map for 1902-1903. Appendix G, Figure G9 provides a timeseries of PDC flow paths. Unlike the 1812 eruption, there was enough information to include a volcanic ballistic and bomb zone line, extending south from the crater to Richmond in the northwest across to Langley Park in the northeast of the island.

[59] Sgt. Antow G. (1903) Letter from the Registrar General to Administer Edward Cameron: "Report of the registrar general on vital statistics 1902", 25th June 1903, TNA: CO 321/219/1.

[60] Llewellyn R. (1902) Correspondence relating to the volcanic eruptions in St. Vincent and Martinique in May, 1902, pg. 65, NDAS-SVG: AA4.1.25

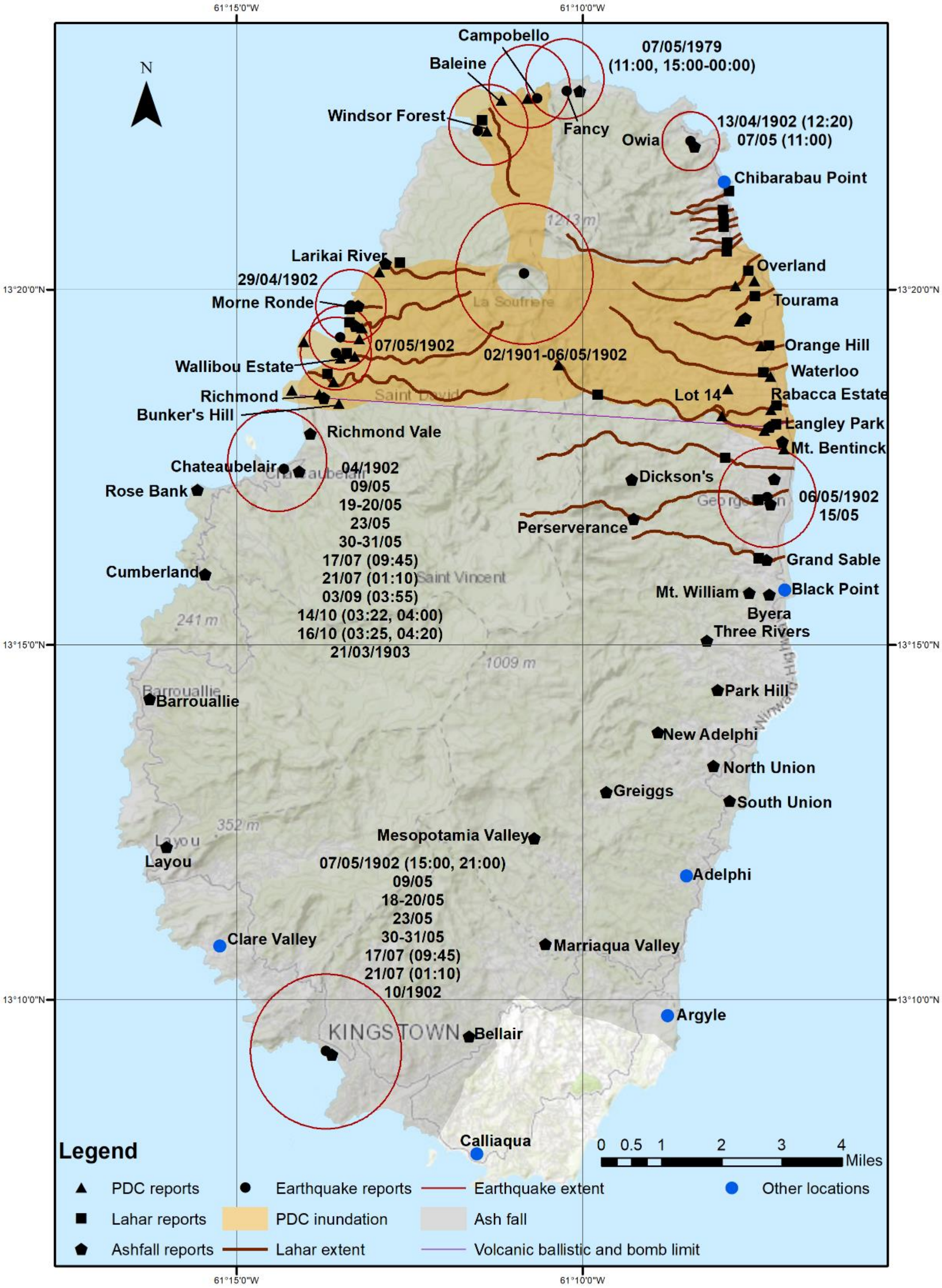

Figure 4.10. The 1902-1903 eruption impact map. A volcanic ballistic and bomb limit was drawn and "other locations" indicate various settlements/estates on the island that did not have any reports of activity. Dates are for earthquakes reported.

More precursory or explosion-related earthquakes were felt in this eruption, due to a combination of the larger eruption and more people recording their observations, evidenced by the data presented in this section. Ash fall was widespread, except no data was available of reports in the Calliaqua-Argyle region in the southeast (Figure 4.10). Damage caused in areas considered "safe" such as Marriaqua and Mesopotamia (Figure 4.10) was due to the accumulation of deposited ash that had not been cleared.

An ash isopach for 14th-16 October 1902 and March 1903 is shown in Figure 4.11a. Thicknesses were originally reported either in inches or feet and have been converted into millimetres. In some cases, a range of measurements was given and multiple measurements for the same place across a certain number of days. In these cases, the minimum value was used as higher values would be measuring ash accumulation instead of fresh fall and there may have been processes of reworking occurring. Unfortunately, there was not enough data to create complete isopach maps for 6th-9th May 1902, 15th May 1902, or 3rd September 1902 activity (Appendix G, Figure G6).

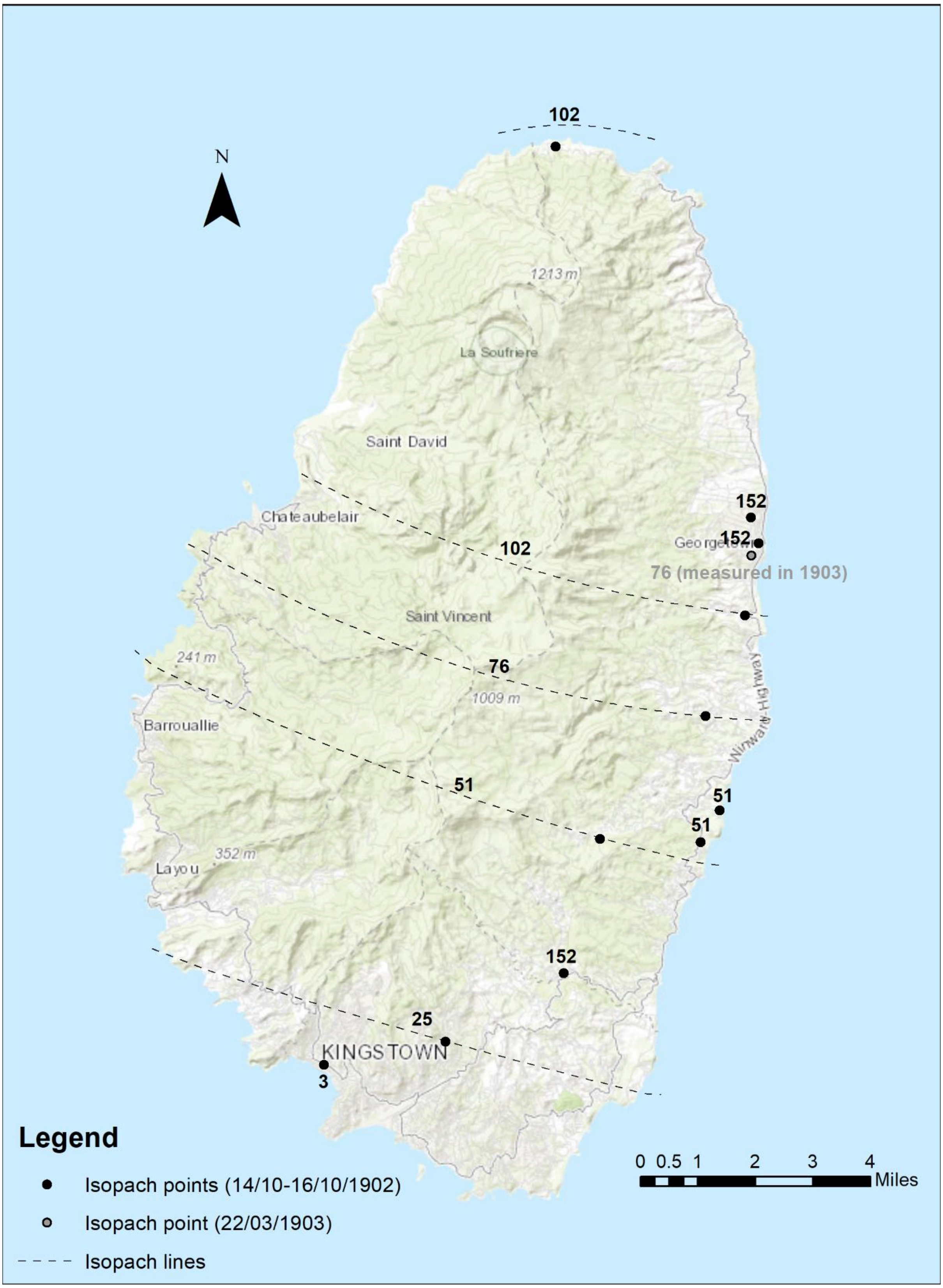

Figure 4.11a. Ashfall isopach for activity from the 14th-16th October 1902 and one datapoint for 22nd March 1903. Thicknesses are given in mm. Corresponding datapoints can be found in Appendix G, Table G2.

Furthermore, Figure 4.11b shows the tephra isopleth for the 14th-16th October, taking the maximum clast size found and described.

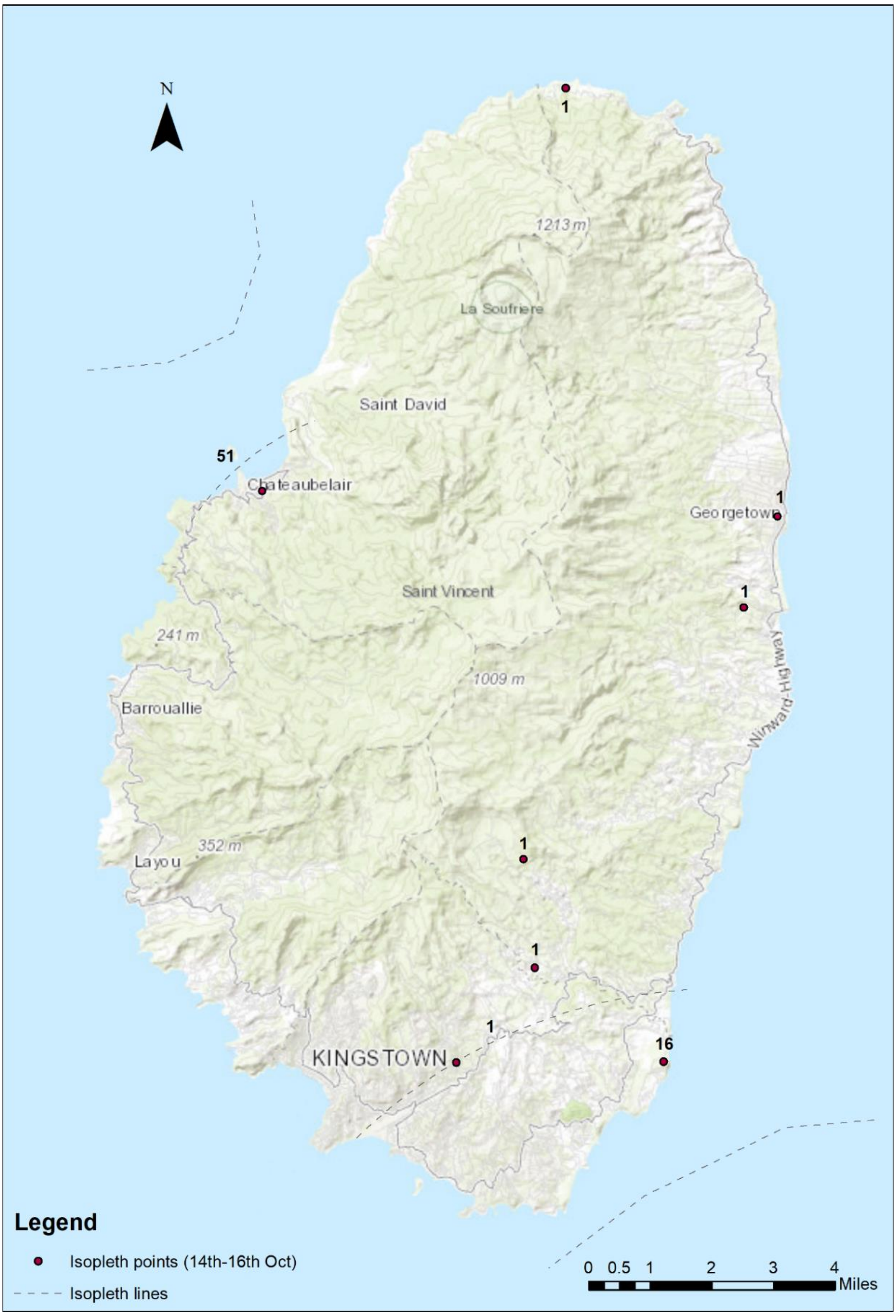

Figure 4.11b. Tephra isopleth for activity from the 14th-16th October 1902. Clast size given in mm. Corresponding datapoints can be found in Appendix G, Table G2.

Isopleth data was originally descriptive e.g. "sand", "stones", "hen's egg", and then converted into millimetres to correspond with the clast size. Comparing the isopleth to Figure 4.11a, it appears that 1 mm (reported as "sand") in clast size was the most dominant to produce deposit thicknesses ranging from 51-152 mm. The 16 mm in clast size (reported as "small stones"), is anomalous and is uncertain why it does not follow a similar pattern however, the 51 mm reported (as "stones") is just below the volcanic ballistic and bomb limit (Figure 4.10), therefore, larger clasts would have been expected. Unfortunately, isopleth maps could not be completed for the 6th-9th May or 3rd September as there was not enough data available or there was no identifiable pattern (Appendix G, Figure G7).

Topographic and valley detail on the base map had improved from the 1812 map, enabling a better interpretation of flow paths. The first lahars reported in the Wallibou and Rabacca rivers (Figure 4.10) flowed approximately an hour in advance of the explosion, indicating a rapid-onset evacuation of the crater lake present at the time (a more detailed time-series of lahars are located in Appendix G , Figure G4). The main flow direction of PDCs were both down the western and eastern flanks of the volcano, mainly as the result of a combination of numerous flows that displayed de-coupling behaviour (a more detailed time-series of the PDCs on the 7th May are located in Appendix G, Figure G9).

Due to more people reporting in 1902, detail of precursory volcanic earthquakes was noted. Preceding the eruption on the 7th May 1902, earthquakes occurred in the vicinity of La Soufrière as early as February 1901 (Roobol and Smith, 1975). Preceding the eruption, the level and temperature of the crater lake increased, as recorded by Edmund Hovey: "On [the] edge of [the] Old Crater [it was] found that the lake which was generally 500 feet down, was level with rim of crater and boiling".[61] Approximately 12 % of the 700 active volcanoes across the world have crater lakes (Rowe *et al*., 1992). Changes in the lake temperature and chemistry, along with seismicity are noticeable signs that a magma intrusion may be taking place within a crater lake (Ohba *et al*., 2000). This is due to a change in degassing (emission of volcanic gases from magma) and heat flow rates that can lead to variations in the physical and chemical properties of crater lakes that result in volume, composition and lake

[61] Hovey E. (1902) Field notebook of St. Vincent: Eyewitness account from Taylor, AMNH: Edmund Hovey Collection, Box 2, Item 17, pg. 8

temperature changes (Martínez *et al*., 2000; Rouwet *et al*., 2004). Heat flow rates also depend on fracturing, which can relate to precursory activity (Kilburn and Voight, 1998).

4.4.1 Inland-directed PDC

Observations from two individuals retrieved from the archives [62] for the 1902-1903 eruption revealed unusual PDC behaviour, which can contribute to the literature on what happens when PDCs travel off land into the sea. Some PDCs generated during the eruption reached the coast. Mr. Durant, who was in Georgetown at the time of the 7th May eruption, observed a PDC flow through the Orange Hill Estate (Figure 4.3) and looking north saw:

> *"…a flash of pinkish purple light resembling lightning seemed to disconnect (spilt) the cloud as it passed to windward, wh[ich] opened and closed again instantly – half of this cloud passed on to windward and the remainder came back on the island".*[63]

A further description of this current by Mr. Taylor, a man who along with approximately 30 others survived the very same PDC by hiding in a rum cellar of the Orange Hill Estate,[64] provided detail on how it felt, sounded and smelt to be within the current:

> *"…the cloud rolled down from the Soufriere along the ravines, struck the sea, burst into flames poof, poof, poof, and at once turned back toward the sugar factory striking the building with great force and forcing shut the heavy doors and the heavy wooden shutters of the window openings".*

Here, these passages are interpreted to have described a PDC that flowed "back inland", in the direction from which it had descended, after reaching the ocean. Another example of PDCs flowing out into the sea was during the 1902 eruption of Mont Pelée on Martinique (which began a week before La Soufrière's eruption). It was discovered that the same nuées ardentes that destroyed St. Pierre, flowed northwest across water and destroyed St. Philoméne and Fond Canonville (Fisher *et al*., 1980). More recent examples are of PDCs from Soufrière Hills Volcano on Montserrat (Hart *et al.*, 2004).

A key paper by Edmonds and Herd (2005) provides a more recent case study example of the behaviour of what they describe as an "inland-directed surge". In 2003, Soufrière Hills

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[62] Hovey E. (1902) Statement of Mr. Durant, AMNH: Hovey Collection, Box 3, Item 30, pg. 8; Hovey E. (1902) Statement of Taylor, survivor of the Orange Hill Estate, AMNH: Hovey Collection, Box 3, Item 31, pg. 14

[63] Hovey E. (1902) Statement of Mr. Durant, AMNH: Hovey Collection, Box 3, Item 30, pg. 8

[64] Hovey E. (1902) Statement of Taylor, survivor of the Orange Hill Estate, AMNH: Hovey Collection, Box 3, Item 31, pg. 14

Volcano on Montserrat experienced a large lava dome collapse. A single large PDC reached the coast and produced a base surge that flowed back in-land.

Another example of this behaviour was recorded during the 2006 eruption of Mt. Etna in Sicily. A PDC was observed to flow over a large body of water but then part of the current travelled backwards. It was believed the generation of an "inland-directed base surge" was due to the rapid heating of water within moist rock fragments that caused further fragmentation and created a runaway fragmentation process (Behncke *et al*., 2008). The thermal energy transfer from hot currents to cool water are an important difference between over-land and over-water flows but, require 10 % weight of water to be incorporated into a PDC in order to expand the current by 400-500 times to generate a base surge (Allen and Cas, 2001; Freundt, 2003; Watts and Waythomas, 2003).

The contact between volcanic material and water can be so violent that they create co-ignimbrite clouds produced from coastal explosions. Co-ignimbrite is defined as a cloud of fine ash particles that overrides a pyroclastic density current (Sparks and Walker, 1977; Houghton and Wilson, 1989; Wilson, 2001). However, the littoral blasts generated when pyroclastic density currents first enter the water appear to be dependent on a fine grain size distribution that causes rapid energy transfer from particle to water (Zimanowski *et al*., 1997; Mastin and Witter, 2000; Edmonds and Herd, 2005; Dufek *et al*., 2007). Here, the "…burst into flames, poof, poof, poof…" and "came back on the island" descriptions are interpreted to record the interaction between the hot volcanic material and cool seawater – which caused "steam blasts" or littoral blasts that Mr. Durant observed to split and come back onto the land. This resulted in the PDC flowing back inland to impact the factory.

4.4.2 Volcanogenic landslide

Evidence for the 1902-1903 eruption indicates that there was significant landslide in the Wallibou-Morne Ronde area (Figure 4.1). A photograph taken by Tempest Anderson at Wallibou (Figure 4.12) in 1902 and at Morne Ronde in 1907 (Figure 4.13), show cliff scarps indicative of landslip:

Figure 4.12. Titled "Wallibu, site of subsidence" taken by Tempest Anderson and held at the Yorkshire Museum (TA030). A statement to Edmund Hovey was provided of this area: "Mr. Marthies said to Mr. Durant that he visited Wallibou estate at the northern base of the mountain and found that a bastion of what had been the shore of that bay, had been blow[n] out to sea and had disappeared and water 3 feet deep [was] to be found when [there] had been a sloping beach of 120 feet, lined inshore by low cliff". [65] The cliff face behind the expedition party shows several layers of deposits, some distinct and faint scarp marks, and *in situ* erosion, showing evidence of a significant cutting back of the cliff face.

[65] Hovey E.O. (1902), AMNH: Hovey Collection, Box 3 Item 30, pg. 5

Figure 4.13. Titled “Site of Morne Ronde subsidence” taken by Tempest Anderson and held at the Yorkshire Museum (TA240). The 1902-1903 pyroclastic deposits are being eroded. The middle of the photograph appears to be a network of drainage channels cut within re-worked pyroclastic material, and the surrounding area, including the cliff, was already vegetated with shrub four years after the eruption. The cliff shows signs of scarring but also weathering.

Based on maps prior to the eruption, the Wallibou-Morne Ronde area was already mountainous, with cliffs and intersecting river valleys (Figure 4.13). As little evidence was found for this area prior to the eruption, there is uncertainty as to when the landslide occurred. However, a brief report published in the Nottingham Evening[66] on the 13th May 1902 from a cable repair ship, stated that an area of telegram cables had 'sunk”, indicative that the landslide may have extended offshore: “The Pouyer Quertier is trying to repair the cable. She reports that she finds it has sunk 1,200 metres where it was only 300 metres down”.

[66] Nottingham Evening, “St. Vincent disaster. Darkness and death. Panic-stricken inhabitants”, 13th May 1902

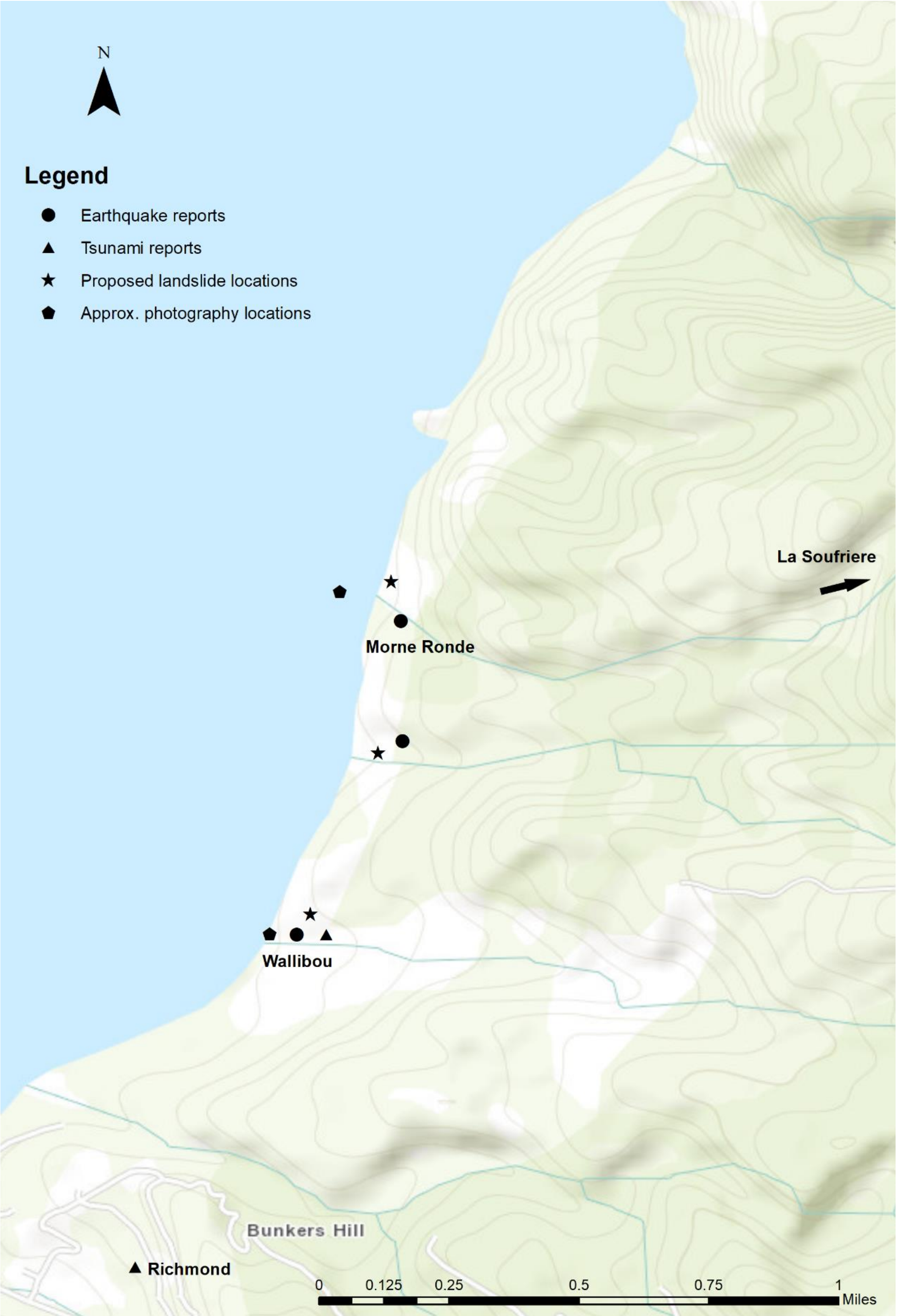

Figure 4.14. Map of the proposed location of the 1902 volcanogenic landslide. Maps and DEMs available cannot make out any significant indications of slumps.

This means there was a 900-metre drop in this area. Although it is not clear how far off the coast the ship was located, Figure 4.15 does show that the cable was located west of St. Vincent, where the Wallibou-Morne Ronde area is:

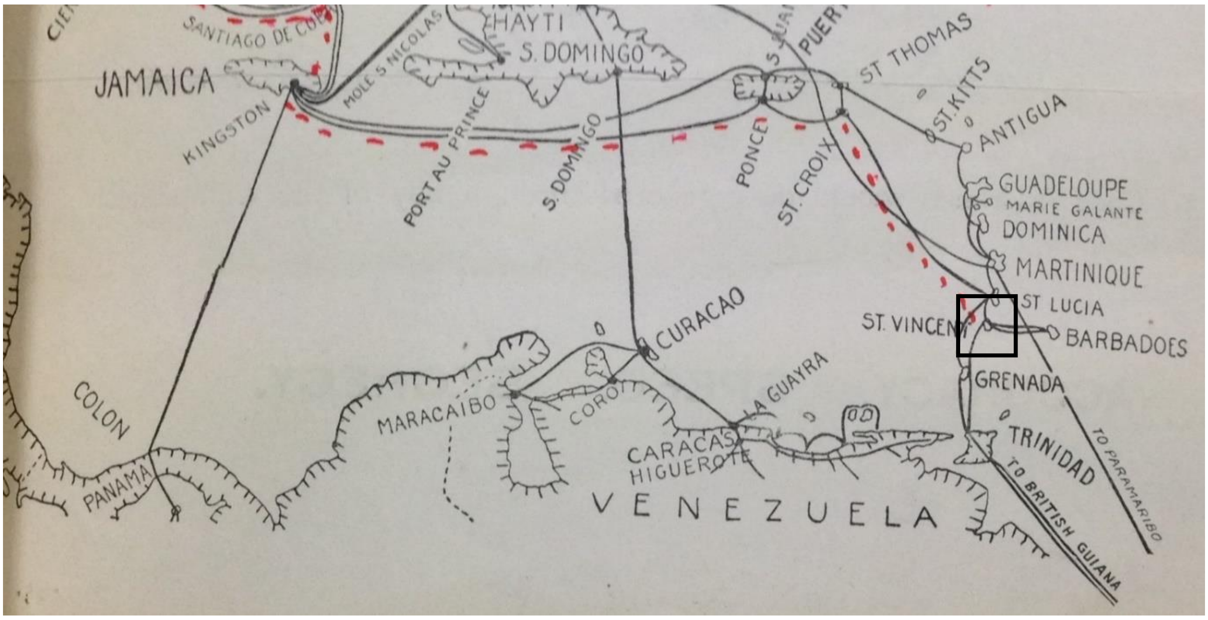

Figure 4.15. Telegram cables connecting the Lesser Antilles, Greater Antilles, South and North America.[67] The black box highlights St. Vincent. Two cable lines run west of the island, one appears closer to the Leeward coast whilst the other is further offshore, and both lines go between St. Lucia and Grenada. The red dashed line was present in the original map, with a note attached stating: "6 cables are still interrupted in the West Indies. Interrupted 5th-7th May". It is possible that the landslide took place during this time, as the initial eruption began on the 6th and the first major PDCs occurred on the 7th.

Personal communication with David Clark, an engineer who works on present-day submarine cable lines, stated that structural damage to such lines could only be the result of either an earthquake or landslide (Clark, pers. comms, 2017). Further observations of the Wallibou and Morne Ronde area suggest a landslide:

> *"…the shores for a considerable space inland along the coast at Wallibo[u] and Morne Ronde sank under the sea to a great depth and boats now travel over the site of Wallibo[u] Village. At 50 feet outwards from the present beach, and where land formerly existed 20 feet above sea level, the water is now 7 ½ fathoms deep, and at 100 feet outward from the same point on the beach it is 18 fathoms. This subsidence appears to be strictly defined with its southern limit at the mouth of the Wallibo[u] River".*[68]

[67] The Halifax and Bermudas Cable Co. Limited and Direct West India Cable Co. Limited Map of the West Indian and North American Telegram Cable route, 3rd June 1902, TNA: CO 321/214

[68] Huggins (1902); 20 feet is 6.1 metres and 7 ½ fathoms is 13.7 metres, with the calculation 6.1-13.7 this equals -7.6 m of material. 18 fathoms is 33 metres.

Further evidence that a landslide occurred in this area links to an earthquake report in the Wallibou area on the 7th May, where "…nineteen shocks occurred within half an hour".[69] It was determined that The Grand Banks 1929 7.2 magnitude submarine earthquake, located south of Newfoundland, generated a large submarine slope failure that damaged 12 telegraph cables (Fine *et al*., 2005).

The evidence of a landslide matches previous evidence that a tsunami was generated by La Soufrière in 1902. Between 7th-8th May, it was stated that "Wallibou was partly under water, which had been swept in from the sea by a tidal wave" and "The Wallibou estate was destroyed, at least in part, by the wave". In addition, the plantations of Richmond (Figure 4.4) were found to be "under water" (O'Loughlin and Lander, 2004).[70] These descriptions can relate to liquefaction, as the area impacted is at the mouth of the river on a beach which would have waterlogged unconsolidated granular sedimentary materials, mainly sands, and then shocks producing vibrations run through these sediments.

Further reports relate to the interaction between the landslide, pyroclastic material and water.

> *"On the Richmond estate near the seashore, a new crater had formed, from which fire and ashes were being vomited…The strange colour and great depth of the new inlet of the sea on the Wallibou imply that an eruption occurred there and that a new crater has been formed which extends from the land into the sea".*[71]

The complex interaction between the landslide, pyroclastic material and water are related to the hydrovolcanic explosions that also occurred in the Wallibou area (Figure 4.7). A moderate landslide, may have caused small tsunami waves to wash back onto shore, impacting the Wallibou and Richmond estates. The waves were between 2-3 metres in height and travelled for approximately an hour (Latchman, 2016). Given that the earthquakes, landslide, and tsunami occur in the same area, the same day for the earthquakes and tsunami, are likely to be related.

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[69] Graves C.B. (1902) "A visit to St. Vincent – how the warnings of the volcano were acted upon", The New York Times, 24th May 1902.

[70] This evidence was personal communication in 2001 by "Woodworth" to O'Loughlin and Lander (2004), however the "Elizabeth Daily Journal" from New Jersey, USA from 19th-22nd May 1902 was said to be Woodworth's source.

[71] See footnote 65.

Small slumps or even PDCs or lahars from a volcano's edifice can produce local tsunamis (Heinrich *et al.*, 1999). Well known examples include the 1792 collapse of Mt. Unzen in Japan, which generated tsunami wave heights of 15 metres from an avalanche of 300 million m^3 of Unzen's edifice, killing more than 35,000 people (Francis, 1993). In 1888, Ritter Island Volcano in Papa New Guinea caused the largest collapse of an island volcano recorded in historical times. Approximately 5 km^3 of material generated tsunami waves 8 metres high, travelling up to 40 to 80 ms^{-1} that lasted for three hours (Ward and Day, 2003). Lastly, 20 x 10^6 m^3 worth of submarine material slumped from the 30th December 2002 event of Stromboli in Italy, generating a tsunami (Pino *et al.*, 2004).

4.5 Reconstruction of the 1979 eruption

In 1952, the Seismic Research Unit of the University of the West Indies was established with the aim of monitoring volcanic activity in the Lesser Antilles, which also included St. Vincent.[72] Monitoring instrumentation, however, was limited and the Belmont Observatory was not officially established before the onset of the 1979 eruption.

La Soufrière's activity first heightened in 1971 with an increase in crater lake temperature and seismicity, which led to an effusive eruption of lava to form a dome in the middle of the crater lake until 1972.[73] By 1976, there was no water present in the crater (Figure 4.16).

[72] The University of the West Indies Seismic Research Centre (2011) Island profiles: St. Vincent – monitoring [online] http://uwiseismic.com/General.aspx?id=70 [accessed 16/10/18]

[73] Seismic Research Unit (1980) Surveillance of Soufriere volcano, St. Vincent by the Seismic Research Unit, University of the West Indies: 1953-1980

Figure 4.16. Crater of La Soufrière in 1976 photograph taken by David Mart with a digital copy donated by Mr. L Peters in 2016. The lava mass to the left of the photograph was emplaced during the 1971-1972 effusive eruption, where there was a crater lake present, however by 1976 no water remained. The white gas emitting from the mass are fumaroles. Vegetation from the crater rim and inner walls has died off, owing to the gas emissions and heat emitted.

Precursory volcanic seismicity then occurred in 1978 before the explosive eruption. The relatively minor activity continued unchanged until early April 1979 when on the 12th April, the frequency of volcanic seismicity increased to approximately one per hour. By midnight, volcanologists monitoring the volcano stationed at the makeshift observatory of Belmont, sent a phone call to the government of St. Vincent of an 'abnormal' situation at the volcano.[74]

Interviews of people who lived closest to the volcano (Fancy, Owia, Sandy Bay, Overland, and Orange Hill) (Figure 4.20) in 1979 reveal that they did not feel any precursory earthquakes, upon asking a question about precursory activity. Two interviewees from

[74] Seismic Research Unit (1980) Surveillance of Soufriere volcano, St. Vincent by the Seismic Research Unit, University of the West Indies: 1953-1980

Sandy Bay on the eastern side of the island (Figure 4.20), noticed ash fall at approximately 07:00 on the 13th April. One of the women said:

> *"I was up early because it was Good Friday, so preparing the meal and so on. My children were out fetching water but ran back shouting: "Mum! Mum! What is on my shirt?!" They had white shirts on, and I knew immediately what it was, I said "That is ash from de [the] Soufrière, my grandmada [grandmother] told me the last time it did this".*

However, on the western side of the island at Chateaubelair, two interviewees (Figure 4.20) said they started to notice the fall of ash after hearing people in the street shouting "Soufrière erupting!" at approximately 13:00. One of the men from Chateaubelair said:

> *"…I came out to see what the fuss about when [people] was shouting: "Soufriere! Soufriere!" The moment I saw ash falling, I grabbed my wife and son and we walked down to Barrouallie".*

Ash was reported to fall in Kingstown in the afternoon and the following day.[75] Due to the restricted visibility of clouds and the ash fall, people closest to the volcano were unable to see the ash plume. However, the plume was clearly visible in the south, described as a 'cauliflower' (Figure 4.17). They observed the vertical expulsion of volcanic material that was being kept buoyant through convection.

[75] The Star, "A scientific team's report, a midnight explosion – 1.2 million ton of ash dumped on island", 28th April 1979

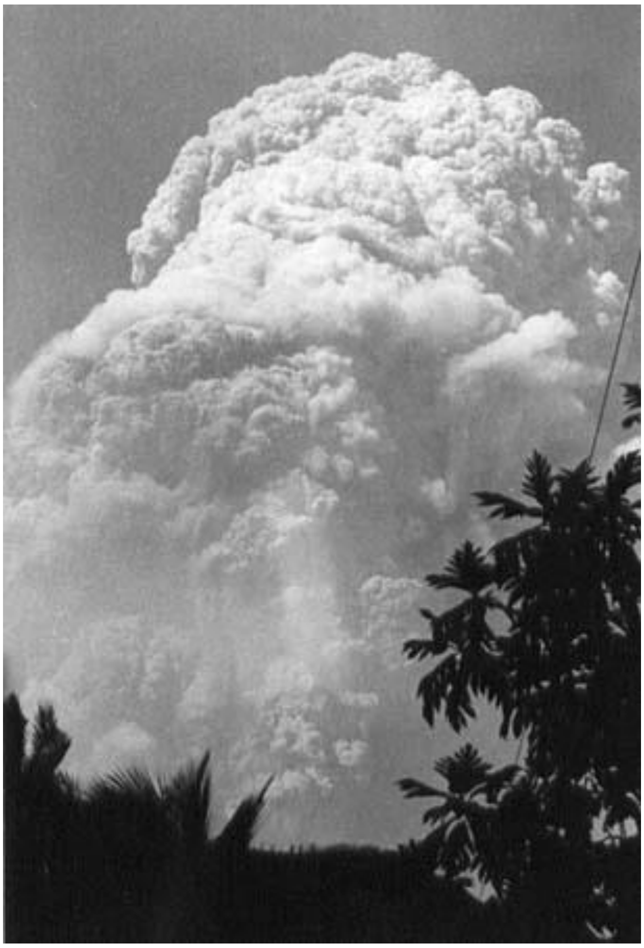

Figure 4.17. Ash plume of La Soufrière photograph on the 13th April 1979, a digital copy was donated for this study by Mr. L Peters in April 2016 however, the original owner of the photograph is unknown. The photograph was taken from an unknown location but on the day of the initial explosion. The rising plume demonstrates the dynamics of convection with the cloud, with the upper part appearing to move away from the photographer, perhaps due to the wind direction. The angle of the photograph and the obstructing foreground, does not show any collapses of the plume that generate PDCs, typical of St. Vincent-style PDCs (Newhall *et al*., 2000).

"…by the afternoon we see the big cauliflower in the air" – Interviewee from Villa (Figure 4.20)

"I saw the huge cauliflower in the air. It filled me with dread. I asked…what did I do wrong? Was God punishing me?" – Interviewee from Sion Hill (Figure 4.20)

Due to the knowledge of what happened in 1902, a government evacuation order was promptly issued to settlements north of the Rabacca River and Chateaubelair (Figure 4.20) on the same day. Only the Windward Highway (Figure 4.20) connects the north settlements to the south, and this goes through the Rabacca River (at this stage, a bridge was not built).

An interviewee from Fancy recalled how he came the next day (14th April) to the Rabacca River to find "hot water" flowing, probably a lahar:

> *"I did not want to leave straight away but when I did, I wanted to walk from here to Georgetown where I could get a pickup. I tried to cross [Rabacca] Dry River but the water was hot".*

The lahar was not large compared to the first lahars of 1902 or 1812. This was probably due to the absence of the crater lake that had disappeared a few years prior to 1979. On the same day, reports of PDCs occur as a "hot avalanche" down the Larikai River Valley (Figure 4.20) that flowed "several kilometres" out to sea.[76] Additional PDC deposits were identified in the upper 2.5 km of the Rabacca River valley catchment by Belmont Observatory volcanologists.[77] An interviewee who was a police officer stationed at Georgetown during the event said that an officer saw the Rabacca River PDC, stating: "…he said it got dark, then he saw the mountain come rolling down towards him and got out of there like a shot!". A further description provides more detail: "The continual flashes of lightening, the intense heat and the visible appearance of a glowing avalanche cascading down the mountain side toward the Rabacca River…".[78]

On the 16th, activity was reported to have changed. A small continuous lahar was observed in the Rabacca River.[79] The observatory recorded 30 earthquakes per hour, but from midnight the earthquakes changed to a "fracture-type".[80] The following afternoon activity increased again with approximately 70 minutes of tremor and only 15 seconds warning before an explosion taking place at 16:57.[81] For three minutes, a PDC flowed down the Larikai River Valley (Figure 4.20). The current took two minutes to cover two kilometres at a speed of 17 ms^{-1} and then decelerated, but eventually covered the remaining kilometre to reach the coast.[82]

Two days later, a restriction zone was in place for all settlements north of Belleisle Hill in the west and Union in the east (Figure 4.20) lasting until September. Approximately 14,000

[76] Cato M. (1979) "Report to the nation by the Hon. Premier – R Milton Cato, April 16 1979", NDAS-SVG: Volcanoes VI
[77] Anon. (1979) "News", NDAS-SVG: Volcanoes VI
[78] The Star, "The Soufriere experience", 28th April 1979
[79] See footnote 76.
[80] The Advocate, "Providing help for St. Vincent", 28th April 1979
[81] See footnote 81
[82] See footnote 81

people were evacuated, with no deaths reported for this eruption (Robertson, 2005). On the same day, numerous reports gathered by an anonymous source described ash deposits in Union, Fancy, Owia, Orange Hill, Georgetown, Colonarie, Prospect, Arnos Vale, and Kingstown (Figure 4.20) as well as the Grenadine islands of Bequia and Mustique (approximately 35 and 50 km respectively) south of La Soufrière.[83]

For the rest of April, there were continued periods of intermittent but diminished activity. However, on the 3rd May, an anonymous photographer took a photograph of the crater, showing the formation of a lava dome (Figure 4.18). For three days, this quiet phase of lava extrusion had grown to a considerable size with no explosions recorded.

Figure 4.18. Lava dome on the 3rd May in the Soufrière crater photograph. A digital copy was provided by Mr. L. Peters in 2016, but the original photographer was not identified. The crater was absent of a standing body of water and, the floor covered by volcanic material. However, the rapidly protruding mass of viscous lava was interacting with any water remaining as well as its own fumarole activity, generating the white clouds of steam surrounding it.

[83] Anon. (1979) Unnamed report, 19th April 1979, NDAS-SVG: Volcanoes VI

The effusion had almost undetectable seismic activity albeit the occasional rockfall from minor dome collapse reported by the Observatory (Roobol and Smith, 1975; Shepherd and Aspinall, 1982).

With the quiet localised activity that was no longer generating explosions, reports from the Observatory to the newspaper were given weekly to keep the public informed. In late May there were increased reports of lahars, coinciding with the onset of the rainy season. Lahars were confined to the river valleys that had PDCs (Larikai, Rozeau, and Rabacca) but also considerable deposits of ash in the Wallibou River. It was reported that the lahars were "highly erosive" but by July, the lahars "…did not contain as much volcanic material". [84] Weekly reports from the volcanologists became monthly from July, with no further explosive activity occurring and quiet lava dome growth until 1983.

The different experiences of the same event is known as the 'Mismatch Effect', which is based on the distance from the volcanic vent (Barber and Barber, 2004). Cashman and Cronin (2008) further suggest that geographic separation of individual settlements further encourages variations on the retelling of the same event. For St. Vincent, variations of the story were found of those living in the northeast and northwest and compared to the north to the south. However, observations by the public were typically undated, perhaps due to the official governmental restriction of people north of the evacuation line (Belleisle Hill to Union) (Section 6.3.1).

Ash fall was the main volcanic hazard affecting the population during this eruption, falling in a "10-mile radius" around the volcano, but it was not damaging.[85] The ash was considered irritating, as stated by an interviewee from Barrouallie in an annoyed tone: "The ash got everywhere". However, in Orange Hill the ash load was enough to cause roof collapse.[86] In Georgetown, a mixture of stones and ash fell and in one instance, it was reported that scoria was approximately 7 cm in diameter.[87] Volcanic bombs were found along the Windward

[84] Belmont Volcano Observatory (1979) 10th May 1979 report, NDAS-SVG: Volcanoes VI; Belmont Volcano Observatory (1979) 3rd July-13th August 1979 report, NDAS-SVG: Volcanoes VI; The Advocate, "Lava dome grows in La Soufriere", 3rd June 1979

[85] The Advocate, "Vincentians flee the wrath of Soufriere", 21st April 1979

[86] Anon. (1979) Unnamed report, 19th April 1979, NDAS-SVG: Volcanoes VI

[87] The Star, "The Soufriere experience", 28th April 1979; Anon. (1979) Unnamed report, 19th April 1979, NDAS-SVG: Volcanoes VI

volcano trail that starts at Lot 14 (Figure 4.20). The landscape near the volcano was described as a "lunar landscape",[88] which may have looked like Figure 4.19.

Figure 4.19. Unidentified location in the northern half of St. Vincent photograph taken originally by Arnold DaSilva and a digital copy donated by Mr. L. Peters in 2016. The appearance of the landscape resembles to Tempest Anderson/Edmund Hovey 1902 eruption photographs – the large amount of ash/pyroclastic material had entirely buried what was once rainforest on the upper slopes of La Soufrière.

Ash was also reported to fall on Barbados, also creating a nuisance: "…the abrasive, sulphurous talc, insinuated itself into every crevice of our homes, blanketed our roofs, plants, trees, offices and beaches".[89] Lastly, there were undated reports from the Observatory stating that lahar deposits had been found in the Rozeau River Valley and in the Upper Rabacca River Valley.[90]

The eruption impact map of 1979 (Figure 4.20) provided the observational locations of reported ash fall, lahars, pyroclastic density currents, and earthquakes on St. Vincent. The location of interviewees conducted for this study at the time of the eruption and the Belmont Volcano Observatory have also been given. Figure G11-14 (in Appendix G) provides

[88] Anon. (1979) Unnamed report, 19th April 1979, NDAS-SVG: Volcanoes VI
[89] Sunday Advocate News, "It's our moral duty to help St. Vincent", 6th May 1979
[90] The Star, "Lava dome growing in crater", 12th May 1979; Belmont Volcano Observatory (1979) Observation report: 10th May 1979, NDAS-SVG: Volcanoes VI.

a timeseries of PDC flow paths and Figure 4.22 is the ash isopach map for 1979 that was completed by the Seismic Research Centre.

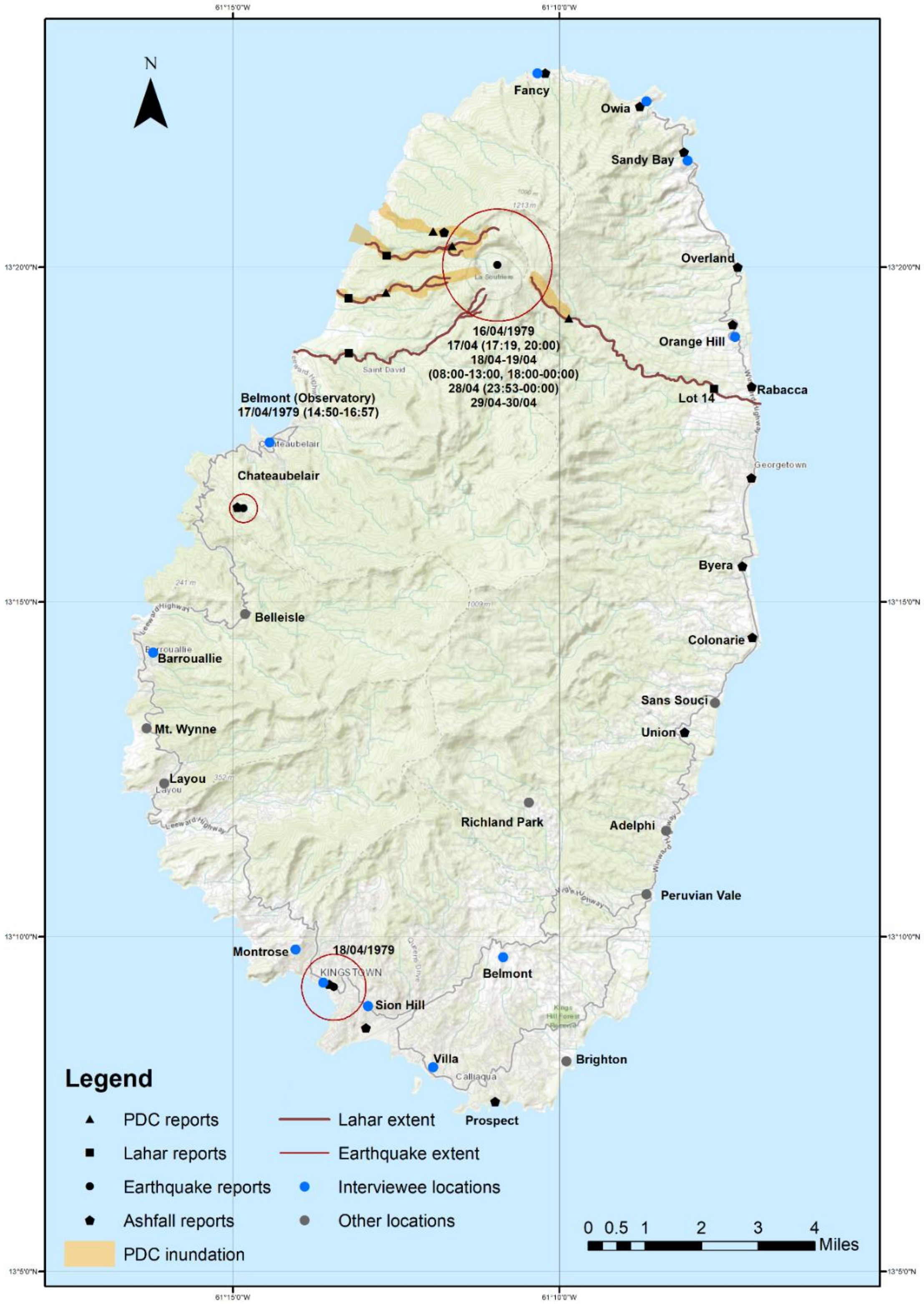

Figure 4.20. The eruption impact map for the 1979 eruption. As ash fall was widely reported across the whole island, a layer was not developed for the map.

Compared to the 1812 and 1902-1903 maps, the 1979 map shows the most significant difference in terms of volcanic hazard dispersal. Ash fall was a nuisance to inhabitants across the whole island, with only a few reports of roof collapse under the weight of ash.

Instances of felt earthquakes were considerably reduced compared to 1902-1903, with the Belmont Observatory's seismograph network registering most of the different volcano-seismic signatures. The base map (Appendix G, Figure G3) has the most topographic detail, enabling the most accurate mapping of lahar and PDC flow paths.

The base map shows how far from the source the Wallibou and Rabacca river lahars reached and the complexity of the Rozeau and Larikai Valley topography. A time-series of lahars are in Appendix G, Figure G10. PDC flow paths for this eruption was the most distinct due to all being channelised flows confined to four river valleys. A time-series of the PDCs can be found in Appendix G, Figures G11-14.

4.6 Comparisons of the 1812, 1902-1903 and 1979 eruptions

The 1812 and 1902-1903 eruptions are similar to one another, but different to the 1979 eruption due to the order of magnitude (Table 4.1). The 1812 and 1902-1903 eruptions were a four on the "Volcanic Explosivity Index" (Section 4.6.1), which controlled the greater extent of PDCs blanketing the eastern and western flanks of La Soufrière, compared to PDCs being channelled down a handful of river valleys in 1979, which was a three on the Volcanic Explosivity Index. The influence of magnitude will also be explored for lahars, earthquakes, and ash fall.

The preceding work on reconstruction of the eruptions from archival sources allowed the production of the eruption impact maps, something that has not been done before for St. Vincent (Section 3.5). These maps, and the chronological narratives, have allowed for direct comparisons between the three eruptions (Table 4.1).

Table 4.1. Comparative table of La Soufrière's 1812, 1902-1903, and 1979 eruption length, VEI, dominant eruptive style, area covered by volcanic hazard deposits, total population of the island, total percentage of people evacuated and lastly the number of people killed. VEI stands for the 'Volcanic Explosivity Index', developed by Newhall and Self (1982). Based on a logarithmic scale from 0 to 8, itis a general indicator of explosivity that takes into consideration: intensity, destructiveness, dispersion power, energy release rate, violence, and the amount of volcanic material ejected during an eruption (Tsuya, 1955; Newhall and Self, 1982;

Pyle, 1995; Pyle, 2000). Further potential parameters include the ash column height and its velocity to reach a given height, the release rate of kinetic energy and destructive potential (Walker, 1980). A Sub-Plinian eruption is defined as unsteady magma discharge rates and the development of oscillating convective columns of lesser height that collapse repeatedly to generate PDCs, their deposits are often less extensive and well-preserved than those of Plinian eruptions (Komorowski *et al*., 2008). Vulcanian eruptions have intense explosions at the onset, followed by continuous emission of volcanic gases and tephra (Iguchi *et al*., 2008). The duration of an eruption is a critical dimension within a volcanic crisis. The 1812 percentage of those evacuated is based on the number of enslaved Africans in 1811 (745). [91] Wider dispersal of ash fall is dependent on duration, as there would be a greater influence of varying wind directions (Kittleman, 1979). [a] VEI data for 1812 and 1902-1903 from Newhall and Self (1982). [b] Eruption style data from Cas and Wright (1987). Total area/length of ash, lahars and PDCs was calculated using ArcGIS's calculation of shapefile/polyline tool.

	1812	**1902-1903**	**1979**
Length of eruption	Six weeks (27th April-6th June)	10 months (7th May 1902-March 1903)	Two weeks explosive (13th-27th April), four years effusive (1983)
VEI [a]	4	4	3
Dominant eruptive style [b]	Sub-Plinian	Sub-Plinian	Vulcanian
Total area covered by ash (km^2)	131	332	344
Total length covered by lahars (km^2)	16	75	29
Total area covered by PDCs (km^2)	37	49.6	3.2
Total population on island	26,740	48,250	86,940
Percentage of people evacuated (%)	3 (802 people)	8 (3,860 people)	16 (13,910 people)
Percentage of people killed (%)	0.2 (53 people)	2.8 (1,351 people)	0

In 1812, there were approximately 12 plantations in the north, by 1902 the 12 plantations plus an additional six locations were turned into settlements but by 1979, ten more settlements were established (Figure 4.21). Settlements built by 1979 were developed north

[91] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

and south of PDC flow paths (Figure 4.21), but it is unclear if this was a conscious decision based on the previous 1812 and 1902 events. How these areas would respond, with a population based on the last census of 2001 at 97,845, [92] would first depend on precursory activity and the size of the eruption.

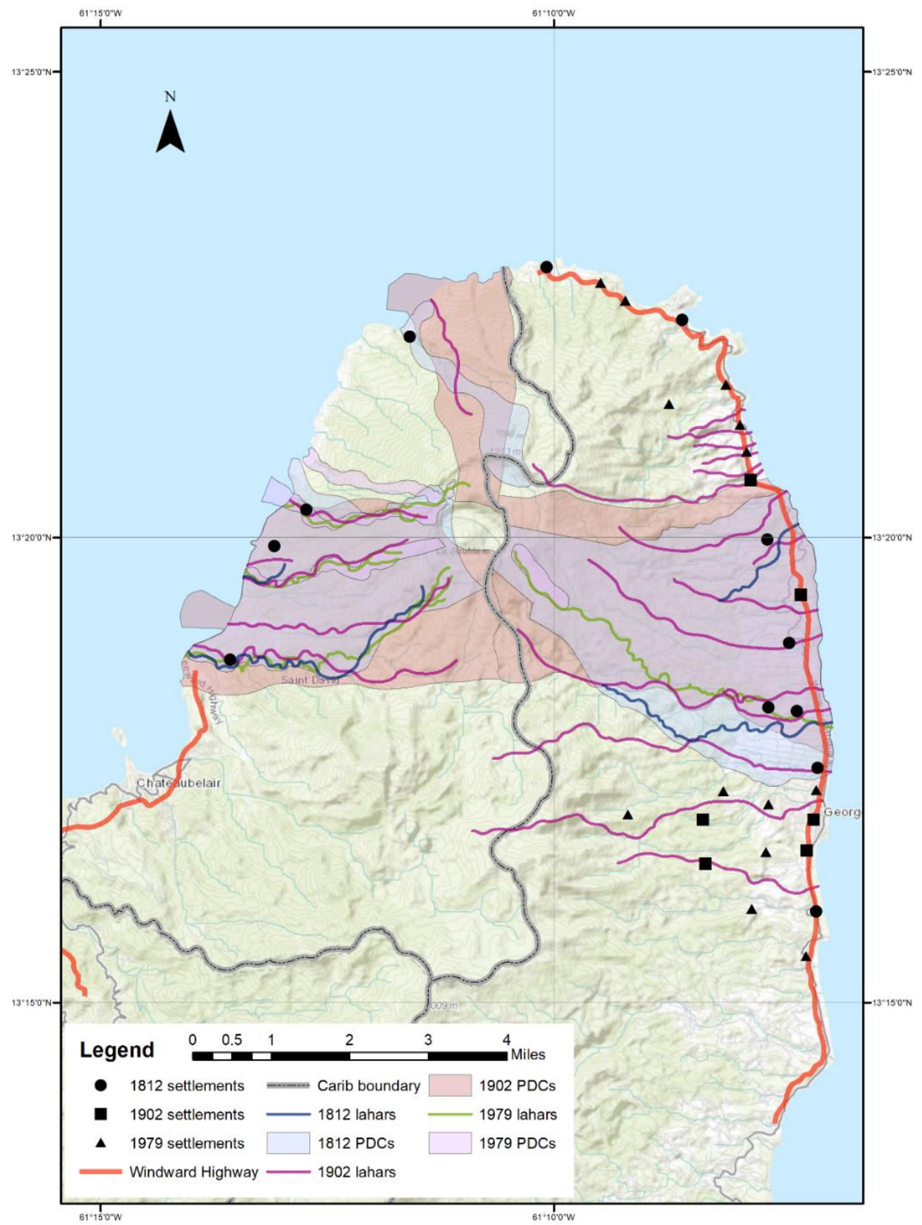

Figure 4.21. Established settlements and volcanic hazard inundation in 1812, 1902-1903, and 1979 collected from historical maps and the three maps created in Section 4.2. The number of settlements is based on what was drawn on the historical maps and therefore, smaller built-up areas not shown on maps may exist today. Three settlements established in 1812/1902 were abandoned and have not been populated since (see Chapter 6). The highway has existed throughout the 168-year period but was not tarmac until 1979 and the bridge over

[92] Statistical Office, part of the Central Planning Division (2001) St. Vincent and the Grenadines population and housing census report 2001: Population size and growth 1871-2001. Kingstown: Ministry of Finance, Planning and Development

the Rabacca Dry River was not built within this time. It is uncertain whether the 1902 and 1979 settlements on either side of the eastern flank PDCs were consciously built because of the volcanic hazard.

The 1812 and 1902 PDCs flowed in similar locations, as did almost all the lahars for the three eruptions – vital information for future hazard/risk assessments and buildings. When compared to the current volcanic hazard map of La Soufrière (Figure 4.22), which is dominantly based on geological studies, the eruption impact maps are similar.

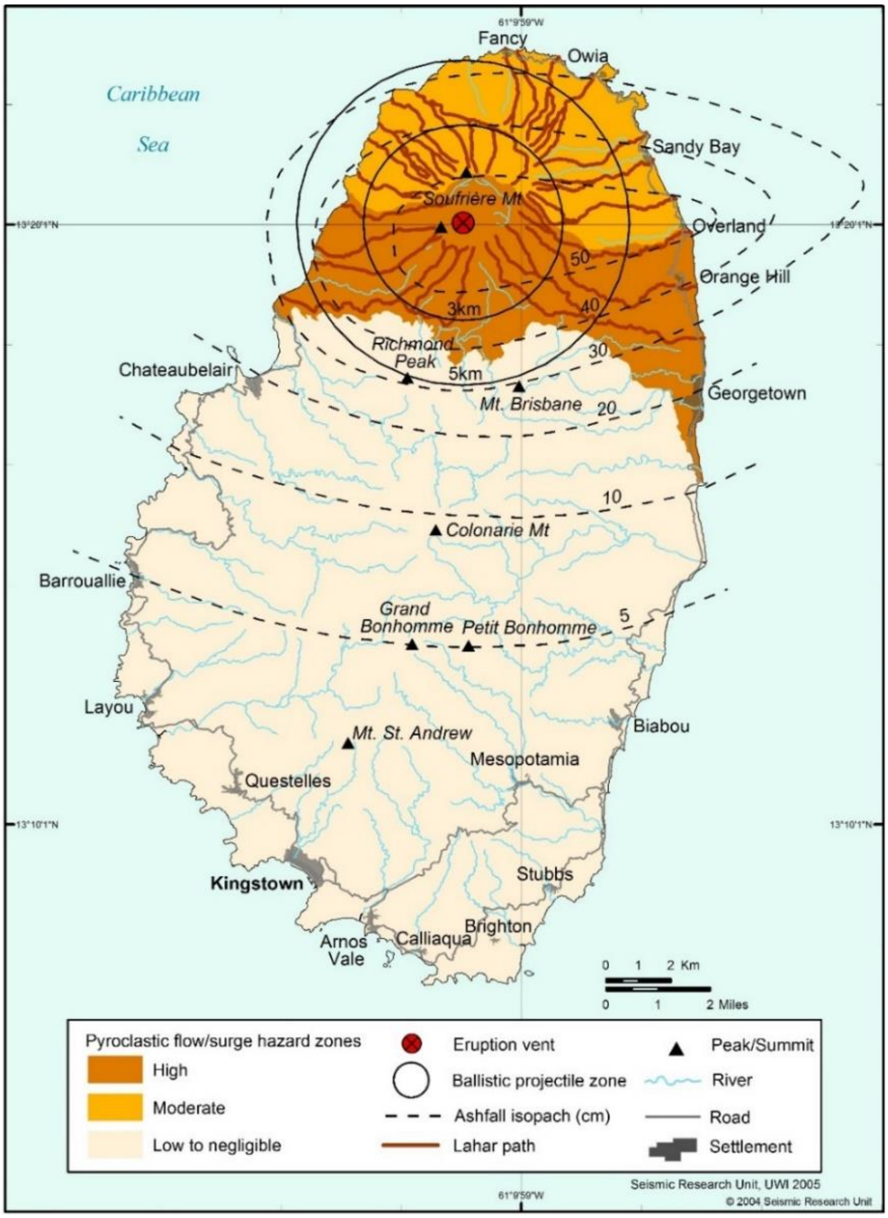

Figure 4.22. The current volcanic hazard map for La Soufrière produced by the Seismic Research Unit (now Seismic Research Centre) in 2005, displaying pyroclastic density current and lahar hazard zones and an ash isopach based on the 1979 and 1902 eruptions, as well as one tephra isopleth for 1902 . The lahars identified in the archival record for the 1902-1903 eruption may not match with the hazard map due to their deposits not being preserved in the geological record.

Similarities between Figure 4.22 and 4.23 include the blanketing of PDCs on the eastern and western flanks, whereby the eruption impact map PDC layers almost identically match with the "high" pyroclastic flow/surge hazard zones. However, lahars that occurred during the 1902-1903 eruption south of Georgetown are not featured in the official map (Figure 4.22).

Table 4.2 shows the frequency of lahars and PDCs for the three eruptions. As many descriptions of processes across the three eruptions had no dates attached to them (See Appendix G, Tables G1-G3), they were not calculated within the dataset, as descriptions could be observing the same process.

Table 4.2. Frequency of lahars and PDCs for the 1812, 1902-1903 and 1979 eruptions, arranged from east (starting at Rabacca Dry River) to west coast (starting at Morne Ronde River for 1812 and 1902-1979 and Larikai River for 1979). The northern, western and eastern flanks are PDCs that blanketed the flanks, not channelised down individual river valleys. The total number of lahars across the three eruptions was n=26 and n=33 for PDCs. The 1902-1903 eruption saw more river valleys active (n=6) compared to n=4 for the 1979 eruption and n=5 for the 1812 eruption. Percentages calculated was the number observed of the total number of hazard processes for the event in question.

		Rabacca Dry River	Tourama River	Morne Ronde River	Larikai River	Rozeau River	Wallibou River	Wallibou Dry River	Northern flank	Eastern flank	Western flank	Total
Lahars	1812	0	1 (33.33 %)	1 (33.33 %)	0	0	1 (33.33 %)	0	0	0	0	3
	1902	10 (58.82 %)	0	1 (5.88 %)	1 (5.88 %)	1 (5.88 %)	3 (17.65 %)	1 (5.88 %)	0	0	0	17

		Rabacca Dry River	Tourama River	Morne Ronde River	Larikai River	Rozeau River	Wallibou River	Wallibou Dry River	Northern flank	Eastern flank	Western flank	Total
	1979	2 (33.33 %)	0	0	1 (16.67 %)	2 (33.33 %)	1 (16.67 &)	0	0	0	0	6
PDCs	1812	2 (28.57 %)	0	2 (28.57 %)	1 (14.29 %)	0	0	0	1 (14.29 %)	0	1 (14.29 %)	7
	1902	2 (17.65 %)	0	0	3 (17.65 %)	1 (5.88 %)	2 (17.65 %)	1 (5.88 %)	2 (17.65 %)	1 (5.88 %)	4 (23.53 %)	17
	1979	2 (22.22 %)	0	0	5 (55.56 %)	1 (11.11 %)	0	0	0	0	1 (11.11 %)	9

For the 1812 eruption, a total of five PDCs were concentrated in three river valleys (Rabacca Dry River, Morne Ronde River and Larikai River), with Rabacca Dry River and Morne Ronde River at a frequency of 28.57 % (n=2) of five recorded PDCs, compared to 14.29 % (n=1) of five for the Larikai River. Conversely, there was one PDC that blanketed the northern flank and another that blanketed the western flank. On the other hand, three lahars were active in three separate rivers: Morne Ronde River, Wallibou River, and Tourama River.

The 1902-1903 eruption, due to its longevity and magnitude, saw more active river valleys compared to 1812. 58.82 % (n=10) of lahars occurred within the Rabacca Dry Valley, but only 17.65 % (n=2) of PDCs. Overall, there were more PDCs that blanketed the western flank (n=4) during the eruption compared to channelised PDCs, the highest being 17.65 % (n=3) of PDCs occurring in the Larikai River.

Lastly, the 1979 eruption saw fewer active locations for lahars and PDCs, but more PDCs occurring (n=9) than lahars (n=7). This reflects the difference in VEI (Table 4.1), as well as the absence of a crater lake (Section 4.5). 33.33 % (n=2) of lahars descended the Rabacca Dry and Rozeau Rivers, whilst 55.56 % (n=5) PDCs were channelised down the Larikai River.

Translating the frequencies of lahars and PDCs for individual river valleys and flanks (Table 4.3) into risk provides results that differ when looking at the eruptions individually.

Table 4.3. Frequency of lahars and PDCs by river valley and volcano flank.

	Rabacca Dry River	Tourama River	Morne Ronde River	Larikai River	Wallibou River	Wallibou Dry River	Rozeau River	Northern flank	Eastern flank	Western flank
Lahar	12 (46.15 %)	1 (3.85 %)	2 (7.69 %)	2 (7.69 %)	5 (19.23 %)	1 (3.85 %)	3 (11.54 %)	0	0	0
	Rabacca Dry River	Tourama River	Morne Ronde River	Larikai River	Wallibou River	Wallibou Dry River	Rozeau River	Northern flank	Eastern flank	Western flank
PDC	7 (21.21 %)	0	2 (6.06 %)	9 (27.27 %)	2 (6.06 %)	1 (3.03 %)	2 (6.06 %)	3 (9.09 %)	1 (3.03 %)	6 (18.18 %)

The Rabacca Dry River on the east coast represented 46.15 % (n=12) of 26 recorded lahars however, there were more river valleys on the west coast (Morne Ronde, Larikai, Wallibou, Rozeau and Wallibou Dry River) that produced 50 % (n=13) of all lahars, which matches the eastern flank frequency when adding Tourama River to Rabacca Dry River's total. On the other hand, the west coast collectively produced more channelised and blanket PDCs (n=23), accounting for 69.7 % of 33 recorded PDCs, whilst the Rabacca Dry River and eastern flank PDCs together have a frequency of 24.24 % (n=8).

Therefore, both the eastern and western flanks are similarly at risk of producing lahars but the western flank is at higher risk of producing PDCs. However, as the eastern flank is more populated and developed (Figure 4.21), the vulnerability of the area is greater than that of the western flank.

Over the 167 years (between the eruptions), the spatial distribution of the increased settlement numbers has concentrated in the east, where the land is flatter compared to the west. At present, no new settlements have developed. Therefore, if activity VEI 4 or VEI 3 happened today, the settlements in Figure 4.21 would be the only ones severely affected.

4.6.1 Volcanic Explosivity Index

The three eruptions of La Soufrière took place on a small island from a singular crater and this work demonstrates that La Soufrière's volcanic hazard characteristics were controlled by the explosivity of the events. The size of 1812 and 1902-1903 eruptions of La Soufrière have been categorised as VEI 4 by Newhall and Self (1982). VEI 4 eruptions have up to 0.1 km^3 volcanic material ejected and plume heights of 10-25 km (USGS, 2017). According to Shepherd *et al*. (1979), the total volcanic material eruption during the explosive phase of the 1979 eruption was 49 x 10^6 m^3 – making the 1979 eruption an order of a magnitude smaller than the previous two at VEI 3. Being a magnitude less would explain the significant differences in ash fall, lahar and pyroclastic density current inundation mapped (Figure 4.20) compared to 1812 and 1902-1903 (Figure 4.1 and 4.10).

4.6.2 PDC paths

The currents are typical "St. Vincent- style" PDCs, which are generated from the collapse of a vertically directed explosion from an open crater (Escher, 1933; Macdonald, 1972; Newhall *et al*., 2000; Voight *et al*., 2000; Le Friant *et al*., 2010). PDC paths have descended La Soufrière in similar areas for the three eruptions. The magnitude of the eruptions is the likely cause of the differences for all three eruptions. A greater VEI means a more explosive eruption, making PDCs more likely and of greater size.

Western flank PDCs in the 1812 and 1902-1903 eruptions were observed to flow "uphill" as they encountered topographic barriers. High inertia can enable the currents to flow "uphill" (Edwards *et al*., 1994; Kneller *et al*., 1991; Pickering *et al*., 1992). Another example of PDCs flowing "uphill" was observed in 1991 at Mt. Unzen in Japan (Takahashi and Tsujimoto, 2000).[93] On the western flank in 1902, a PDC at Chateaubelair Bay that travelled a short distance out to sea caused near suffocation as people caught in this current described breathing to be difficult. Experiencing "near suffocation" from a PDC is possible, if the person is on the periphery of the current (Baxter *et al*., 1998; Jenkins *et al*., 2013). The PDCs descending the eastern flanks of La Soufrière from 1812 and 1902-1903 however, were spread out more due to the flatter topography.

PDC flow paths for the 1979 eruption was the most distinct, as all were channelised flows confined to four river valleys. In particular, the potential reason why the Rabacca PDC in 1979 only flowed 2.5 km and not the full length of the river valley (approximately 7.4 km) would be due to less volcanic material feeding the flow (Doronzo *et al*., 2010; Sulpizio *et al*., 2014). Channelised PDCs are generally more dense and strongly influenced by topography (Neri *et al*., 2014). Channelised PDCs are denser due to the concentration of larger and heavier clasts within a channel that cannot be suspended by turbulent gas in the upper, more dilute portion of a PDC and therefore, deposited over a much smaller area (Nield and Woods, 2004; Dufek, 2015).

4.6.3 Lahar flow paths

Lahars, like PDCs, have flowed down similar areas for the three eruptions. The difference between all three eruptions, however, has been the volume, frequency, and how many rivers had active flows. The volume of lahars in 1812 and 1902-1903 was greater due to the presence of a crater lake, whereas due to the absence of a crater lake by 1976 (Figure 4.16), 1979 lahars had a higher sediment concentration as opposed to the water content[94]. A lahar with higher sediment content as opposed to water content is more destructive and erosive due to higher scour power (Thouret and Lavigne, 2000). The Wallibou River, one of the main drainage channels for La Soufrière, was dammed by pyroclastic material that remained intact for one to two years after the 1812 eruption but was eventually overtopped and

[93] Two models have been proposed to explain the ability of PDCs travelling uphill. The first is a thin flow that is highly concentrated with a short-duration, but a high travelling speed of up to 150ms^{-1} that would originate from the collapse of a >50 km ultraplinian eruption column (Wilson and Walker, 1982). The second model suggests that PDCs overcome topographic barriers due to the current's thickness in a dilute current where particles are suspended (Valentine, 1987; Fisher *et al*., 1993; Bursik and Woods, 1996; Dade and Huppert, 1996; Baer *et al*., 1997). An alternative model incorporates the two mentioned: the upper levels of a current are more dilute and it is the lower, more denser part of the current that may be blocked by a topographic barrier, causing the upper portion of the current flow uphill (Legros and Kelfoun, 2000; Branney and Kokelaar, 2002; Doyle *et al*., 2010).

[94] The Belmont Observatory Team (1979) Report: 3rd July- 13th August 1979. NDAS-SVG: Volcanoes VI

destroyed by the accumulation of water due to the combination of natural drainage and the rainy season (June-December).

There was record of lahars occurring just before or simultaneously of initial explosive activity in 1902. The explosion also caused ground motion on the west to north eastern flank, causing lahars to flow down La Soufrière's two main drainage river channels of Rabacca and Wallibou, and we interpret that this was the cause of "breakout" lahars. One lahar described in the Wallibou river by Edmund Hovey as "pulsing" would have been the result of a breach in a natural dam formed by volcanic material (Pierson, 1980), in conjunction with heavy rainfall experienced beforehand. A different lahar in the Morne Ronde River was "boiling" due to a subaqueous storage system within the volcano or potentially due to the remobilised material still being somewhat hot. This would indicate the remobilisation of volcanic material in the channel after heavy rains during the height of the rainy season, a danger exhibited by lahars in 1813 or 1814 triggered in the Wallibou River (Shepherd, 1831).

Large, rapid-onset evacuation of a crater lake before an eruption is common at any volcano with the presence of a lake within its crater. For example, the 1995-1996 eruption of Mt. Ruapehu in New Zealand, saw 10 x 10^6 m^3 of lahar material before initial explosive activity (Bryan *et al.*, 1996; Johnston *et al.*, 2000). The frequency and how many rivers were active for La Soufrière's eruptions was largely dependent on the timing of the rainy season (June-December). Due to the longevity of the 1902-1903 eruption, more rivers compared to 1812 and 1979 produced lahars (Table 4.1).

4.6.4 Earthquakes

Volcanic earthquakes signal magma movement or an explosion. Many of the earthquakes that occur either before or during eruptive activity are indicative of rock fracture caused by either regional tectonic stresses, magma ascent, or failure of the internal structure of the volcano brought on by the interactions of volatiles and heat from the magma storage system (Scandone *et al*., 2007). The descriptions of the increased frequency and intensity of the earthquakes suggests a change in the migration of magma from the deep to the shallow crust. Generally, stronger volcanic earthquakes relate to the brittle-elastic process of fracturing the surrounding rock driven by magma (Weinberg and Regenauer-Lieb, 2010).

However, eyewitness descriptions can make it challenging to distinguish different earthquake characteristics, such as its epicentre and the type of earthquake. Generally, people closer to a volcano feel earthquakes, which was the case for the 1812 and 1902-1903 eruptions on the western and eastern flanks of La Soufrière. In this case, earthquake reports relied on people being in the area, before the use of the seismograph.

In 1812, felt earthquakes were only reported in Morne Ronde and the wider area of the eastern flank (Figure 4.1). In 1902, because there was a larger population compared to 1812, more people reported feeling earthquakes. On the western flanks, areas from Morne Ronde down to Chateaubelair were felt, on the eastern flank the area was only confined to Georgetown, but several reports occur on the northern flank (Figure 4.10). Conversely, in 1979, and perhaps owing to the lower magnitude, instances of felt earthquakes were considerably reduced, with the Belmont Observatory's seismograph network registering most of the different volcano-seismic signatures (Figure 4.20). However, a shared similarity between all three eruptions was reports of feeling earthquakes in the capital, Kingstown, approximately 20 km south of La Soufrière, which suggests ground motion caused by the eruption (Goto *et al.*, 2001).

4.6.5 Ashfall

The magnitude of the eruption, dominant wind direction and how activity was reported, were the main similarities and differences. The variation in ash thickness is due to the direction, height, and duration of the plume.

In 1812, due to limited people reporting in the area, ash fall was only recorded for the northern half of the island (Figure 4.1) but also islands north of St. Vincent. St. Lucia (78 km to Castries City), Martinique (143 km to Fort-de-France) and Dominica (219 km to Roseau) all reported ash falling, as well as Barbados to the east (172 km to Bridgetown) and Grenada (155 km to St. Georges) to the south (Figure 4.23).

Figure 4.23. Regional ashfall during the 1812 eruption of La Soufrière. Datapoint numbers refer to Appendix G, Table G1.

In 1902, ash fall was reported across the island and abroad (Figure 4.10) on Barbados but also further south on Trinidad (297 km to Port of Spain) (Figure 4.24). The wide dispersion is due to the height of the plume by a VEI 4 eruption, as it entered higher into the atmosphere. The reports of ash fall to the southwest, south, and east to Barbados demonstrates the variability of ash dispersal height influenced by the trade winds (Sigurdsson and Carey, 1981). The strong expulsion of volcanic material encountered a south-westerly wind direction that transported ash northeast.

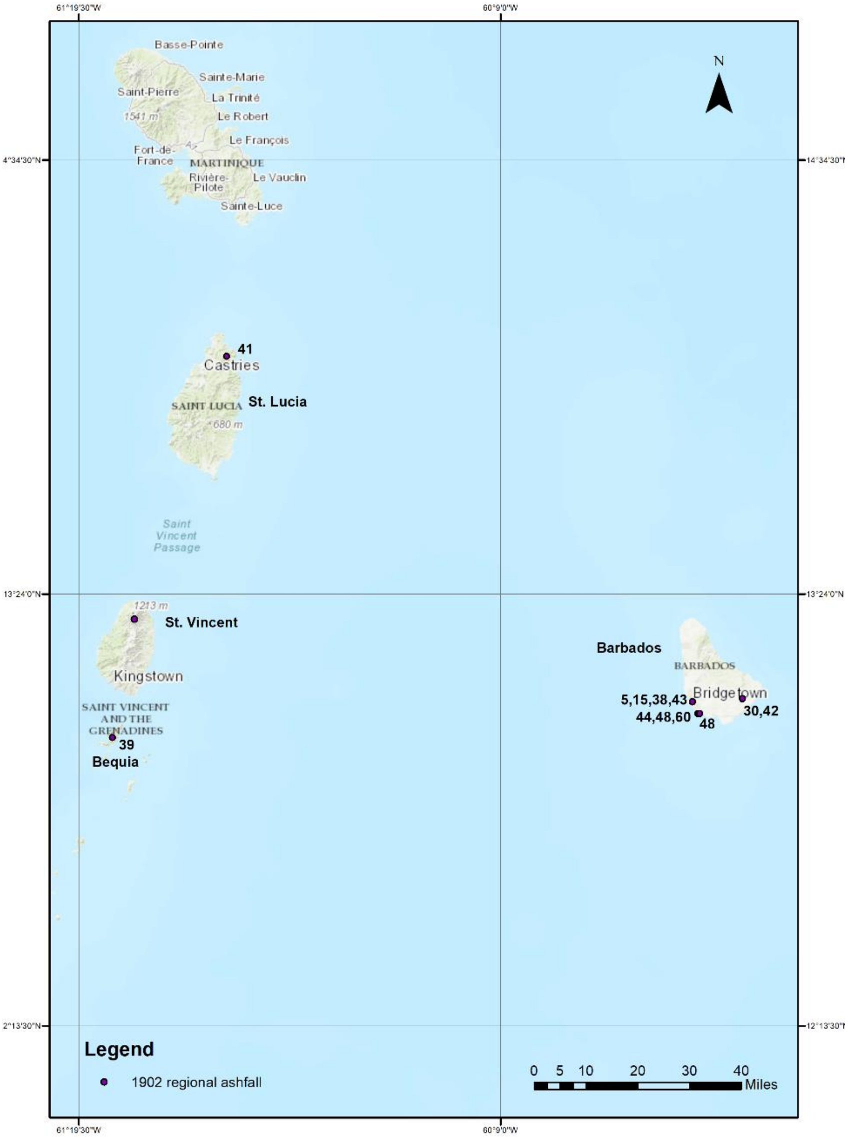

Figure 4.24. Regional ashfall during the 1902-1903 eruption of La Soufrière. Datapoint numbers refer to Appendix G, Table G2.

In 1979, ash fall was widely reported across the island, but only reached Barbados (Figure 4.25). A similarity was reports of roof collapse across St. Vincent for the three eruptions, which demonstrates that the distal impacts of the eruption (relative to the island's size) can still be dangerous, despite ash generally causing roof collapse nearer volcanoes (Spence *et al.*, 2005; Macedonio *et al*., 2008). Roof collapse from ash loading accumulation is a common form of damage done to properties during eruptions (Spence *et al*., 2005).

What is important to note for the three eruptions is the different patterns of ash fall. In 1812, the ash seems to have fallen towards the north, in 1902 more towards the south, whilst in 1979 ash fell on the whole island. The different patterns of ash fall depend on local wind patterns and demonstrates that ash fall dispersion cannot be generalised.

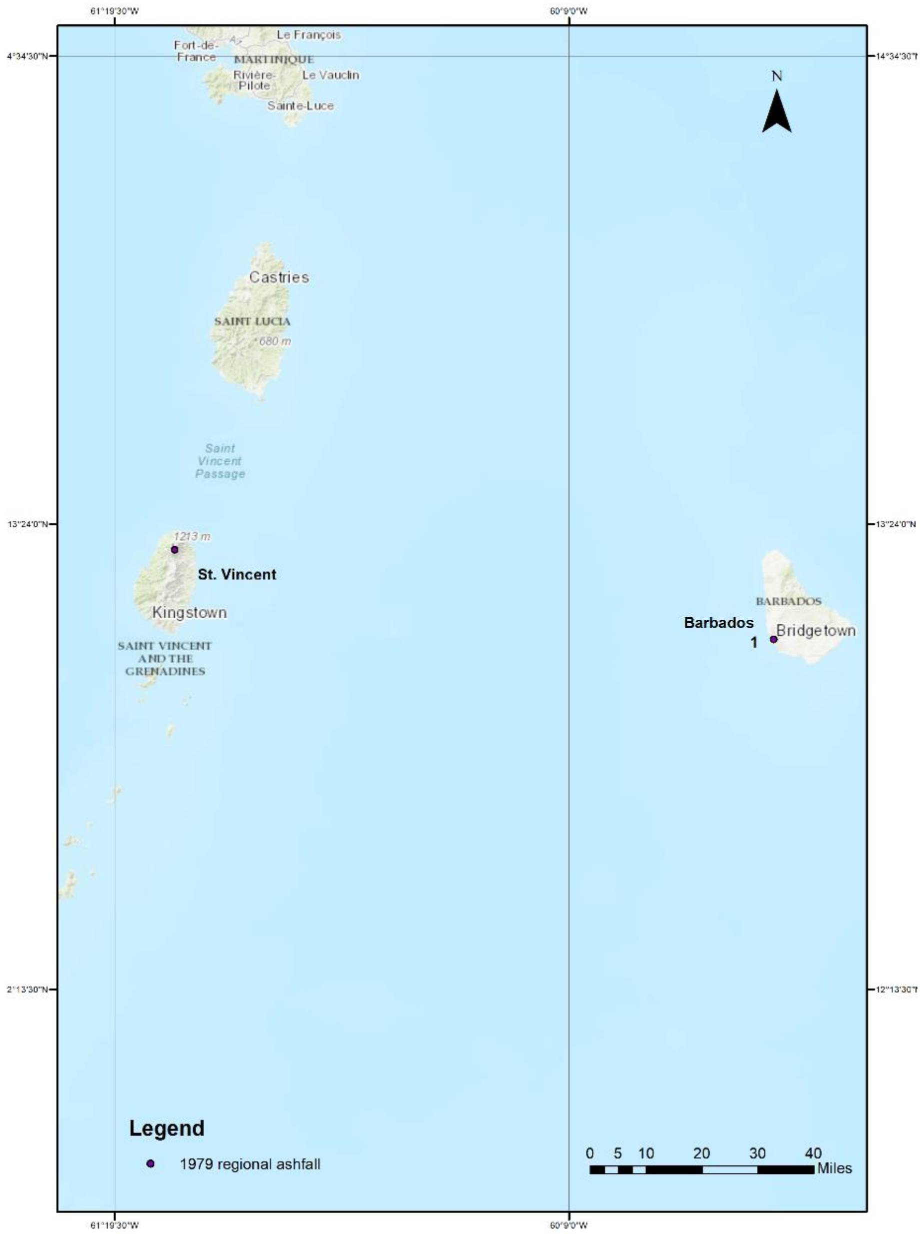

Figure 4.25. Regional ashfall during the 1979 eruption of La Soufrière. Datapoint numbers refer to Appendix G, Table G3.

4.7 Conclusion

The reconstruction of the 1812, 1902-1903, and 1979 eruptions of La Soufrière have shown the differences between VEI 4 and VEI 3 eruptions on the island and the control of topography on PDCs and lahars. Using archival sources has provided a complementary approach to the interpretation of volcanic hazard phenomena whilst acknowledging how society on St. Vincent described and perceived observed volcanic hazards. Such usage revealed the most detailed chronology of the 1812 event to date, previously overlooked aspects of 1902 eruptive activity of inland-direct PDCs, and a volcanogenic landslide and the mismatch effects of the 1979 eruption.

St. Vincent is a typical volcanic small island where the volcano's hazards would cover a relatively large area in proportion to the total land area of the state. However, due to societal development, more people are becoming increasingly exposed to well-defined volcanic impact areas in the north of the island. The most immediately threatening hazards are PDCs that blanket the eastern and western flanks of the volcano, as well as down several river valleys that can cut-off and isolate northern settlements to the south. Ash fall is the most widespread, affecting the whole island as well as neighbouring Lesser Antilles islands north, east, and south of St. Vincent. Lahars are the most persistent hazard, occurring before, during, and after each volcanic eruption, due to the combination of a crater lake, groundwater, and heavy rainfall occurring from the rainy season.

Chapter 5 – The impacts of La Soufrière on St. Vincent's agricultural sector

5.1 Introduction

Despite up to 800 million people globally living in proximity to volcanoes and the majority of populations relying upon the fertile volcanic soil for farming, there are a few physical impacts of volcanism on agriculture (Cronin *et al.*, 1998; Annen and Wagner, 2003; Wilson *et al.*, 2011; Brown *et al*., 2015). On the other hand, economic impacts can be vast. Pastures and crops buried by ash from the 1980 eruption of Mt. St. Helens in the USA resulted in damages of up to US$ 100 million (Cook *et al.*, 1981; Johansen *et al.*, 1981; Folsom, 1986; Lyons, 1986), while ash fall and lahars of the 1991 eruption of Mt. Pinatubo in the Philippines caused an estimated total of US$ 131 million (Mercado *et al.*, 1996; Wilson *et al.*, 2011). Agriculture on St. Vincent has mainly focused on cash crop exports (e.g. sugar, cotton, arrowroot, banana) and subsistence crops (e.g. cassava, breadfruit, yam). Agriculture was first based on plantation enslaved-based labour, a peasantry, and then contract farming. Throughout the island's history, agriculture has been the mainstay of the economy (Webster and Ganpat, 2014) and thus, important to study here.

In this study, how the colonial society living next to La Soufrière made them adapt to the impacts of La Soufrière on one of the most important economic sectors of the island, was examined using multiple sources of data, including the eruption impact maps developed in the previous chapter. The key method used was the Levene's Test, a statistical analysis method used to determine significance difference in sugar production in 1812 to other years. This chapter details the impact on agriculture from the three eruptions comparatively for the first time. This study demonstrates that influential decisions made within the recovery phase of the agricultural sector can be as impactful as the volcanic eruptions. It was found that the agricultural systems in place for each volcanic eruption had their own socioeconomic issues that were exacerbated at the time, causing different impacts on recovery and adaptive strategies. Recovery and adaptive strategies included financial assistance, tax breaks, selling land or receiving a donation in assets.

This chapter reviews the agricultural systems in operation before and during each eruption, the benefits of volcanic soil, and the impacts the eruptions had on crop production, imports, and exports. The chapter ends with a focus on the adaptation strategies used to help the agricultural sector recover from the eruptions.

5.2 Agricultural systems on St. Vincent

Colonialism caused differentiated access to land, wealth and political power (Mintz, 1965). The Caribbean developed insular social structures based on 'class', with those higher up in the hierarchy having greater socioeconomic and political status compared to the class lower in the hierarchy (Mintz, 1965). On St. Vincent it is not fully known how much acreage was given to colonists versus the enslaved and peasants. However, as cultivation historically could be found at almost all locations below 1,000 feet, the most suitable land was approximately 36,000 acres compared to marginal and severely limited land of approximately 16,000 acres (Spinelli, 1973). Lands above 1,000 feet were deemed unsuitable for cultivation and became official "Crown Lands" in 1912 (Spinelli, 1973).

5.2.1 18th Century

To meet the demands of the British Empire, the main crop produced and exported from St. Vincent from 1764 to 1902 was sugar, and its by-products rum and molasses (Spinelli, 1973). Between 1804 to 1824, the value of sugar cane was £738,835 per year on average (approximately £81.7 million with inflation), with sugar contributing 69 % of the total income (Smith, 2011). More specifically in 1812, the estimated value of all agricultural products was £611,881 and exports estimated at £508,004.[95] To mass cultivate the sugar cane, an average of 18,065 enslaved Africans were kept from 1810 to 1814 out of the island's total population of approximately 27,000. Whilst sugar monoculture was the main cash crop, enslaved people grew multiple subsistence crops such as breadfruit, peas, yams, and corns (Boa, 1998). This was common for all colonies utilising enslaved persons and became a "livelihood" for them and the post-emancipation population. Unfortunately, there was little data available to analyse the impacts of the eruption on enslaved subsistence living, so such analysis cannot be conducted here.

Sugar cane during the colonial period was cultivated by the "cane-hole" technique, defined as the process of planting cane cuttings in five feet square holes that were five to six inches deep in order conserve top soil (Sheridan, 1974). Stalks of sugar cane planted in this way can

[95] Colquhoun P. (1815) Treatise on the wealth, power, and resources, of the British Empire, in every quarter of the world, including the East Indies. London: Joseph Mawman; pg. 381-382

survive field burning, and it protected the cane from high winds and gully erosion. It also allowed enslaved people to plant subsistence (also known as "provision") crops between the spaces during the wet season (Sheridan, 1974).

The routine of producing sugar cane - and subsequently sugar, rum, and molasses - relied on the timing of the dry (December to May) and wet seasons (June to November). Harvesting and producing sugar, rum, and molasses took place during the dry season (Sheridan, 1974). Meanwhile during the wet season, the processes of producing the cane-holes, laying manure, planting, and weeding occurred. On St. Vincent and Dominica, holing and planting took place at the end of November/beginning of December (Carmichael, 1883). At five to six months, the last of the weeding is done before harvest (Sheridan, 1974).

The larger the plantation, the more availability to rotate plots of land to allow soil recovery to avoid land exhaustion and therefore, ways to maintain a steady yield year upon year.[96] On St. Vincent, 22 estates out of over 100 had 500 acres or more available to cultivate from 1801 to 1824.[97] These estates had more options available to maintain steady sugar cane yields and a reduced risk of land exhaustion and soil erosion.

5.2.2 Early 19th Century

From emancipation (1834) to World War Two (1945), St. Vincent's agricultural system was separated into large landowners producing sugar on large land lots attached to estates, and peasants who grew subsistence crops such as arrowroot, cacao, maize, and cassava. Between 1903-1952, peasants largely grew cotton as a cash crop (Spinelli, 1973). This reflected the Caribbean region trend of household production of subsistence crops on small plots, with cash crops being produced on large estates in relation to the market, location, and condition of the land (Wolf, 1966; Shanin, 1966). These two groups within the agricultural sector were operating within an embedded socioeconomic system of dependency to Britain, a common SIDS issue that developed from the 1800s. The limited amount of agricultural land available and a small population of 48,000 in 1902 compounded the issues.

[96] Martin S. and Grainger J. (1802) "An essay upon plantership. In: Three tracts on West Indian agriculture and subjects connected therewith"
[97] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

The estates were in decline since emancipation as former enslaved people disassociated themselves with the plantations. As a result, estate land was purchased by the colonial government. Estate land purchased by the colonial government was divided into allotments under the 'Land Settlement Scheme' for the peasantry (Spinelli, 1973).

Land Settlement Schemes were various ways to develop land-use. In the British West Indies, five types of Land Settlement Schemes were identified: housing settlements, garden plots/small holdings, the fulltime peasant holding scheme, settlement cooperatives, and estate settlement schemes (Hills, 1965). Fulltime peasant holdings and settlement cooperatives were introduced in larger colonies such as British Guiana, British Honduras, and Jamaica due to more land being available. However, for smaller colonies such as St. Vincent, the estate settlement scheme was utilised. The scheme enabled the colonial government to purchase estates for land settlement purposes for township development.

In the Caribbean, Frucht (1967) stated that the period after emancipation in 1834 until the end of World War Two in 1945 was characterised by farmers being viewed as "peasants". A peasantry class must be understood and described with the general societal and historical context for the targeted group in question (Shanin, 1982). In contrast to "farmers", peasants rely on subsistence and cash crops for means of survival and to maintain social status rather than investing and expanding their scales of operations (Wolf, 1955). In the Caribbean, peasant communities were founded on lands marginal to the needs of plantations and exhibit "peasant-like" production patterns in conjunction with "working class-like relations of production" – defined as "proletarian" (Frucht, 1967). For the distinction between large landowners, 'peasants' in this section refers to small landowners or sometimes referred to as "allottees" in official archival documents used.

Sharecropping in the Caribbean was solely to benefit planters and absentee owners to avoiding wage payments to labourers during and after slavery. This was a combination of using household labour, but the share was in kind and not cash. In practice, this meant that the labourer provided the tools and the landowner provided the crop, fertiliser etc. and an overseer (Frucht, 1967). Share-rent was a common form, whereby the tenant supplies tools, labour, seeds etc. whilst the landowner rents out the use of their land (Frucht, 1967).

5.2.3 End of the 19th Century

The main socioeconomic impacts for the 1979 eruption started from World War Two, which marked a crisis in the Caribbean agricultural sector, with a temporary withdrawal of imports and greater reliance upon domestic produce (Jesse, 1994). But at the end of the war, there was an end of sharecropping and farming-out (a third party investing in development) as predominant systems of production, due to the global decline in the sugar and cotton markets (Frucht, 1967).

The Caribbean governments (with their various levels of autonomy at this stage) from approximately the 1950s onwards, bought abandoned or unprofitable estates and initiated Land Settlement Schemes to encourage the development of a yeomanry (defined as a group of people who held and cultivated small estates). One of the main incentives to keep agricultural labour in the Caribbean and to decrease the motivation to emigrate, plantation estates were sold and divided into small holdings (Frucht, 1967). Thus, the agricultural economy in this period became dominated by subsistence crops.

After 1955, the Caribbean shifted away from the domestic production and exportation of food to developing the construction and tourism industries, which resulted in an agricultural deficit as production decreased and food imports rose (Harker, 1989). The decline in domestic production was from a lack of linkages between domestic agricultural production and other economic sectors (tourism, commerce, manufacturing and producer services) (Timms, 2001). As a consequence, foreign exchange rates were high, leading to export income focusing on food imports (Brohman, 1996; Renard, 2001). Furthermore, the labour force was decreasing due to extensive migration to metropolitan countries resulting in population decline and new social, economic and political relationships between the islands and distant locations, which included the flow of remittances (Connell and Conway, 2000).

The peasant sector on St. Vincent experienced unfavourable conditions and a large percentage of uncultivated land in small allotments between 1955 and the 1970s. The conditions suggested by Rubenstein (1987) and Grossman (1993) which drove people away from working in agricultural sector include: 1) migration, 2) uneconomic size of holdings, 3) poor quality of land, 4) poor market condition, and 5) the low status of agricultural work. The low status of agricultural work has been related to the stigma developed surrounding the island's history of slavery (Ganpat and Webster, 2010). In some instances, these factors reflected the political-economic conditions of an inequitable distribution of land that had relegated peasants to marginal, bad quality small plots that were highly susceptible to erosion. Not only this, there was a lack of access to credit which combined with marginal holdings, yielded low incomes (Grossman, 2000).

Two changes to the autonomy of St. Vincent and the Grenadines occurred between the end of World War Two and the 1979 eruption. First, in 1967, the island gained Associated Statehood status with Britain that gave it a full internal self-government under the Associated Statehood Act 1967.[98] Seven years later, the island became a member of CARICOM (Caribbean Community), which represents the interests of predominantly Anglophone Caribbean nations and access to the CARICOM single market.[99]

By 1979, a reduced labour force was characteristic of St. Vincent's and the wider Caribbean's agricultural sector. For St. Vincent, top commodities exported from 1967 to 1990 were banana, coconut, roots and tubers (arrowroot and eddoe), yam, and cassava.[100] Sugar was re-introduced in 1979; however, it is unclear whether this was before or after the volcanic eruption.

5.2.4 Benefits of volcanic soil

Volcanic soil is commonly described as fertile for any crop that grows within it. There are various subtypes of volcanic soil named "andosols" that differ in climate, rock type, and cultivation practices (Bartoli *et al.*, 2003). Organic matter contributes to the chemical and physical properties of andosols as high phosphate retention, weak stickiness, low bulk density, water retention, and the development of a root network (Nanzyo *et al*., 1992).

Volcanic ash contains a variety of elements that once deposited, have a ratio of loss or accumulation. For example, silica, magnesium, and potassium concentrations decrease as the result of weathering, while iron, titanium, and aluminium steadily accumulate. Aluminium and iron are attributed to regulating chemical reactions and biotic productivity

[98] CARICOM (2018) Saint Vincent and the Grenadines: Key Facts [online] www.caricom.org/about-caricom/who-we-are/our-governance/heads-of-government/St-Vincent-and-the-Grenadines [accessed 12/03/18]

[99] CARICOM (2018) Who we are [online] www.caricom.org [accessed 12/03/18]

[100] Food and Agriculture Organisation (2016) St. Vincent crop production [online] faostat.fao.org/DesktopDefault.aspx?PageID=339&/ang=en&country=191 [accessed 01/04/16]

as well as containing chemical characteristics that influence organic matter (Nanzyo *et al*., 1992).

As a parent material, ash has more control over soil formation (termed "andosolisation") than any other parent material. This involves rapid *in situ* weathering and the production of a high content of non-crystalline materials (Nanzyo *et al*., 1992). However, fresh ash can cause acidic damage to vegetation due to 1) the presence of hydrochloride, hydrofluoride, and sulphuric acids; 2) 'smothering' which inhibits photosynthesis; and 3) the formation of inclusions in which unwashed fruit and vegetable skin incorporate ash by growing around it and forming nodules (Wilson *et al.*, 2007).

In the Caribbean, the volcanic soils have unusually high concentrations of acidic amino acids, related to enzymes acting upon organic matter (Sowden *et al*., 1976), however the behaviour of amino acids in soils is still not fully understood. In Dominica for example, tropical clay soils are influenced by the age of the land surface, annual and seasonal rainfall as well as the lithology. The lithology mainly consists of acidic andesite and dacitic pyroclasts, which in combination with the rainfall and age of the surface, affects the distribution of soil type and leaching effectiveness (Rouse *et al*., 1986).

The two main dominant soil types on St. Vincent are yellow earth soils, derived from basic fragmented pyroclastic volcanic material and, dark soils that consist of cemented fine-grained ash (Ahmad, 1987). Due to the removal of topsoil, cultivation of the low-lying land has destabilised the steep volcanic slopes and exposed subsurface waters, augmenting erosion and contributing to landslides in the area today (Murray, 2003).

5.3 Spatial distribution of impacts of the eruptions on estates and land-use

5.3.1 1812

From 1801 to 1824, 129 estates were in production on St. Vincent and divided into five parishes – St. George, St. Andrew, St. Patrick, St. David, and Charlotte.[101]

[101] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

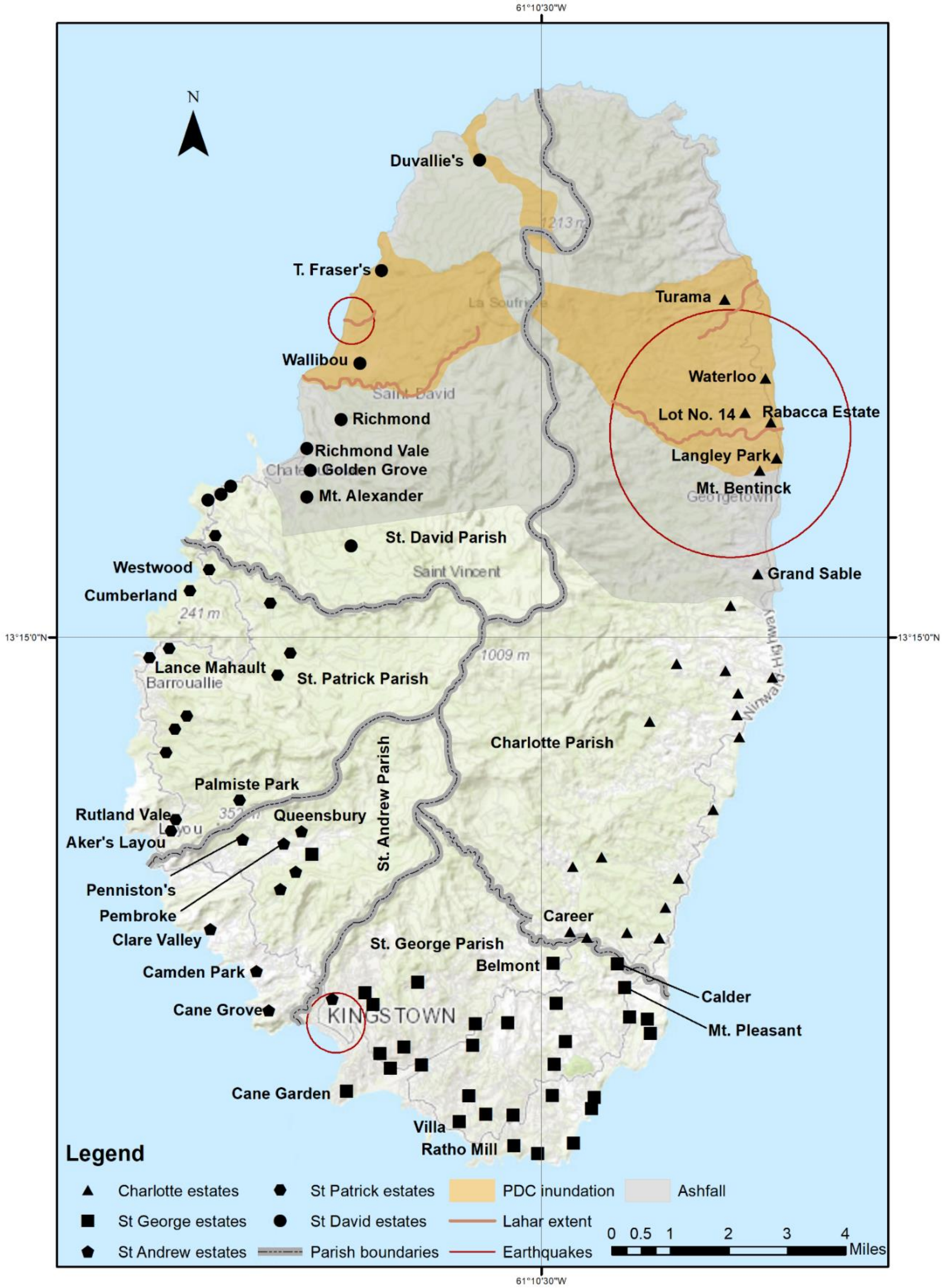

Figure 5.1. The 1812 eruption impact map with locations of plantation estates in operation by 1812. Named locations are within the text, except for Colonarie Farm, Two Valleys, Thomas Riddoch's and Thomas Dickson's (Table 5.1), as the exact locations could not be found within the archives.

Most of the estates have been mapped and layered on top of the eruption impact maps in chapter 4 (Figures 4.1, 4.10 and 4.20). Figure 5.1 shows that the most significant impact of the volcanic eruption on estates across the island was ash fall from the economic point of view. Only nine out of over 120 plantation estates at the time were susceptible to the greater impacts of lahars and pyroclastic density currents (PDCs).

A letter dated 6th November 1812 from St. Vincent's Governor addressed to the Administrator for the Windward Islands stated that the volcanic eruption had "overwhelmed" several plantations.[102] Figure 5.1 shows that estates located in the northern parts of St. David's and Charlotte parish were impacted the most, but it was difficult to determine the exact extent of damage to the estates in the northern portion of the island from the data available.

The three estates confirmed destroyed as a direct result from the eruption were the estates of Duvallie's, Thomas Fraser, and Thomas Riddoch[103], which are all located in the parish of St. David (Figure 5.1). However, the location of the Duvallie's Estate was not identified in the document detailing estimated losses and it is uncertain as to why this is. Thomas Fraser's estate was located at the foot of La Soufrière's western flank adjacent to the Larikai River (a source of channelised PDCs), whilst Duvallie's was on the volcano's north-western flank that was destroyed (Section 4.4). Duvallie's Estate and Thomas Fraser's Estate were subsequently abandoned however, by the time of the 1902-1903 eruption, the exact same areas were developed as a village and as an estate (See Chapter 6).

5.3.2 1902-1903

By the 1902-1903 eruption, a similar number of estates from 1801 to 1824 were producing sugar (138). Within the high impact area in the northern half of the island (Figure 5.2), 11 estates were in production (Wallibou, Windsor Forest, Cramacou, Owia, Tourama, Orange Hill, Waterloo, Lot 14, Rabacca, Langley Park, and Mt. Bentinck) and four self-sustaining Garifuna villages (Fancy, Sandy Bay, Frasers, and Morne Ronde).

Unfortunately, the exact locations and the detail of impacts to allotments were not recorded sufficiently in the archival record. Estates that were documented damaged, purchased for refugees by the colonial government in response to the eruption or requested money for repairs under the 'Soufriere Relief Fund' are shown in Figure 5.2.

[102] Brisbane C. (1812) Letter from Governor Charles Brisbane to Earl Bathurst: "The Grand Sable estate and establishment of a church and town", 6th November 1812, The National Archives (TNA): CO 260/29

[103] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

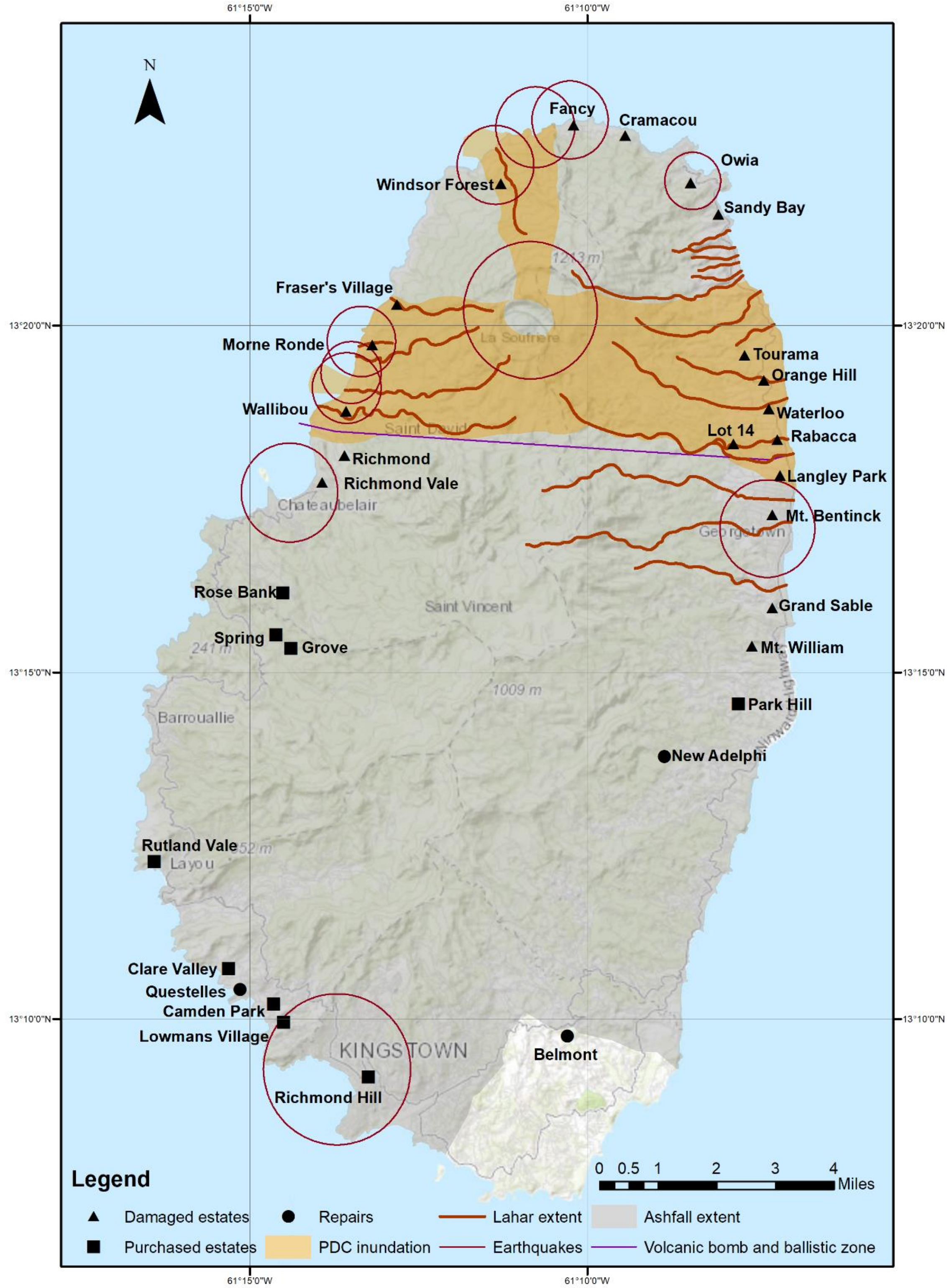

Figure 5.2. The 1902-1903 eruption impact map with locations of reported damaged estates, purchased land of estates by the St. Vincent colonial government and repairs to estates with money from the "Soufrière Eruption Fund".[104] Named locations referred to within the text.

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[104] Anon. (1902) Executive Council minutes; present: Governor Llewellyn, Colonial Secretary Cameron, Duncan McDonald, 11th September 1902, NDAS-SVG: AA1.13.27; Cameron E. (1903) Letter from Administrator Edward Cameron to Governor Robert Llewellyn, 21st May 1903, TNA: CO 321/218; Chamberlain J. (1903) Letter from Joseph Chamberlain, 31st July 1903, TNA: CO 321/219

The damaged estates were in the northeast and northwest. Estates that were purchased for peasants were in the middle and south of the island. But from the archival data, it was locations in the south that requested repairs from assistance of the relief fund. The damaged estates of Windsor Forest and Fraser's Village were located on the sites of Duvallie's and Thomas Fraser's estates that were destroyed by PDCs in 1812. This demonstrates that when rebuilding, the lessons from the previous eruption were not remembered or that there was a willingness to take the risk of rebuilding in the very same locations due to added benefits of the newly fertilised soil. The lack of 1902 documentation for Figure 5.2 relating to peasants in response to the eruption showed that the colonial government exerted minimal effort in assisting them to maintain or rebuild their livelihoods compared with what was extended to the larger landowners.

5.3.3 1979

Mapping the impact of the 1979 eruption on agricultural land was not replicated in a similar way for the previous two eruptions. This was in part due to data collected for this project – the only available agricultural land-use data found was from the late 1940s due to an inability to locate data closer to the 1979 eruption. In addition, crop production was no longer attached to estates, with land redistributed and devoted to a wider variety of cash and subsistence crops. Figure 5.3 shows the eruption impact map for 1979 with an overlay of agricultural land-use for 1947.

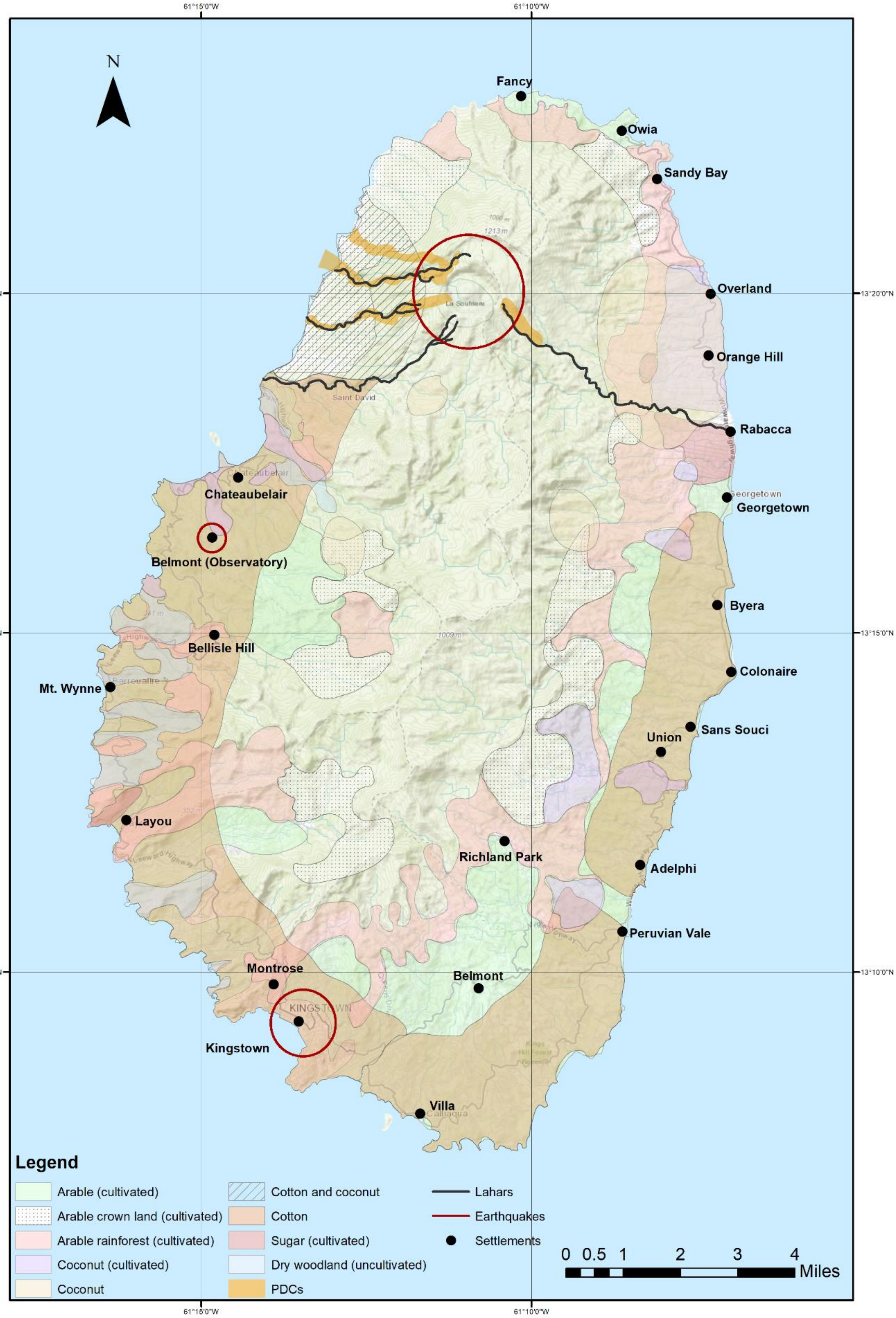

Figure 5.3. 1979 eruption impact map with agricultural land-use in 1947 adapted from Gibbs (1947). Locations displayed are a mixture of interviewee locations and other locations on the island from Figure 4.20.

Lahars flowed down the Larikai, Rozeau, Wallibou (western flank) and Rabacca River (eastern flank) valleys, through land that cultivated cotton, coconut, and sugar (pre-1979) and PDC impacts were confined to cotton and coconut land. Due to the fragmentation of subsistence and cash crop land, the pre-existing volcanic risk to the crops was more dispersed and not heavily concentrated on the flanks of La Soufrière compared to the eruptions of 1812 and 1902-1903.

5.3.4 Discussion

By 1812, the northern portion of the island's land was only recently (in relation to when the eruption occurred) in colonial government possession to sell to estate owners in the late 1700s following the end of the Second Carib War (Meide, 2003). In this context, the 1812 eruption was a "new" experience for the population, as it is uncertain from the oral and written record of any surviving indigenous knowledge about La Soufrière, and the benefits of cultivating sugarcane outweighed the costs.

Peasants in St. Vincent and the Caribbean region by 1902 were a marginal group. Their increased vulnerability and risk included the lack of accessibility to services, low economic status, and lower political standing (Lowe, 2010; Smith, 2012; Mikhail, 2015). The low economic status was because large landowners applied a heavy tax on all lands used for crops. This meant that the majority of peasants were not able to sustain themselves on growing subsistence crops alone and thus, had no choice but to accept staying on estate grounds and earn daily wages (Y Sánchez, 1964). Being on a small island, this extended to the dominantly black and mixed-race group not being as socially, economically, and politically mobile as their white large landowner counterparts. The lack of records of aid or compensation given to peasants by the colonial government may indicate that they were not given any.

The 1979 eruption's most extensive impact came from 344 km^2 of ash fall (Section 4.5), causing an estimated EC$13,784,797 (equivalent to £20,238,397.76 with inflation) economic impact (Robertson, 2005). For comparison, an investigation into the impacts of Mt. Merapi's 2006 eruption in Indonesia on arable agriculture stated that damage to crops from volcanic ash was dependent on crop type, how thick the ash deposit was and, whether an eruption occurred in the wet or dry season (Wilson *et al.*, 2007). The investigation found that root and low-growing vegetables such as potatoes and carrots were more resilient to ash, whilst plants with large hairy leaves like tobacco trapped ash easily. Ash thickness determined the extent of acid damage, smothering and/or collapse (Wilson *et al.*, 2007).

5.4 Impacts on crop production, imports and exports and expenditure

5.4.1 1812

To investigate the impact of the eruptions on the agricultural economy, this section investigates the impacts of the eruptions on crop production, imports, exports and governmental expenditure.

Production reflects the estates that have a larger acreage, flatter topography and more fertile land in the east to the west. The highly impacted estates in the parishes of Charlotte and St. David were compared to estates within the three other parishes of St. Patrick, St. Andrew, and St. George (Figure 5.1).

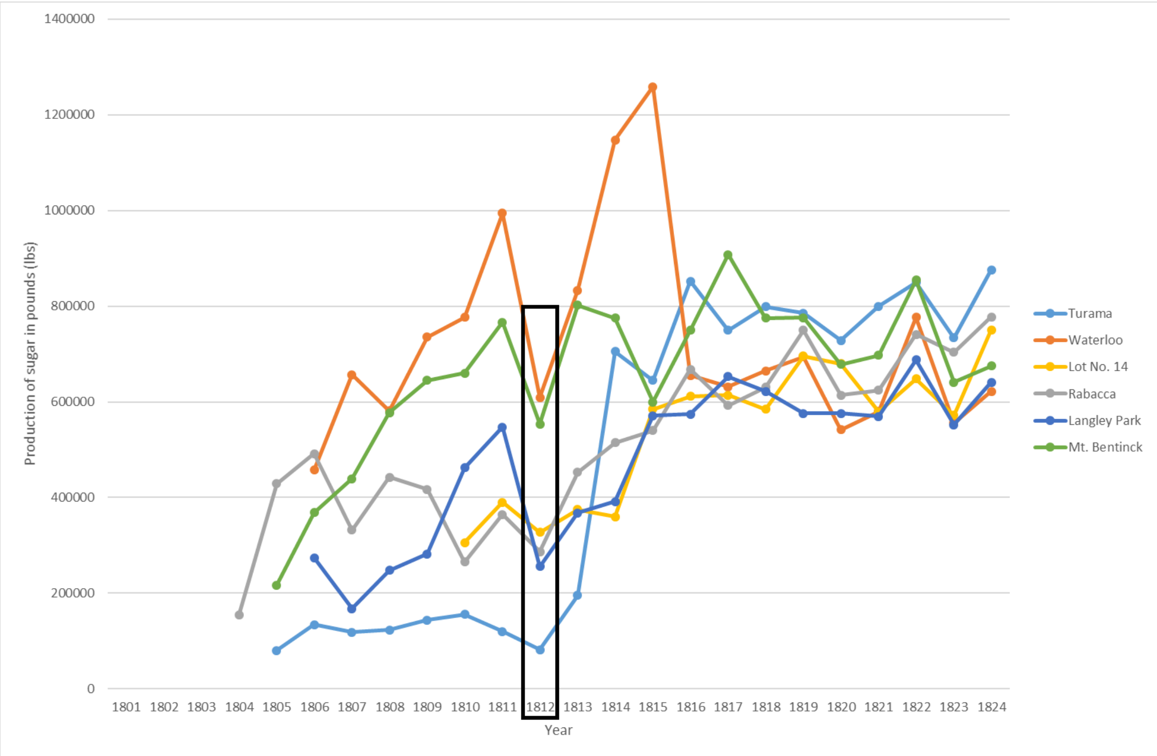

Figure 5.4. General returns of sugar production for the years 1801 to 1824[105] for estates in proximity to La Soufrière in the parish of Charlotte (Figure 5.1). The estates displayed began production after 1801 but before 1812. Location of estates can also be found in Appendix H, Figure H1.

The total area of the parish of Charlotte is 147 km and the average purchase price for the estates shown in Figure 5.4 from 1801 to 1824 was £4,222.92 (£467,113 with inflation) (see

[105] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

Appendix H, Table H1 for a detailed explanation for calculating the average purchase price). Activity on the estates (locations all in Figure 5.1) commences in 1804 (Rabacca), 1805 (Turama and Mt. Bentinck), 1806 (Waterloo and Langley Park) or two years before the eruption in 1810 (Lot No. 14). Despite the late start compared to other parish's estates, all estates have a rapid upwards trend (Figure 5.4). In 1812, sugar production for all the estates decrease, but for the following year, all increase again. The estates move towards uniformity as differentials (differences between successive values) narrow from 1816 onwards to settle at 600,000 and 800,000 pounds (lbs); it is uncertain if this related to volcanic activity. The dip in production in 1819-1820 could be explained by a direct hit from a tropical storm (Shepherd, 1971), but is uncertain what the cause of the next decrease in 1822-1823 was due to.

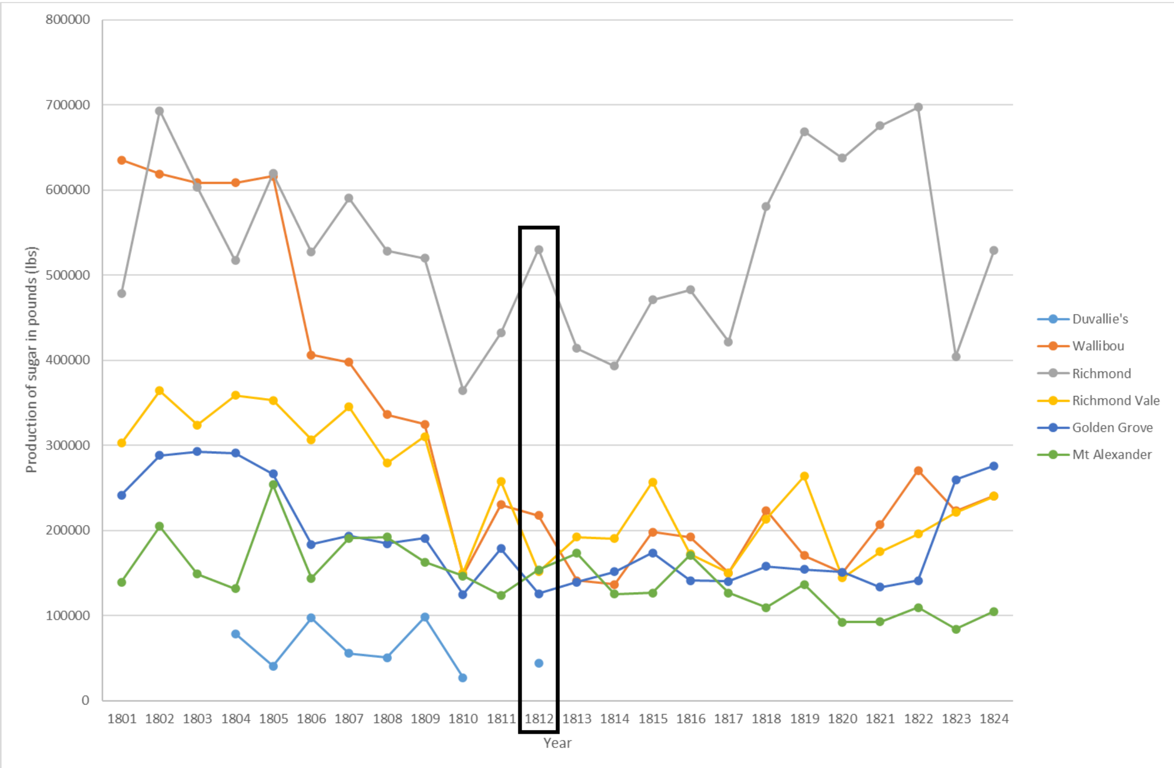

Figure 5.5. General returns of sugar production for the years 1801 to 1824 for parish of St. David estates in proximity to La Soufrière. The estate of Thomas Fraser was excluded due to producing cocoa and coffee, not sugar. Location of estates can also be found in Appendix H, Figure H2.

The total area of the parish is 86 km and the average purchase price of the estates in Figure 5.5 from 1801 to 1824 was £3,414.32 (£377,628.17 with inflation). All estates (located in Figure 5.1) apart from Duvallie's estate were in sugar production at the start of the dataset. There is a general steady decline from 1801 to 1812 (Figure 5.5). There is some decline with differentials narrowing at around 1810-1811, apart from Richmond, however Wallibou shows a more rapid decline from 1806 to 1810. It is uncertain why this is. In the year of the eruption, Richmond sees a slight increase whilst the other estates see a small decline, in addition to the Duvallie's estate stopping production due to its destruction. From 1813 onwards, all estates remain steady, except Richmond which sees a rapid rise and fall in production between 1816 and 1823.

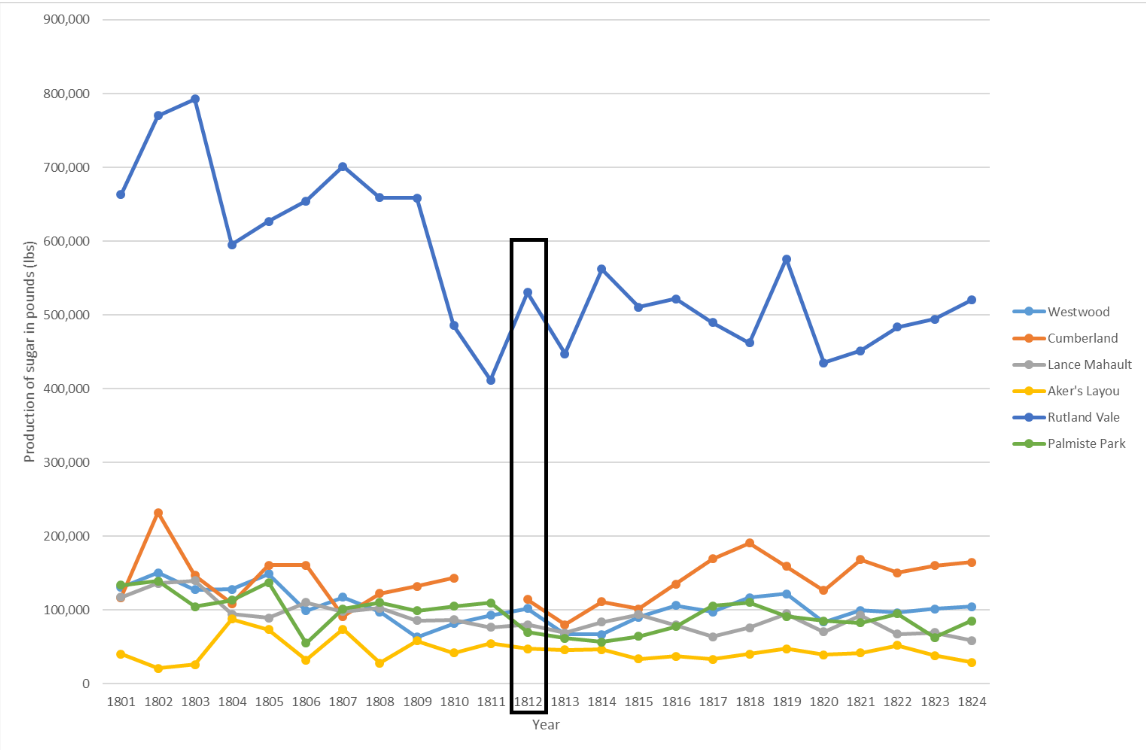

Figure 5.6. General returns of sugar production for the years 1801 to 1824 for parish of St. Patrick estates, arranged as the three most north within the parish and the three most south within the parish. Location of estates can also be found in Appendix H, Figure H3.

The total area of the parish is 48 km and the average price of estates in Figure 5.6 from 1801 to 1824 was £2,171.14 (£240,137.89 with inflation). Throughout the dataset (Figure 5.6), the estates' sugar production (located in Figure 5.1) of Cumberland, Lance Mahault, Aker's Layou, Westwood and Palmiste Park, remained fairly steady and uniform between approximately 20,000 and 200,000 (lbs). But Rutland Vale was an outlier by producing more sugar and larger fluctuations, seeing a decline from 1801 to 1811, a slight increase in 1812 and then remained steady apart from an increase to decrease from 1819 to 1820. Rutland Vale may be an outlier compared to the other estates due to having a larger acreage, between 224-700 depending on the year.

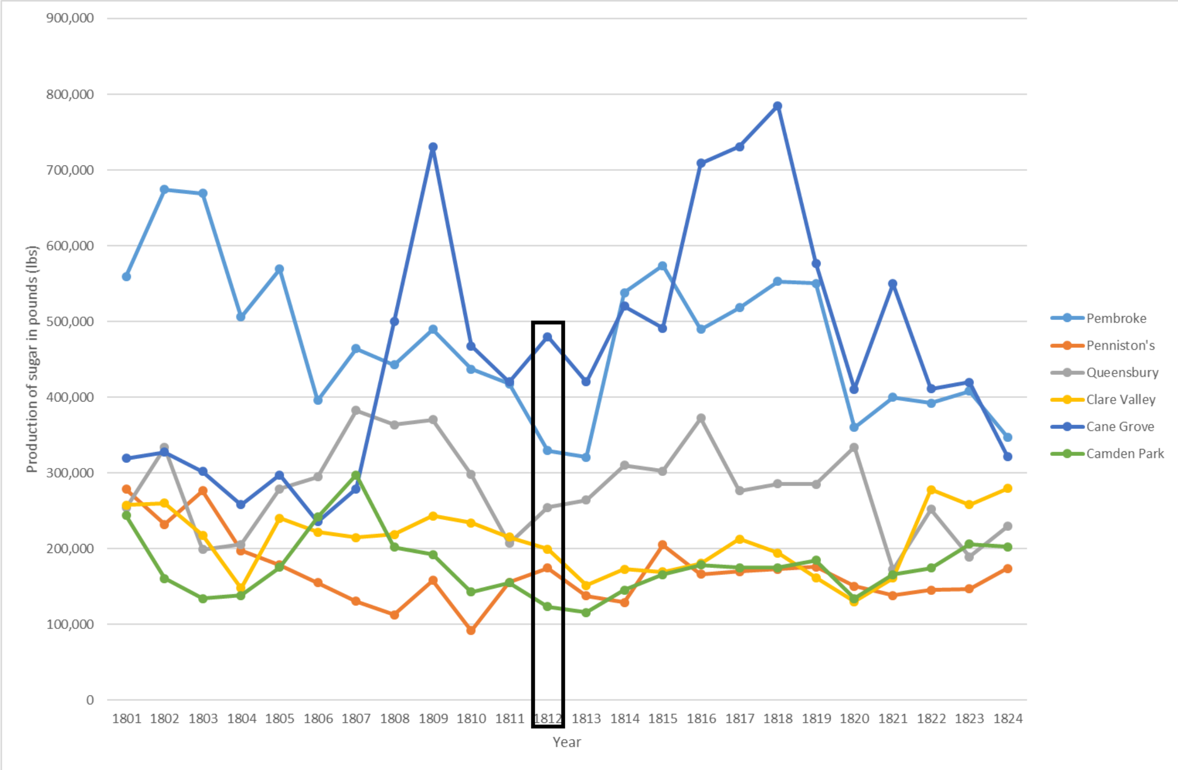

Figure 5.7. General returns of sugar production for the years 1801 to 1824 for Parish of St. Andrew estates, arranged as the three most north within the parish and the three most south within the parish. Location of estates can also be found in Appendix H, Figure H4.

The total area of the parish is 34 km and the average price for estates represented in Figure 5.7 from 1801 to 1824 was £18,319.16 (£2 million with inflation). St. Andrew's sugar production is the most variable, giving the noisiest dataset (Figure 5.7). There is no discernible shift in differential, but it is uncertain as to why this is. Each estate (all in Figure 5.1) fluctuates throughout the whole dataset however, Cane Grove shows the most significant rapid increases and decreases in 1807 to 1810 and 1815 to 1820. Cane Grove, Queensbury and Penniston's saw slight increases in 1812, while Pembroke, Clare Valley, and Camden Park saw slight decreases.

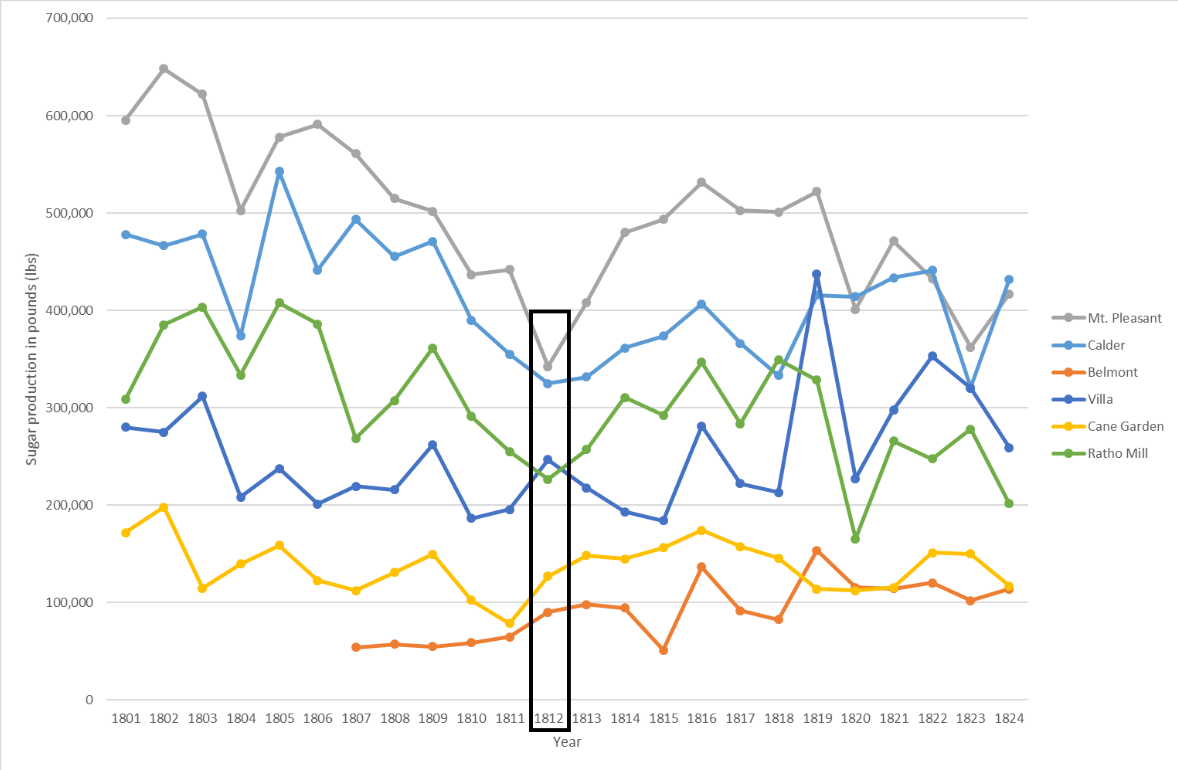

Figure 5.8. General returns of sugar production for the years 1801 to 1824 for parish of St. George estates, arranged as the three most north within the parish and the three most south within the parish. Location of estates can also be found in Appendix H, Figure H5.

The total area of the parish is 56 km and the average purchase price for estates presented in Figure 5.8 from 1801 to 1824 was £2,628.41 (£290,687.42 with inflation). Sugar production for St. George's is variable giving a noisy dataset (Figure 5.8) but with no shift in differential. Individual estates maintain their own position with some overall decline, and it is uncertain as to why this is the case. All estates (located in Figure 5.1) except Belmont start production from the beginning of the dataset and demonstrate a gentle decline up to 1812. In 1812, Mt. Pleasant, Calder, and Ratho Mill sugar production declines slightly, while there is a small increase for Villa, Cane Garden and Belmont. From 1813 onwards, all estates individually fluctuate but overall, remain within 500,000 and 100,000 lbs. Mt. Pleasant, Villa, and Ratho Mill decrease in 1820.

Table 5.1 represents the production of sugar for plantation estates shown in Figures 5.4-5.8 for the years 1811, 1812 and 1813.

Table 5.1. Production of sugar for plantation estates[106] in the parishes of Charlotte, St. David, St. Patrick, St. Andrew and St. George arranged in proximity to La Soufrière for the years 1811, 1812 and 1813. Interestingly, there is a mismatch between the production of sugar for Richmond and Mt. Alexander (an increase of 98,208 lbs and 26,684 lbs from 1811 to 1812 respectively) and the estimated losses (£3,528 and £1,100 5s. respectively) (Table 5.2).

Estate	**Sugar production in 1811 (lbs)**	**Sugar production in 1812 (lbs)**	**Sugar production in 1813 (lbs)**
Charlotte			
Turama (5 km)	120,000	82,000	195,500
Waterloo (6 km)	994,650	609,350	833,000
Lot No. 14 (6 km)	390,000	327,600	375,000
Rabacca (7 km)	364,500	287,000	453,000
Langley Park (8 km)	547,500	256,000	368,000
Mt. Bentinck (8 km)	766,250	553,329	802,400
St. David			
Duvallie’s (3 km)	-	44,100	-
Wallibou (5 km)	230,200	217,420	140,831
Richmond (6 km)	432,000	530,208	413,952
Richmond Vale (8 km)	257,679	151,616	192,096
Golden Vale (8 km)	178,500	125,580	139,198
Mt. Alexander (9 km)	123,967	153,651	173,026
St. Patrick			
Westwood (12 km)	93,000	101,989	66,778
Cumberland (13 km)	-	114,000	79,856
Lance Mahault (15 km)	76,400	80,000	68,800
Palmiste Park (17 km)	109,575	70,000	61,488
Aker’s Layou (18 km)	54,300	47,500	46,000
Rutland Vale (18 km)	411,700	530,600	447,074
St. Andrew			
Penniston’s (14 km)	155,602	174,315	137,600

[106] The Gazette Office (1825) “An account of the number of slaves employed…”, BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

Estate	Sugar production in 1811 (lbs)	Sugar production in 1812 (lbs)	Sugar production in 1813 (lbs)
Pembroke (15 km)	417,500	329,387	320,913
Queensbury (15 km)	206,858	254,400	263,900
Clare Valley (20 km)	215,040	199,500	151,500
Camden Park (20 km)	155,214	123,330	115,586
Cane Grove (21 km)	420,000	480,000	420,000
St. George			
Mt. Pleasant (17 km)	441,700	342,200	408,000
Calder (18 km)	355,000	325,000	331,500
Belmont (19 km)	64,768	90,000	98,000
Villa (21 km)	195,434	246,560	217,600
Cane Garden (23 km)	78,400	127,000	148,000
Ratho Mill (24 km)	254,900	226,400	257,150

Overall, there was a 61 % loss in production in 1812, with a further decline of 48 % in 1813, but production improves or returns to 1811 levels by 39 % in 1813. All six estates of the Charlotte parish (Figure 5.4 and Table 5.1), plus Richmond Vale, Golden Vale, and Wallibou shown in Figures 5.5 and Table 5.1 show a decrease in sugar production for 1812, whilst Richmond and Mt. Alexander show an increase in production for that year (Figure 5.5 and Table 5.1). Figure 5.1 shows that Duvallie's, Wallibou, Turama, Waterloo, Lot No. 14, Rabacca, Langley Park, and Mt. Bentinck were in PDC impact zones which would have contributed to the estimated losses (Table 5.1). Indeed, Duvallie's production stops in 1812, reflecting the estate's destruction and abandonment (Section 4.2.1).

Waterloo (223,650 lbs increase between 1812 and 1813) and Mt. Bentinck (249,071 lbs increase between 1812 and 1813) saw the highest increase in sugar production, whilst Turama took another year to reach an increase equivalent to the two estates. However, from the 1811 values in the following year, all estates apart from Wallibou and Richmond saw an increase in sugar production. Comparing the results with St. Patrick (Figure 5.6), St. Andrew (Figure 5.7), and St. George's (Figure 5.8) estates closest and furthest away from La Soufrière's crater, there were no noticeable patterns present. The location of estates did not appear to be a factor in observed increases or decreases in production for parishes of St. Patrick, St. Andrew, and St. George compared to St. David and Charlotte (see Appendix H).

A rich record of sugarcane production for each estate from 1801 to 1824[107] was available to investigate what effect, if any, the 1812 eruption had on agricultural production. The Levene's Test was used to determine a statistical variance between years of produced sugar when there was and was not an eruption (Figure 5.9). The test assesses the equality of variances for two or more groups (Levene, 1960). As some sugarcane production records were incomplete due to either not being recorded, starting production after 1801 or stopping production, only 77 out of 129 estates were part of the test. This unfortunately meant that the Charlotte estates in proximity to La Soufrière (Turama, Waterloo, Lot No. 14, and Rabacca) (Figure 5.1) were excluded from the analysis. This was due to these estate lands not starting production until 1804, and therefore were incomplete to perform the test as it required more years' worth of data to perform a complete test. The test has shown that the years 1812 and 1813 were low mean sugar production levels compared to other years (Figure 5.9).

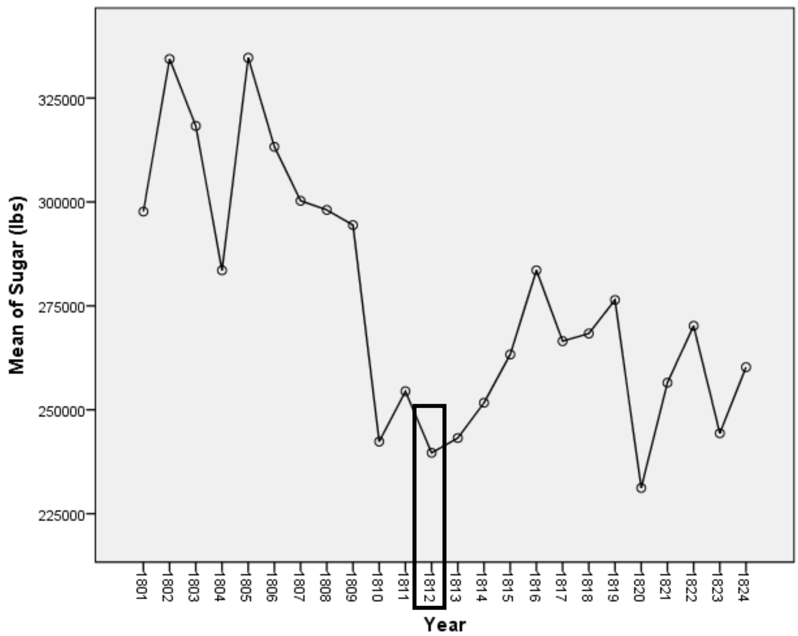

Figure 5.9. The mean production of sugar based on the Levene's Test. The ANOVA test within SPSS showed that between groups, there was a significance of .005. This means that the quantity of sugar and the year unlikely occurred based on random sampling and that there was a difference between the variances of sugar produced and the year.

[107] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

There was several years where mean sugar production was at its highest: 1802 (334,400 lbs), 1805 (334,692 lbs), 1806 (313,271 lbs), 1816 (283,563 lbs), 1819 (276,436 lbs), 1822 (270,206 lbs). The lowest mean sugar production years were in 1804 (283,550 lbs), 1810 (242,348 lbs), 1812 (239,646 lbs), 1813 (243,207 lbs), 1820 (231,192 lbs) and 1823 (244,349 lbs). The 1812 eruption began at the end of April (Section 4.3), around the time sugar cane would have been harvested. So, production numbers would have been impacted as there were no enslaved people to harvest the crop on impacted estates. An exception to the low sugar production results is the lowest productivity level in 1820. Looking more closely at sugarcane production for estates nearest to La Soufrière (Figure 5.1), production for estates on the eastern flank in the parish of Charlotte (Figure 5.4) close to La Soufrière perform better, particularly after 1812 despite starting production later than the estates in St. David's parish (Figure 5.5).

The volcanic eruption and the consequent hazard impacts caused a short-term disturbance to sugar cane productivity in 1812 and 1813. The slight reduction difference between Langley Park (291,500 lbs lost between 1811 and 1812) and Mt. Bentinck (212,921 lbs lost between 1811 and 1812) would be due to being located on the periphery of the PDC flow path (Figure 5.1). The differences between Waterloo and Turama relate to the rate in which the volcanic deposits were incorporated into the soil (Wilson *et al*., 2011). A plausible explanation related to the 1812 eruption contributing to Waterloo's sharp increase in productivity from 1813-1815 would be related to 'nutrient limitation' - described as the addition of a nutrient that causes increased plant growth (Vitousek *et al*., 1993).

Several factors would have therefore led to the 1812 and 1813 results in Figure 5.9:

- The location of estates in proximity to the volcano,
- The eruption occurring during the dry season and for a relatively short time (approximately three weeks),
- Enslaved people absent to harvest and store the sugar cane,
- The thickness of local deposition/emplacement of the volcanic hazards (Figure 5.1),
- And the physical and chemical properties of the volcanic hazards.

However, after 1813 the benefits of the added fertile volcanic material improved soil fertility and therefore sugar cane productivity, particularly three years later in 1815 (a 36 % increase change compared to 1812's quantity) (see Appendix H, Table H2 for calculation details), which was similar to the effect of Mt. Bromo's eruptions three years after an eruption (Bachri *et al.*, 2015).

Table 5.2. Estimates of the losses sustained to estates from the 1812 eruption of La Soufrière written by those affected and signed by the heads of the colonial government council and House of Assembly.[108] Owners, plantation acreage and parish location used the document of enslaved people and sugar returns.[109] The exact location of Two Valleys, Colonarie Farm and Thomas Riddoch's could not be located within the archival record.

Estate name	Estate owner	Acreage in 1812	Estimated loss in pounds (£) and shillings (s.)
Charlotte Parish			
Waterloo	R. Sutherland	810	£19,378
Langley Park	Heirs of John Cruikshank	600	£8,064
Grand Sable	Thomas Brown	1700	£7,392
Lot [No.] 14 Rabacca Estate	Alexander Cumming	400 510	£6,974 £4,700
Turama Career	W. McKenzie	600	£4,006
Mt Bentinck	R. Brown	750	£3,718
Colonarie Farm	Alexander Clunes	-	£250
St. David's Parish			
Wallibou	John and Louis Grant	660	£8,261
Richmond Estate	James Cruikshank	500	£3,528
Thomas Fraser	Thomas Fraser	117	£1,262 10s.
Mt Alexander	H. Haffey	300	£1,100 5s.
Thomas Riddoch	Thomas Riddoch	68	£75

108 Fraser S. *et al*. (1813) "Petition to the House of Commons", National Archive and Document Service of St. Vincent and the Grenadines (NDAS-SVG): AA7.1.50

109 The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

Estimated losses for 1812 are shown in Table 5.2, as reported by the estate owners and recorded in a petition to the British House of Commons. It is not known how the losses were calculated. This data implies that the eruption did more damage to estates closer to the volcanic centre, as expected. The St. David and Charlotte parishes' estates were impacted disproportionately. Therefore, the significance of these two parishes was their physical locations of being in the path of PDCs that put the properties and inhabitants at risk. However, Table 5.2 shows that Thomas Fraser's estate estimated losses, despite being confirmed destroyed in the records, in some instances were not as high compared to other estates that were damaged. On the other hand, Fraser's estate loss per acre is higher than Turama, Rabacca and Mt. Bentinck. This was related to the size of the estate (117 acres for Fraser's estate compared to Wallibou's 660 acres for example, see Table 5.2) and its level of contribution to the sugar industry. For example, the Waterloo estate had up to 810 acres available and in 1810 produced 777,000 pounds (lbs) of sugar compared to Duvallie's 123 acres and 27,000 lbs of sugar in 1810.[110] On the other hand, approximately 10 km southeast of La Soufrière, the Grand Sable estate (Figure 5.1) estimated losses that were exceptionally higher than other estates closer to the volcano, where there was greater volcanic hazard impact.[111]

A plausible explanation for a decrease in sugarcane production for other years would be due to a hurricane or tropical storm. However, only one tropical storm was recorded in 1819 for the length of the dataset, which would explain decreases in 1819-1820. Hurricanes cause widespread damage to the sugarcane crop through intense rainfall and high winds and cause short-term increases in surface temperatures that can affect crop productivity (Carmichael, 1883; Sheridan, 1974; Hsiang, 2010). Unfortunately, no reports were available to investigate import and export trends for the 1812 eruption.

[110] The Gazette Office (1825) "An account of the number of slaves employed…", BL: Document Supply MFR/8397, General Reference Collection 8229.aaa.25

[111] Further investigation into a plausible explanation to the estimate losses showed that Grand Sable was not found to have suffered from a loss in sugar production but, a letter from Governor Brisbane to the Earl of Bathurst, the Administrator of the Windward Islands, may provide a clue as to what happened. According to the letter, the colonial government wanted to purchase 132 acres of the Grand Sable estate to rehouse displaced African slaves and turn the location into a village (township). The Governor further stated that Thomas Brown resisted giving up his lands to be converted into a village. The estimated losses recorded likely related to the selling of this land, as a form of persuasion to Thomas Brown; Brisbane C. (1812) Letter from Governor Charles Brisbane to Earl Bathurst: "The Grand Sable estate and establishment of a church and town", 6th November 1812, TNA: CO 260/29

5.4.2 1902-1903

Unfortunately, due to the Great Hurricane of 1898 and the volcanic eruption four years later, the recording of cacao, arrowroot, cassava, maize, sugar, and cotton do not commence until after 1905.[112] Therefore, an investigation into the 1902-1903 crop production trends was not possible. However, an analysis into the short-term change in 1902 import trends was done to determine what was considered vital to address the disruptions to the agricultural sector at the time.

During 1902, three products were highlighted to be imported duty-free as relief for victims: fish, flour, and rice (Table 5.3). Many victims were peasants, losing their land and consequently livelihoods from subsistence growing of foodstuffs such as arrowroot and cacao to the volcanic eruption.

Table 5.3. Fish, flour and rice quantities imported into St. Vincent for the years 1900-1902.[113] In 1901, 60 lbs and 25 lbs in 1902 of rice were imported duty free for the Administrating Officer for the colonial government and 7,200 lbs of fish and 100 barrels of flour were imported items admitted duty free as relief in response to the volcanic eruption in 1902. 1903, 1904, and 1905 was unavailable in the record.

	1900	**1901**	**Duty free (1901)**	**1902**	**Duty free (1902)**
Fish (pounds)	658,421	576,841	-	726,922	7,200
Flour (barrels)	1,575	908	-	759.5	100
Rice (pounds)	484,615	359,019	60	2,153,078	25

Table 5.3 shows a significant increase in fish and rice imports for 1902, whilst flour imports fall due to changes in demand. Unfortunately, there was no data available for 1903-1905 for a longer comparison series; however, over the course of the eruption, the colonial government, had to make sure approximately 4,000 or more displaced persons were fed daily.[114] This required a substantial increase in the quantity of imported foods especially since cultivatable land acreage was temporarily reduced.

[112] Agriculture Department (1905-1952) Several volumes of Agriculture Department reports, NDAS-SVG: No reference identification
[113] Adapted from: Anon. (1901) St. Vincent Blue Book for the year 1901, TNA: CO 321/218/31; Anon. (1903) St. Vincent Blue Book for the year 1902-1903, TNA: CO 321/219/32
[114] Nottingham Evening Post, "St. Vincent eruption. Volcano still active", 20th May 1902

Except for the fish and flour that were admitted duty-free in response to the eruption from the USA, 1902 imports generally came from more foreign sources – temporarily increasing the dependency on imports, a common SIDS issue (Pelling and Uitto, 2001). Relying upon the colonial government in 1902-1903 for imported food as a result of subsistence crops not being cultivated during the eruption would have exacerbated pre-existing vulnerability and risk factors of the peasantry. This would be due to the volcanic eruption disrupting 'normal' societal functions such as the production of food and an immediate solution had to be found to food shortages (Paton *et al*., 2001; Witham, 2005; Boruff and Cutter, 2007; Leone and Lesales, 2009; Lewis and Kelman, 2010; Smith, 2012).

Relief from Britain, its colonies as well as other foreign nations through sources (e.g. governmental, authorities, royal, or community) was substantial for this eruption. In total, £72,750 from 15th May to the 30th November 1902 was donated (Table 5.4) (Pyle *et al*. 2018). These donations, along with other funds related to relief efforts of the eruption, were amalgamated into a single pot created by the colonial government called the "Soufriere Relief Fund".

Table 5.4. Summary of donations from various countries arranged in highest to lowest. Adapted from Pyle *et al*. (2018) and all archive references are found within.

Location	**Amount (£)**
Britain	54,540
Canada	5,160
Barbados	2,885
St. Vincent	2,169
Trinidad	1,518
Belgium	1,348
British Guiana	1,174
The Netherlands	1,250 florins
Jamaica	750
USA	517
Berlin	500
Mauritius	380
Grenada	337
Seychelles	200
Dominica	181
British Honduras	102
Turks and Caicos Islands	100

Fiji	100
Bermuda	97
Australia	97
St. Kitts	83
Venezuela	78
Montserrat	65
Mexico	53
St. Lucia	42
Suriname	38
South Africa	36
St. Croix	31
Antigua	22
Bahamas	10
Malta	8
India	5
Nevis	1

5.4.3 1979

Data for agricultural productivity in 1979 included total production of top commodities for the period 1967 to 1990 for the whole island (rather than by estate as in 1812), as production was no longer attached to a specific estate. Therefore, a statistical analysis of top commodities was not performed as there was not an extensive dataset, only an annual number per crop. Crops included banana, coconut, roots and tubers, yam, and cassava, but not sugar, which was not re-introduced in time in 1979 to begin records. Figure 5.10 shows the total production of top commodities of banana, coconut, roots and tubers, yam, and cassava from 1967 to 1990.

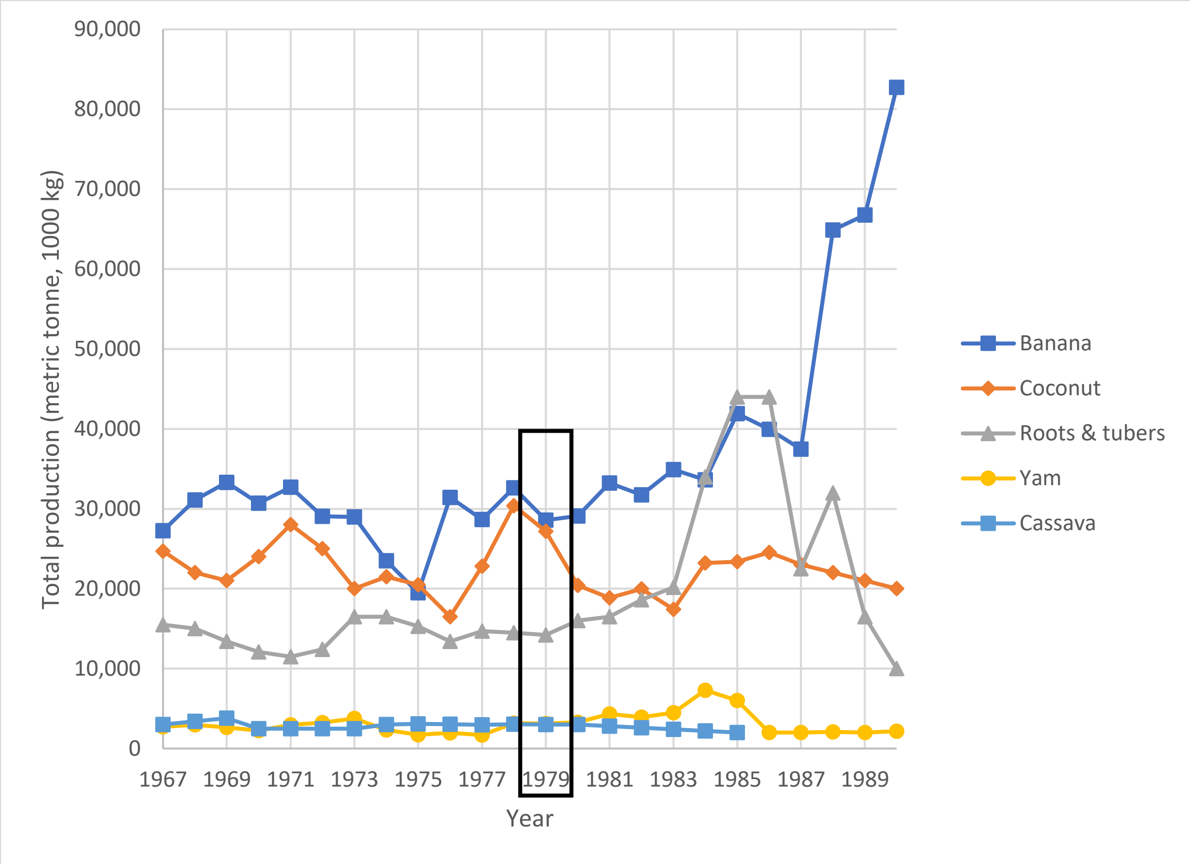

Figure 5.10. Total production of banana, coconut, roots and tubers (although not specified, these are arrowroot, eddoe, and taro), yam, and cassava for the years 1967 to 1990. Adapted from the Food and Agriculture Organisation.[115]

Banana (a cash crop) production declined from 1973-75 (28,964 to 19,477 tonnes), followed by an increase in 1976 (31,420 tonnes), a decline in 1979 (28,590 tonnes) and a rapid increase from 1987-89 (37,472 to 66,752 tonnes). Coconut (a cash crop) on the other hand, increased in 1971 (28,000 tonnes), had its highest production in 1978 (30,400 tonnes), and followed by decline in 1979 (27,160 tonnes). Furthermore, roots and tubers (a cash and subsistence crop) remained stable from 1967-1979 (between 11,500-16,500 tonne), followed by a rapid increase in 1983 (20,190 tonnes), then a sharp decline in 1987 (22,500 from 44,000 tonnes in 1985-1986). Yam (a subsistence crop) was steady from 1967-1983 (between 2,722-4,500 tonnes) then decreased from 1984-1986 (7,300 to 2000 tonnes). Lastly, Cassava (a subsistence crop) remained constant until it stopped appearing as a top commodity in 1986 (between 2,000-3,800 tonnes). Production trends shown in Figure 5.10 were related to the priority of growing certain cash and subsistence crops.

[115] Food and Agriculture Organisation (2016) St. Vincent crop production [online] faostat.fao.org/DesktopDefault.aspx?PageID=339&/ang=en&country=191 [accessed 01/04/16]

It was reported from St. Vincent's Department of Agriculture that arrowroot cultivation located in the northeast was "seriously affected by the volcano".[116] According to the report, approximately 285 acres of arrowroot fields were not harvested and about 45,600 baskets (also known as "bushels" - a unit of dry mass) were unable to be processed following the eruption. There were mixed reports between damage to arrowroot, sweet potato, and yam caused by escaped livestock,[117] but tannia and eddoe (the same type of crop as arrowroot), were reported to be the least affected crops and recovered quickly from ash damage.

On St. Vincent plantain, a fruit from the same family as banana (*Musa*.), initially suffered greatly, with the fingers turning black when covered by volcanic ash. This led to them being rejected on the market, but production and sales had returned to normal levels by the end of the year.[118] Banana on the other hand (a key exporting crop for St. Vincent at the time) "suffered heavily",[119] with some farmers having to completely replant their fields (unfortunately the data was unavailable), whilst others had to do extensive burning and cleaning. Bananas' quality improved by the end of the year due to the extensive assistance from the Bananas Growers Association of St. Vincent (Grossman, 1993). To compare for crops grown on St. Vincent in 1979, Table 5.5 summaries observations of impacts on a selection of crops surrounding Mt. Merapi.

Table 5.5. Effects of volcanic ash on a selection of crops from the 2006 eruption of Mt. Merapi, Indonesia adapted from Wilson *et al*. (2007). The 2006 eruption occurred during Indonesia's dry season, as was the 1979 eruption of La Soufrière. Tephra is all volcanic material, including ash and key properties include ash thickness, grain size and soluble salt content. Both Indonesia and St. Vincent cultivate similar tree plants. Bananas and Plantains (mentioned after the table) come from the same family (*Musa*.) and are therefore comparable. Potatoes/taro can be compared to arrowroot, eddoe, and tannia, which are cultivated in St. Vincent - although not part of the same family, they are all root vegetables as the tubers and roots underground and only the leaves exposed above ground.

[116] The Department of Agriculture (1979) The Department of Agriculture annual report for the year 1979, NDAS-SVG: OP17.1979.
[117] See footnote 116.
[118] See footnote 116.
[119] See footnote 116.

Crop	Vulnerability rank	Vulnerable parts of the plant	Vulnerable stages of development	Ash thickness versus damage
Tree plants (citrus fruits and others)	Low to moderate	Skin of fruit, limited leaf and flower damage – acid and abrasion. Leaves on trees within or at periphery of PDCs were scorched but many show signs of recovery after 10 days.	Young and small trees most vulnerable to PDCs	Tree trunks greater than 25 cm survived PDCs. Acid damage to leaves and fruit from 1-20mm of ash. Flowers damaged from acid and abrasion – 15-20mm.
Bananas	Insufficient observations	Leaves effective collectors of ash; fruit appeared unaffected.	-	-
Potatoes/taro	Some	Leaves vulnerable but root crop unaffected.	Young plants	Leaves damaged by tephra, 100% expected with 4-5mm.

According to Table 5.5, young potatoes and taro plant leaves are vulnerable to ash however, the implications of abandoning cultivation during Mt. Merapi's 2006 eruption was not considered. The combination of damage and abandonment of crop production would seriously impact exports, which is vital for small developing islands.

In general, for households with garden plots, improvements to subsistence crops (e.g. peanuts, peppers, herbs, mango, and breadfruit) quality after the eruption was noticeable. Interviewees from Fancy, Overland, Richland Park, Belmont, and Chateaubelair (Figure 5.3) stated that their crops were "in abundance" the following year. For example, an interview with a man in Belmont (approximately 19 km southeast from the volcano) conducted for this study on the 30th April 2016, who grew a variety of low-lying and medium-height crops for domestic consumption and selling between neighbours, was surprised and pleased by the rigorous growth and good yields of their garden after the volcanic eruption.

Another factor that potentially affected production from Figure 5.10 were several recorded tropical storm events during this period. Tropical depressions brushed or hit the island in

1967, 1968, 1970, 1971, 1974, 1976, 1978, 1979, 1983, 1984, 1986, 1987, and 1988. In 1980, Hurricane Allen at category 4 hit the island[120] and was noted to severely impact the banana industry (Grossman, 2000). Due to higher wind speeds, it would be expected that banana and coconut would be severely impacted due to the plants' tree trunks, whilst intense rainfall waterlogged the root crops. For Hurricane Allen, there appeared to be a bigger decline for coconut (loss of 6,760 tonnes from 1979 to 1980) than the other crops.

As a direct result of the 1979 eruption, all major crop export values were lower than in 1978 (Table 5.6) falling by 5 %.[121] For a SIDS like St. Vincent, 5 % decrease in export value would have a large impact on the economy.

Table 5.6. Quantities of major commodity exports for the years 1977 to 1979,[122] arranged in order of quantity, with added percentage change. Major commodity exports classified by The Department of Agriculture differ from major commodity total production identified by the Food and Agriculture Organisation (Figure 5.10). Quantities in 1980 and 1981 were originally in tonnes sourced from FAO[123] and converted into pounds. It was stated that coconut, mango, and 1981 plantain were unofficial figures. Coconut was excluded from percentage change for 1980-1979 due to different quantity methods used between organisations (number and tonnes). Banana, coconut and copra, plantain, mango, nutmeg and mace, and cocoa bean crops, stem, and leaves grow above ground. On the other hand, the dasheen, arrowroot, sweet potato, ginger, yam, carrot, and peanut crop and its roots are below ground with only its leaves and stem exposed.

Crop	**All quantities in lbs unless stated otherwise**						
	1977	**1978**	**1979**	**1980**	**1981**	**Change between 1979 and 1978 (%)**	**Change between 1980 and 1979 (%)**
Banana	60,111,987	68,337,350	49,236,978	64,145,700	73,237,563	-28	+49
Coconut (number)	4,053,765	5,320,430	4,033,164	20,400 (tonnes)	18,860 (tonnes)	-24	-
Dasheen (taro)	3,114,477	5,094,866	3,848,586	-	-	-24	-
Arrowroot starch	1,578,300	1,770,000	1,418,500	-	-	-20	-
Sweet potato	1,349,395	2,794,495	2,560,640	4,651,754	3,018,128	-8	+18
Ginger	1,255,052	638,415	1,054,159	-	-	+65	-

[120] National Oceanic and Atmosphere Administration (2017) NOAA historical hurricane tracks, Washington DC: US Department of Commerce [online] http://oceanservice.noaa.gov/news/historical-hurricanes/ [accessed 03/02/2017]

[121] See footnote 116

[122] See footnote 116

[123] The Food and Agriculture Organisation (2018) FAOSTAT for Saint Vincent and the Grenadines for the years 1980-1981 [online] http://www.fao.org/faostat/en/#data/QC [accessed 06/03/18]

	1977	1978	1979	1980	1981	Change between 1979 and 1978 (%)	Change between 1980 and 1979 (%)
Yam	1,048,425	957,980	631,091	7,198,093	9,523,970	-34	+1409
Carrot	709,050	678,350	382,750	936,965	399,037	-44	+4
Plantain	591,715	1,280,973	1,687,624	3,229,772	4,850,170	+32	+187
Mango	341,010	382,024	257,189	3,472,281	3,809,588	-33	+1381
Nutmeg	267,712	219,098	200,740	469,585	158,733	-8	-21
Copra (by-product of coconut)	248,640	642,338	716,800	-	-	+12	-
Farine (cassava flour)	128,860	121,657	58,372	-	-	-52	-
Mace (by-product of nutmeg)	46,137	50,980	45,364	-	-	-11	-
Cocoa bean	23,756	60,544	32,575	286,601	297,624	-46	+814
Peanut	2,299	120,477	780	-	-	-99	-

All commodity exports increase from 1978 to 1979 except for ginger (+65 %), plantain (+32 %) and copra (+12 %). The biggest decreases came from yam (-34 %), carrot (-44 %), mango (-33 %), farine (-52 %), and peanut (-99 %), whilst banana decreased by 28 %. On the other hand, for 1979 to 1980 overall exports increased (apart from nutmeg) despite the impacts of Hurricane Allen. No further data was available to determine the reason behind the increases and decreases. Export figures do raise problems as the trends seen only reflect foreign demand rather than production, hiding productivity and home demand.

According to Table 5.5, banana leaves trap volcanic ash but, the fruit 'appears' to be unaffected. However, 268 tons of bananas a week were being rejected as a result of the eruption.[124] It is unclear in the data what damage bananas suffered; however, damage may

[124] Caribbean Business News (1979) "Soufriere cripples Vincentian trade", May-June 1979, NDAS-SVG: Volcanoes VI

have been like plantain (fingers turned black). But as demonstrated in the previous sub-section, the banana crop production recovered a few years later (Section 5.5).

5.4.4 Discussion

Other investigations into impacts of volcanic eruptions on agricultural productivity suggest that impact and recovery is dependent on the timing of the eruption (e.g. during growing season), and tephra composition, thickness, and deposit compactness (Self, 2006; Johrendt, 2007; Sheets, 2007; Jenkins *et al*., 2015). However, there are differences in the length of disruption depending on the volcano. For example, the 1991 eruption of Volcán Hudson in Chile only erupted for four days but ejected up to 4.3 km^3 of tephra. The properties of tephra and the timing of the eruption impacting a vital part of the agricultural cycle, caused significant and prolonged impacts and recovery challenges in Chile and Argentina (Wilson *et al*., 2011).

Larger eruptions such as the AD 421 eruption of Volcán Ilopango in El Salvador (equivalent to the 1991 eruption of Mt. Pinatubo in the Philippines) impeded the reestablishment of cultivation for a century due to high acidity, low water retention, low organic content, and mineral deficiencies (Dull *et al*., 2001). On the other hand, some volcanic eruptions can lead to increased soil fertility and crop productivity from one to three years after an eruption such as observed following the eruptions of Mt. Bromo in Java (Bachri *et al*., 2015).

As mentioned in Section 2.2, a sustainable development constraint for SIDS is their susceptibility to economic and natural hazard shocks. A natural hazard shock may lead to an economic shock through the disruption and destruction they cause, whilst an economic shock would make the society financially at risk in lowering its capacity to cope and respond to a natural hazard shock.

Many societies developed hazard-resilient crops such as yam (also grown on St. Vincent), which is resistant to high winds and can be stored. In addition to diversifying the varieties of crop grown to reduce the likelihood that all species in one location would be heavily damaged (Campbell, 1984). For example, in Fiji, excess breadfruit and cassava (also grown on St. Vincent) were buried in specially prepared holes for off-season when there was a surplus, whilst fish and other proteins were smoked, dried, or salted for longer preservation (Johannes, 1978; Aalbersberg, 1988; Veitayaki, 2002). In times of a hazardous event in Fiji, these preserved foods were used in the interim before full recovery and assuming seasonal cultivation. In the Caribbean today, fish is usually preserved through salting and used in soups and simple dishes with vegetables (i.e. Jamaica's national dish is Ackee and Saltfish).

However, during the late 20th Century in Fiji, these methods of having emergency food available during times of disaster were being lost as modernisation took over. Cash crop and commercial fishing contributed to a loss in traditional methods and techniques of preservation and storage. The knock-on effect of this was disaster relief was increased to supply Fiji's communities following a disaster rather than promotions of self-sufficiency (Campbell, 1990; Mercer *et al.*, 2007). This change from traditional preservation and storage methods transforming into a heavier reliance on disaster relief due to modernisation has also been observed on Vanuatu (Campbell, 1990). In terms of preparedness perceptions, students in the Taranaki region of New Zealand recalled that for a future hazardous event to occur, their families have a three-day stockpile of food and water (Finnis *et al.*, 2010).

The observed temporary export patterns on St. Vincent following the 1979 eruption would be a modern approach to having emergency food readily available. A potential influence on the quantity of exported commodities, particularly banana, is of contract farming. Contract farming has an ancient origin. It involves a purchaser buying the output of a farmer before production begins, but farmers must follow strict cultivation and harvest guidelines set by the buyer. In exchange, the buyer provides a variety of inputs such as credit, information, and services (Goldsmith, 1985; Williams and Karen, 1985; Grossman, 1993). This method - if managed correctly - creates positive multiplier effects for employment, infrastructure, and market development in the local economy (Warning and Key, 2002). The strict guidelines define a specific length, shape, colour, and texture and if a banana was not to the standards of the purchaser (in the instance of St. Vincent, this was Geest Industries),[125] the fruit was rejected.

On the other hand in Senegal, contract farming disrupts power relations and increases tensions within farm households, especially between male household leads and their wives and children (Carney and Watts, 1990). Furthermore, the potential overreliance on cash

[125] Caribbean Business News (1979) "Soufriere cripples Vincentian trade", May-June 1979, NDAS-SVG: Volcanoes VI

crops can also make households more vulnerable to food shortages and price fluctuations (Warning and Key, 2002).

5.5 Recovery and adaptation

The colonial society for the three eruptions adapted via financial assistance, and therefore, was how the colonial society adapted to the volcanic eruptions of La Soufrière. The effectiveness of this strategy depended on conditions of the global market at the time.

Data on the expenditure in assisting the financial recovery of the agricultural sector was lacking for 1812; however, there was some insight into the financial consequences to the government for 1902-1903 and 1979. For the 1902-1903 eruption, the colonial government prioritised recovery of the agricultural sector through various funds (Table 5.7).

Table 5.7. Assets and liabilities of the St. Vincent colonial government for the year 1901 and 1903.[126] 1902 was not available in the record. Figures show what money was spent and saved in 1901, three years after the 1898 hurricane, and the money saved and spent in relation to the initial eruption in 1902.

Assets for 1901	Pounds, shillings and pence (£. s. d.)	Liabilities for 1901	Pounds, shillings and pence (£. s. d.)	Assets for 1903	Pounds, shillings and pence (£. s. d.)	Liabilities for 1903	Pounds, shillings and pence (£. s. d.)
Cash in treasury chest	13. 3. 9	Savings bank account	9,807. 17. 11	Cash in treasury chest	832. 4. 6	Savings bank account	12,255. 3. 4
Savings bank funds	9,500. 0. 0	Hurricane relief	28. 14. 2	Colonial bank on current account	11,117. 2. 2	Special hurricane loan fund	1,392. 5. 9
Alexander fund	294. 18. 7	Immigration fund	78. 6. 9	Savings bank funds	9,500. 0. 0	Roads & land settlement	1,076. 7. 7
Roads & land settlement	538. 12. 1	Special hurricane loan fund	209. 4. 7	Soufriere eruption fund	8,023. 5. 5	Soufriere eruption fund	41,065. 15. 11
Graham bequest fund	30. 0. 0	Colonial bank account	221. 4. 4	Alexander fund	613. 12. 5	Alexander indemnity fund	619. 9. 4

[126] Adapted from: Anon. (1901) St. Vincent Blue Book for the year 1901, TNA: CO 321/218/31; Anon. (1903) St. Vincent Blue Book for the year 1902-1903, TNA: CO 321/219/32

				J.B. Kernahan for settlement of claims by crown land owners, consequent on eruption of Soufriere	1,200. 0. 0		

Unfortunately, no data was available for 1902 however, the total number of assets for 1901 and 1903 remained the same, but some assets in 1901 became liabilities in 1903 (Alexander fund and roads and land settlement). The "Alexander Fund" was originally used to repair estate damage caused by the 1898 hurricane to the several estates owned by Alexander Porter (Tourama, Orange Hill, Waterloo, Lot 14, Rabacca, Mt. Bentinck, Langley Park, and Richmond) (Figure 5.2) (the balance is present in 1901 and increases in 1903).[127] The roads and land settlement asset/liability involved the continual upgrading of the road and purchasing land to be turned into townships. Due the impacts of La Soufrière's eruption, the establishment of the fund by 1903 would have taken over some of the funding of costs related to the roads and land settlement liability (Table 5.7).

The different funds in 1903 suggest that in response to the eruption, additional financial sources were given to the colonial government to spend in the recovery phase of the crisis. The expenditure as the result of two destructive natural hazard events occurring relatively close together would have impacted on the financial resilience and increased dependency on foreign assistance of the island.

The power held by the large landowners created a perception amongst themselves and the colonial government that they were the 'real' sufferers. This included Alexander Porter, as his estates were physically and economically at risk due to the large area of land exposed to the volcanic hazards. Despite being at risk, Mr. Porter had a lot of wealth, which brought with it power. As an absentee learning that his estates were impacted, he wrote a persuasive letter to seek compensation: [128]

[127] Llewellyn R. (1903) "Compensation to Mr. A Porter and resettlement on his estates", 5th January 1903, TNA: CO 321/218/6

[128] Porter, A. (1902) Letter from Mr. Alexander Porter to Administrator Joseph Chamberlain: "Compensation for losses through eruption", TNA: CO 321/214

> *"…without any assistance [my] estates notwithstanding my heavy losses and doing all [fre]quently averting a crisis among the excitable negroes population especially in the Carib Country districts…I feel in face of an estimated loss of £27,000 on my estates caused by this terrible calamity that unless I receive a moderate amount of compensation…the difficulties of the government will be greatly increased with a large unemployed negro and coloured population clamouring for food".*

This was in conjunction with the continued perception (and perhaps arrogance) by the large estate owners that sugar cultivation was still the most important cash crop on the island, which brought in employment opportunities[129]. This perception and general higher socioeconomic and political mobility of large landowners meant that there were more options available to them to compensate for their losses.

Estate owners were able to apply to the 'hurricane loan special fund' (Table 5.6) which was a colonial government-controlled account set up in response to damages sustained from the Great Hurricane of 1898, which was made up of donations and grants from various individuals and organisations,[130] and by 1904 £1,608 10 shillings (s.) and 11 pence (d.) was available.[131] The hurricane fund was used in conjunction with a 'Soufriere relief fund'[132] (Table 5.7) once the eruption had occurred but documents available do not show peasants applying to either fund. The Hurricane loan/relief accounts were used in 1901 and 1903 as liabilities, suggesting that the island was still recovering, rebuilding, and using donations and grant money from the 1898 hurricane. The colonial government created the funds to collect donations and grants coming from various national and foreign sources intended to repair and replace equipment needed in the production of sugarcane. The intent appears to be directed only to the large landowners however, making it harder for peasants to recover.

Another recovery strategy following the eruption was to sell land/estates to finance repairs for more profitable estates. Mr. Porter, who in writing to the colonial government, stated that his estates suffered losses at an estimated £27,000 (£3.5 million with inflation) and emphasised that he was also impacted by the 1898 hurricane. He felt that if the estates were abandoned, the financial repercussions would be damaging to the island's economy

[129] See footnote 128.

[130] James Howath (1900) Letter from Secretary of State to the Colonial Treasury of St. Vincent: "Hurricane Loan Ordinance", 12th April 1900, TNA: CO 321/202

[131] Cameron, E.J. (1903) "Annual colonial report for 1903-1904, number 403", NDAS-SVG: AA7.1.50.

[132] See footnote 131.

because the colonial government will have to provide for "…a large unemployed negro and coloured population clamouring for food".[133] In Mr. Porter's view, his estates provided jobs for a considerable number of Black and mixed-race persons, and if there were a lack of financial assistance, the colonial government would have to deal with an increase in people seeking benefits. Mr. Porter's argument for assistance was also in part due to his ownership of the 'Carib canal', a source of irrigated water to several estates in the area.[134] It appears he was granted an 'Indemnity Fund' detailed in the 1903-1904 colonial report[135]. This fund totalled £1,022 13s. 8d. whilst the Soufrière Eruption fund totalled £30,066 2s. 1d. It is unclear whether the eruption fund or the colonial government supplied the indemnity fund.[136]

Another way a large landowner could seek financial assistance was to request for an exemption on land tax, to concentrate efforts on repairing property (Table 5.8). The 'sundry small properties' were an aggregate of peasants and had to be handled by the colonial government in some way. Requests mainly originated from heavily impacted estates in the northern half of the island, for example Fancy and Cramacou (Figure 5.2).[137]

Table 5.8. Estates damaged by the volcanic eruption exempt from land tax payment for the year 1903[138]. Arranged by parish and in order of highest to lowest tax.

Estate	Owner	Acreage	Amount of tax
St David Parish			
Richmond	Alexander Porter	830	£41 10s.
Richmond Vale	Duncan A. MacDonald	626	£31 6s.
Estate	**Owner**	**Acreage**	**Amount of tax**
Windsor Forest	Duncan A. MacDonald	200	£10
Charlotte Parish			
Grand Sable	Heirs of H.A. Hazell	1592	£79 12s.

133 Porter, A. (1902) Letter from Mr. Alexander Porter to Administrator Joseph Chamberlain: "Compensation for losses through eruption", TNA: CO 321/214

134 Williams R. (1908) Correspondence between the Governor Ralph Williams and the Administrator, 30th February 1908, NDAS-SVG: CONF 21908

135 Cameron, E.J. (1903) "Annual colonial report for 1903-1904, number 403", NDAS-SVG: AA7.1.50.

136 See footnote 135.

137 Simmons, C.J. (1903) Letter from Mr. C.J. Simmons to Administrator Joseph Chamberlain: "Request for tax allusion for Fancy Estate, Cramacou and Cape Roll", 28th August 1903, TNA: CO 321/219

138 Adapted from: Melville, G. (1903) Letter from Sir George Melville to Administrator Joseph Chamberlain: "Discussion of estate land tax remission", 8th October 1903, TNA: CO 321/219

Tourama	Alexander Porter	800	£40
Mt Bentinck	Alexander Porter	760	£38
Waterloo	Alexander Porter	754	£37 14s.
Orange Hill	Alexander Porter	739	£36 19s.
Owia	J. Littledale and others	612 ½	£30 12s. 6d.
Langley Park	Alexander Porter	600	£30
Rabacca	Alexander Porter	610	£30
Lot 14	Alexander Porter	500	£25
Mt William	Claude A. Hadley	475	£23 15s.
Fancy	C.J. Simmons	290	£14 10s.
Cramacou	C.J. Simmons	105	£5 5s.
Other			
Sundry small properties	-	-	£20 8s. 2d.

Governor Llewellyn stated that a one-year land tax exemption to those heavily impacted by the eruption should be granted.[139] In September 1903 after the eruption had ceased, however, the Land Commissioner suggested a temporary alternative by paying the land tax in instalments and interest added onto non-payments.[140] However, further correspondence by the Commissioner in October saw more requests for exemptions from large landowners and the Commissioner calling into question its continuity. It was considered that some large landowners only paid half the tax, and that the other half should be paid in the form of the colonial government taking possession of their lands. This was evidently done for the estates of Grand Sable, Mt. William, and Richmond Vale.[141]

Similarly, for persons (dominantly peasants) owning an allotment under the Land Settlement Scheme, it was stated that they should apply for an exemption to paying land tax like the larger landowners, as a means of securing payment without "inflicting hardship on

[139] Lucas (1903) "Suggestions on land taxation by Mr. Kernahan", 2nd September 1903, TNA: CO 321/220

[140] Kernahan, J.B. (1903) Letter from Land Commissioner Mr. Kernahan to Administrator Joseph Chamberlain: "Land settlement scheme report by J.B. Kernahan", 15th May 1903, TNA: CO 321/218

[141] Melville, G. (1903) Letter from Sir George Melville to Administrator Joseph Chamberlain: "Discussion of estate land tax remission", 8th October 1903, TNA: CO 321/219

allottees [peasants]".[142] Another suggestion was for those displaced by the eruption and moved onto land purposely brought by the colonial government for them, should pay the land tax without exemption. On the other hand, it was in the Land Commissioner's racist opinion that the "negro peasants" were lazy (a racial stereotype still imposed on Black people today) in paying the land tax and the source of the island's economic troubles in addition to the volcanic eruption.[143]

According to a report by the Administrator for the Windward Islands Mr. Thompson in 1897, the reason a financial crisis on the island at the time was related to the limited amount of agricultural land available.[144] In the letter, the issues permeated by the control of the land by a small minority of absentees was noted to:

> *"…cling to them with a tenacity worthy of a better cause, and who thus not only have the power to decide what produce shall be exclusively cultivated but control the labour market and the rate of wages and make peasant proprietors an impossibility".*

However, due to the colonial racism present, this was not addressed thoroughly. There was a distrust between peasants and the colonial government, at the time believed to be the result of the "Jenning's Valley Incident".[145] Although there was limited information available on when this event took place, it involved a group of peasants purchasing land at an undisclosed date in the Jenning's Valley, located above Grand Sable (Figure 5.2). For reasons not entirely clear, the peasants were forcibly removed, and their crops cut down despite paying the first instalment. The distrust caused by the incident had a lasting effect that affected the colonial government receiving land tax payments that may have proved beneficial to financial recovery from the volcanic eruption[146].

Seeking opportunities at the colonial government level was a further recovery option that also can be viewed as an adaptive strategy. A couple of months after the 1902-1903 eruption ended in March 1903 (however, the activity was uncertain for the locals and officials at the time), St. Vincent's Agricultural Officer Mr. Morris put forward to Governor

[142] Kernahan, J.B. (1903) Letter from Land Commissioner Mr. Kernahan to Administrator Joseph Chamberlain: "Land settlement scheme report by J.B. Kernahan", 15th May 1903, TNA: CO 321/218

[143] See footnote 142.

[144] Thompson, H. (1897) "Report on the condition of St. Vincent, memorandum", TNA: CO 884/5

[145] See footnote 142.

[146] Llewellyn, R. (1903) Letter from Sir Robert Llewellyn to Administrator Joseph Chamberlain: "Aiding the commissioner of agriculture to plant cotton in St. Vincent", 2nd June 1903, TNA: CO 321/219

Llewellyn, the suggestion to encourage peasants to grow cotton.[147] This was in part due to cotton being easily introduced on land formerly occupied by arrowroot (Spinelli, 1973).

Mr. Morris and the Imperial Department of Agriculture of the West Indies (established near the end of the 1890s)[148] were observing the decline in sugar on the market, due to a few interconnected reasons: once emancipation in the British West Indies occurred in 1834, former enslaved people severed ties with the plantation estates, which led to a shortage of labour. From this, an economic depression from declining sugar industry profits arose as the result of increased competition of sugar beet production. This depression drove many plantation estates in the British West Indies to bankruptcy and in response, the West Indian Encumbered Estates Act of 1854 was established in order to sell and repurchase estates (Spinelli, 1973).

It was advised by the Imperial Department for the British West Indie colonies to either modernise the sugar industry or to change to another commodity, which was done for St. Vincent peasants and arrowroot in the 1840s (Spinelli, 1973). However, large landowners (mainly absentees) that remained in production after the Encumbered Estates Act on St. Vincent continued to grow sugarcane. Their persistence in the unwillingness to diversify cash crops grown and methods of producing sugarcane exacerbated the issues of the agricultural sector's vulnerability.

The combination of the market decline of sugar, plus the 1898 hurricane and the volcanic eruption, brought St. Vincent's sugar industry into severe decline. This prompted Mr. Morris and the Imperial Department to come to the decision that cotton would be the prime choice and become St. Vincent's top cash crop at the time due to:

- English spinner demand,
- The US was consuming more of its own cotton, reducing supply available to the UK,
- Soil and climate were favourable,
- Large lots of abandoned sugarcane land,

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[147] Llewellyn, R. (1903) Letter from Sir Robert Llewellyn to Administrator Joseph Chamberlain: "Cotton cultivation", 20th May 1903, TNA: CO 321/219/48

[148] The National Archives (2017) Colonial Office: Imperial Department of Agriculture [online] http://discovery.nationalarchives.gov.uk/details/r/C4807 [accessed 16/11/17]

- Labour force could be obtained, and paid lower than in the US,
- Highest quality (sea island) is easily grown in Caribbean and,
- Large landowners and peasants could engage in an industry which would not require large capital outlays for equipment and buildings, and could be exported six to eight months after planting (Spinelli, 1973).

But it was not until after the eruption ended in May that cotton was planted in the southeast of the island,[149] as it was suggested that cotton should be planted in areas “free from any danger” of La Soufrière. Interestingly, this corresponds to the approximate area where there were no reports of ash fall (Figure 5.2) and hurricanes were not mentioned despite being a present problem to the sector.

There was uncertainty as to when cultivation could resume on agricultural land in the northern half of the country, particularly on estates owned by Mr. Porter[150]. Mr. Morris suggested that to start the cotton industry’s development on the island, grants could be issued from the British West African colonies and the British Cotton Growing Association.[151] It was later suggested that a sum from the eruption relief fund might be used to boost the industry; however, Governor Llewellyn was reluctant to do so, as in his opinion the fund should solely focus on relief effects.[152]

It would be argued that using the fund to help those displaced by the eruption to re-establish their livelihoods would have been justifiable. Peasants had more incentive to diversify in what crops to grow compared to the large landowners. This was mainly due to the traditions held by their enslaved ancestors, who cultivated ‘provisions’ (subsistence crops) for household consumption and any excess sold on the local market (Anderson and Flett, 1902). This was a form of social resilience that would have proven beneficial at the household and community level (Kelman and Mather, 2008).

[149] Llewellyn, R. (1903) Letter from Sir Robert Llewellyn to Administrator Joseph Chamberlain: “Aiding the commissioner of agriculture to plant cotton in St. Vincent”, 2nd June 1903, TNA: CO 321/219

[150] Llewellyn, R. (1903) Letter from Sir Robert Llewellyn to Administrator Joseph Chamberlain: “Cotton cultivation”, 20th May 1903, TNA: CO 321/219/48

[151] Anon. (1902) “Estate land tax exemption”, TNA: CO 321/214

[152] See footnote 149.

Diversifying agriculture and supporting business development is important for some rural development programmes in several countries and SIDS within the African Caribbean Pacific group today (Angelucci and Conforti, 2010). But these programmes can be hindered by:

1. A small domestic market,
2. Scarce natural resources,
3. High level of strategic imports such as food and fuel,
4. Inability to influence international prices,
5. Uncertainty of supply due to remoteness and insularity and,
6. Lack of economies of scale.

Similar issues faced St. Vincent in 1902. In 1905, a review by the head of the British Cotton Growing Association in St. Vincent wrote favourably of the assistance of the Imperial Department of Agriculture in establishing the industry in late 1903, with more than 300 acres (1.2 km^2) of cotton being planted.[153] Three types of cotton were planted: Sea Island, Marie Galante, and Upland. However, the Sea Island variety fared better on the market so much that "…word from brokers was that St. Vincent cotton holds the proud position as being the finest produced in the British Empire"[154] and the industry would continue to flourish until 1933 (Spinelli, 1973).

The disproportionate assistance given to large landowners compared to peasants was largely rooted in the power the dwindling planter class (post-emancipation) had over the agriculture sector, based on having control over the land (Bolland, 1981). This was in addition to a colonial political and social structure that largely benefited a minority but highly socially mobile group. Furthermore, the combination of racism and distrust caused the colonial and British governments to favour the large landowners over the peasants. The combined factors of power, socio-political mobility, racism and distrust led to resources to aid recovery being against the interests of peasants (Watts, 1994). This caused further polarisation of the socioeconomics of the agricultural system. This was coupled with global market competition and the inability to pay instalments on time, causing substantial

[153] Sands, W.N. (1905) "Review of local cotton industry with suggestions for the present planting season", TNA: CO 321/228
[154] See footnote 153.

restrictions for peasants to gain a foothold within the sector. The agricultural sector in this case, was not only disproportionately physically at risk due to the locations of large estates on the fertile volcanic soil surrounding La Soufrière, socially at risk due to the oppressed political, social and economic mobility of peasants, but also was economically at risk due to the pre-existing nature of the control over land and work.

For the 1979 eruption, the most spent by one of St. Vincent's governmental ministries was an estimated EC$26,290,800 (£7,508,652.48 as of 30th October 2019) by the Ministry of Trade and Agriculture from 1979 to 1981 (Table 5.9).[155]

Table 5.9. Estimated expenditure for the Ministry of Trade and Agriculture for the years 1979 to 1981.[156]

Details of expenditure	**Estimated expenditure for 1979/1980**	**Estimated expenditure for 1980/1981**	
	Development aid grants (EC$)	**Loans (EC$)**	**Development aid grants (EC$)**
Crop rehabilitation (Soufrière)	2,000,000	1,000,000	-
La Soufrière monitoring equipment	125,000	-	-
Arrowroot expansion	-	740,000	-
Arrowroot factory	1,500,000	450,000	-
Sugar cane planting	10,000	20,000	-
Sugar factory	6,500,000	9,500,000	-
Coconut improvement	-	800,000	-
Coconut development	120,000	-	5,000
Banana rehabilitation (Soufrière)	1,000,000	1,300,000	300,000
Banana development programme	11,000	-	100,000
Banana development (input subsidy)	300,000	-	3,000
5-year banana development programme	500,000	-	6,800

[155] Anon. (1979) Estimates of revenue and expenditure for 1979-1980, NDAS-SVG: AA1.15.24.; Anon. (1980) Estimates of revenue and expenditure for 1980-1981, NDAS-SVG: AA1.15.267.
[156] See footnote 155.

As the table shows, the priority was to assist the top cash crop industries at the time: banana (EC$3,520,800 in total), arrowroot (EC$2,690,000 in total), and coconut (EC$925,000 in total). The sugar industry was reintroduced in the latter half of 1979, an idea that can be traced back to 1970. According to a letter, the reintroduction was a political move for the Labour Party's (political party operational from 1956-1994) leader Premier Cato (also Premier in 1979) to gain support over Vincentians by providing employment opportunities.[157]

Near the end of 1979, the Department of Agriculture also distributed seeds that were donated to them.[158] However, government support for local food production had been consistently limited across all British West Indies countries around this time (Long, 1982; Axline, 1998). Therefore, despite the initial assistance, any success thereafter was the result of the farmers rather than continued governmental support.

Additional support came from various national, regional, and international community associations and non-governmental organisations. For example, substantial help to farmers came from the Lions Club of St. Vincent by providing carrot seeds, planters, and fertiliser, the St. Vincent Christian Council gave EC$200,000, the Ancient Order of Foresters provided 10 black belly sheep, the US-based organisation Brother's Brother Foundation contributed vegetable seeds, whilst the UK branch of Oxfam contributed US$5,000 towards seeds and chemicals.[159]

Whilst contract farming demands made the impact of the eruption on the sector momentarily severe due to production and asset loss, recovery was less dependent on the social structure that was embedded during the last two eruptions.

5.6 Conclusion

The investigation of the 1812, 1902-1903, and 1979 eruption impacts of La Soufrière on St. Vincent's agricultural sector has shown differences but also notable similarities. Firstly, the volcanic hazard impacts occur in the same places (with varying intensities based on the magnitude and length of the eruption) but damage to the sector was not homogenous.

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[157] Embleton R. (1970) Letter from R.L. Embleton to D.G. Mitchell, R.W. Newsam and G. Kelly, NDAS-SVG: FCO6310.

[158] Anon. (1979) Estimates of revenue and expenditure for 1979-1980, NDAS-SVG: AA1.15.24.; Anon. (1980) Estimates of revenue and expenditure for 1980-1981, NDAS-SVG: AA1.15.267.

[159] The Department of Agriculture (1979) The Department of Agriculture annual report for the year 1979, NDAS-SVG: OP17.1979.

Secondly, the volcanic eruptions caused short-term disruption with no long-term impacts. Surprisingly, throughout history, St. Vincent's agricultural economy has been resilient to eruptions of La Soufrière.

The differences lie within the socioeconomic structure of the agricultural systems between each eruption and consequent recovery options available. Due to colonial racism, recovery options for marginalised groups during the 1812 and 1902-1903 eruption were vastly limited and not widely documented, compared to their white elite counterparts. On the other hand, by 1979 this was not the issue. By 1979, the high demands associated with contract farming as well as Hurricane Allen the following year generated export issues. However, a considerable amount of aid in the form of money and assets was inputted into the top cash crop industries to ensure quick recovery. These factors contributed to the emergence of adaptive strategies specific to the agricultural sector in the form of selling and buying land and reducing the exports of subsistence crops, where the key seems to be targeted cash aid to the main economic crops after each eruption. This demonstrates the importance of the socioeconomic structure of an economic sector as well as the physical distribution of assets in relation to the volcanic hazard impact areas in relation to a volcano's eruptive history.

Chapter 6 – The impacts of La Soufrière on St. Vincent's human-volcano system

6.1 Introduction

The following chapter explores the influence of La Soufrière's physical presence on settlements and livelihoods, then examines the patterns of evacuations and resettlement. The chapter ends with exploring how the eruptions exacerbate issues of corruption and demonstrates the connectivity of St. Vincent to the wider Caribbean region.

Social issues are important to investigate because each social group, community, and nation experiences disasters differently based on key variables such as occupation, ethnicity, and gender (Wisner *et al.*, 2004a). However, investigating social issues exacerbated by disasters is challenging, as it is dependent on data available; appropriate data may not be recorded accurately or may not be recorded at all. In this regard, understanding different social groups' disaster narratives is vital in pinpointing the directions of volcanic risk reduction, but unfortunately due to the records kept in 1812 and 1902-1903, the white elite's narratives are more visible than other social groups. This was addressed with the selective nature of the 1979 semi-structured interviews (See Section 3.3.7 and 3.5.2).

This chapter identifies patterns of settlement locations and chosen livelihoods in the northern portion of the island related to plantation estates and not the geographical distribution of volcanic hazards of the three eruptions. Evacuation was based on a mixture of people interviewed as well as evidenced in Chapter 4, recognising visual and "felt" signals of volcanic activity and official evacuation orders, whilst resettlement was based on property and livelihoods being impacted and better opportunities were found elsewhere. Three types of social capital activities were identified: 1) a community helping to move huts, 2) a cultural exchange project, and 3) swap labour. Opportunities were exploited to the point of corruption, and competition for disaster relief increased (termed "bodou"); nevertheless, the response to the eruptions demonstrated the connectedness of the Caribbean region.

Here, how the colonial society adapted social behaviours in response to the volcano's eruptions is investigated. This thesis argues that colonialism has influenced volcanic coexistence on St. Vincent.

6.2 Settlements and livelihoods

6.2.1 Settlements

Livelihoods closely correspond with settlement and the location of resources and can rapidly change (Wisner *et al.*, 2004a). For St. Vincent and other colonised West Indian islands, livelihoods were closely associated with the location of plantation estates.

After a failed military expedition to subdue the Garifuna, early French settlers in 1719 established small farms along the sheltered western coast near Kalinago settlements (Coke, 1969). The Garifuna had settlements along the southern and eastern coasts (Spinelli, 1973). Archaeological evidence suggests that before European contact, the Kalinago and Garifuna settled on parts of the island away from La Soufrière (Fitzpatrick, 2012). Across the Caribbean, volcanic eruptions appear to have been a deterrent to prehistoric settlers (Callaghan, 2010).

Once the island was ceded to Britain (see Section 1.6) and plantation estates were established, the formation of small settlements around those estates occurred. After emancipation, many former enslaved people sought to establish residence in "free villages", towns, and small settlements by purchasing provision grounds when available and occasionally, squatting when land was not affordable (Spinelli, 1973). In 1854, 7,466 people were reported to be living in villages built since emancipation, whilst in 1855 this was 7,965, 8,209 in 1859, and 12,833 people in 1861.[160] However, those not in the new villages lived in pre-emancipation towns and settlements like Georgetown.

Eleven settlements were in PDC and lahar flow paths between 1812 to 1979, whilst eight were solely adjacent or near a river that channelled lahars (Figure 4.21). Seven settlements were at risk from being cut-off from using the Windward Highway. In the north of the island, 22 settlements are located on the coast and nine are towards the interior and closer to La Soufrière. Only 43 % out of 84,595 acres (342 km^2) of land on the island is cultivatable by being below 1,000 feet in elevation (Spinelli, 1973). However, by the time of emancipation

[160] The Colony of St. Vincent Blue Book (1854) Pg. 155; (1855) pg. 150; Sewell, Ordeal of Free Labour, pg. 79; Blue Book (1861) Pg. 162-163 – Found in Spinelli (1973), pg. 88

most of the accessible land was private "Crown Lands", which inhibited the availability of land for peasants to buy or squat.[161]

In tropical areas like St. Vincent, the elevation and fertile soils associated with volcanic regions provide incentives for agrarian populations to settle close to active volcanoes (Small and Naumann, 2001). Nevertheless, the population in this area are exposed to a multi-hazardous environment, due to settlements situated along the coast and damage to sensitive ecosystems, but also exposure to seaward hazards (such as sea level rise and tropical storms). Unfortunately, such environmental considerations do not have the influence on settlement patterns (McGranahan *et al*., 2007).

Being concentrated in a relatively small space between La Soufrière and the coast gives rise to environmental inequalities that affects livelihoods. Causes of environmental inequities are often complex and deeply rooted in historical patterns of commerce, geography, state, and local land-use decisions and other factors that affect where people live and work (Environmental Protection Agency, 1992).

Political processes have great influence in shaping the context in which we live. While participation in these processes does not ensure policies favouring any particular subpopulation, a lack of participation (e.g. voting) results in voices unheard (Hunter, 2000). However, due to colonialism and the lower social standing of every other social group apart from the white elite, political participation was suppressed.[162] Another avenue is grassroots organisations bringing public and political attention to a particular proximate hazard (Hunter, 2000). Such community activism in response to proximate environmental hazards represents an important component in the struggle for environmental justice (Brown and Mikkelsen, 1990; Bullard, 1990).

A study of Fancy, Owia, and Sandy Bay following a drought and then Hurricane Tomas in 2010 revealed current environmental justice issues about a changing climate (Smith and

[161] Spinelli (1973) wrote as a footnote without a reference suggesting the reason why squatting was not as common on St. Vincent compared to larger British West Indie colonies: "…all the available lands in the colony have been granted or settled and the proprietors are sufficiently alive to their own interests to prevent any unauthorised occupation…the fertility of crown lands is great but the inaccessibility and the primeval forest cover needed to be cleared makes the risk too great to chance losing all if one is evicted".

[162] St. Vincent and the Grenadines did not gain universal adult suffrage until 1951, therefore political participation amongst enslaved persons, freed persons, peasants and women was essentially non-existent in 1812 and 1902-1903 - http://caribbeanelections.com/vc/education/right_to_vote.asp [accessed 04/12/18]

Rhiney, 2016). According to the study, the factors driving vulnerability within the Garifuna communities are a combined function of:

- Centuries of economic neglect,
- Political marginalisation,
- The communities' lower socio-economic status,
- Geographic location,
- Heavy reliance on land-based resources (i.e. agriculture).

Moreover, these factors are coupled with psychological barriers, such as saliency (the prioritisation of risks to oneself) and confidence that affect residents' capacity to adapt to a changing and variable regional climate regime. This would collate with the volcanic risk perception study of La Soufrière that found that only 33 people out of 100 have a moderate confidence in preparing for a future eruption (Scarlett, 2014).

The political and economic processes of residential areas near environmental hazards tend to be characterised by lower housing costs, therefore draw in lower-income households (Hunter, 2000). This drew in peasants buying or squatting on marginal estate land, created an enclosed loop of vulnerability and environmental inequality, and eventually became more permanent settlements by the 1979 eruption. Environmental inequalities affect livelihoods through the exploitation of natural resources in which people rely on, in this instance peasants depending on good quality land, and leads to loss of earnings and opportunities (ESCAP, 2018).

6.2.2 Livelihoods

A major short-term impact of volcanic eruptions is the disruption to livelihoods, making it a factor of resilience as well as vulnerability (Barclay *et al*., 2015). Livelihoods are the means by which individuals can provide living essentials for themselves and the capacity to secure them and other assets (Kelman and Mather, 2008). On St. Vincent, livelihoods have been influenced by globalisation, the geographical setting of the island, and the physical presence of La Soufrière and its eruptions. The main livelihood in the northern half of the island around La Soufrière has been - and still is - agriculture (Armijos and Few, 2016). The largest and most productive plantation estates were located on flatter and more fertile land.

This study has shown that for each eruption, volcanic hazard impacts occur in the same places, but damage was not equal. The unequal impacts were due to the size of the eruptions and the differences in the socioeconomic structure of the agricultural system between each eruptions and consequent recovery options available. Despite the impacts however, agricultural livelihoods are resilient to the eruptions of La Soufrière.

The 1812 eruption caused a temporary total reduction of cultivable land by 6080 acres (Smith, 2011), which limited the scale of productivity. At the time, it was reported that "Work [was] much injured", [163] meaning that jobs were severely impacted. Disruption affected livelihoods across the entire sector from crop and by-product production, storage, transportation, and trading (Chapter 5). However, it is difficult to separate the impacts on enslaved Africans, freed persons, and the Kalinago and Garifuna in terms of livelihoods, as their voices are absent from the narrative.

Existing conditions of poverty in 1902 were exacerbated by the eruption, as most of the affected population relied on agriculture:

> *"The areas of safety for dwellings and cultivation are gradually being reduced…and all the people crowded there [south of the island] I do not know how they can exist, except in poverty and distress".* [164]

The 1902-1903 eruption impacted £19,350 (£2.2 million with inflation) worth of land (Pyle *et al*., 2018). A breakdown in different community's resilience following the weeks and months after the 7th May 1902 eruption occurred, as many people had moved away from their own settlements (Section 6.3). Being situated on various estate and village lands away from their original communities meant that their usual access to social networks and assets were disrupted.

The temporary abandonment of land and separation of communities, as they travelled to different locations, led to fears of famine, due to the high reliability on subsistence farming: "The livestock and people are fleeing to the towns…and a famine is threatened". [165] Between

[163] Perthshire Courier, "Extract of a letter from a gentleman in St. Vincents, to his brother in Perth," 3rd December 1812

[164] Western Times, "Volcano's havoc. Distressing reports from St. Vincent," 19th November 1902

[165] Yorkshire Evening Post, "St. Vincent devastated. Explosions herd 200 miles away. Springs dried up. Weird apparitions in the skies," 12th May 1902

2,000 and 4,380[166] people out of a total island population of approximately 48,250[167] (4-9 %) needed relief, a difficult undertaking for the colonial government to meet for a small developing colonial island. Consequently, the need to accommodate subsistence farmers who had lost their livelihoods due to the eruption led to large amounts of disaster relief and, as a result, an increased relief dependency.

In 1903, a letter from Garifuna representatives of Owia and Fancy expressed their agitation and dissatisfaction in the response to relief in rebuilding their livelihoods:

> *"…we are suffering great privation and want, the week's wages received by us being insufficient to keep our families for more than three days out of seven. We…direct that steps be immediately taken to give us…homes and lands on which we can obtain a livelihood".*[168]

The main concern for the Garifuna who were evacuated was rebuilding their livelihoods as soon as possible. This was a similar situation for farmers affected by the 2015 Calbuco eruption in South Chile. There was miscommunication between the authorities who assumed they knew what the farmers needed without consulting them properly on the issues of rebuilding their livelihoods.[169]

As a result of the Garifuna expressing their discontent, the St. Vincent colonial government purchased portions of unwanted estate land for the Garifuna and peasants. But due to the underlining colonial racism, there was a general feeling the black peasantry should be "grateful" for all the assistance given to rebuild livelihoods. For example:

> *"…you [Governor Llewellyn] have set these people up with good houses and provision grounds with some money (as compensation for their losses) in hand, and they are now far better off than they ever were before".*[170]

With a total population of 86,940,[171] approximately EC$75,000 (£108,934.41 with inflation) per day was needed to run over 60 evacuation centres housing approximately 15,000

[166] Cheltenham Chronicle, "Volcano's victims," 17th May 1902; Pyle *et al*. (2018) total number of the population impacted by the 1902-1903 eruptions on the Leeward (west) and Windward (east) sides of La Soufrière was calculated to be 4,382 persons.

[167] Registrar General (1903) Report of the Registrar General of births, marriages and deaths of the year 1902, TNA: CO 288/68, 25th June 1903

[168] Garifuna representatives (1903) Letter from Garifuna representatives to the Prince Reagent Edward VII, TNA: CO 321/220

[169] Village representative (2016) Interconference fieldtrip to Calbuco volcano, Cities on Volcanoes 9, Puerto Varas, Chile, 20th-25th November 2016 – the woman, whose family and the village are farmers, were frustrated with the lack of communication with the local authorities, as the authorities did not consult them in what they needed, making assumptions that were not appropriate for the village to keep their livestock safe and to maintain their livelihoods whilst the eruption was ongoing.

[170] Dasent (1902) Letter from Mr. Dasent to Mr. Lucas, 16th December 1902, TNA: CO 321/214

[171] Statistical Office (2001) St. Vincent and the Grenadines: population and housing census report 2001, Kingstown, St. Vincent: Central Planning Division, Ministry of Finance, Planning and Development.

people[172] during the 1979 eruption. Handling of rebuilding livelihoods had improved by then, but it was not without difficulties. As highlighted by The Advocate,[173] "…the social dislocation of the population has profound implications for the economy, the people's health and their children's education". A key livelihood concern related to the agricultural sector in 1979, was the government trying to convince people to return to their homes:

> *"…he [Premier Cato] will need to make sure that the evacuees wish to return to their areas…and it is for him to convince the evacuees, especially the younger ones, that country life – and that in an area already proven less than kind – is better than the supposed delights of urban living. To do this will require re-settlement with improvement. They must return, not merely to the same environment, but to a better one".*[174]

The impact of the eruptions on livelihoods within the agricultural sector was tied to socioeconomic conditions in 1812, 1902 and 1979 (Chapter 5) and the differing size of eruptions (Chapter 4).

Understandably, communities closer to a volcano are at a greater risk of having their livelihoods impacted but, depending on other resilience factors (including social networks and temporary alternative means to generate income like fishing), impacts on livelihoods between communities like vulnerability, can be dynamic (Dibben and Chester, 1999) and differ from one person and/or community to another.

However, the dominance of the agricultural sector to the island's economy increased trade dependency, exacerbating the effects of insularity (Smith, 2011). Furthermore, colonists as the dominant social group in terms of power within and out of the agriculture sector led to efforts to mitigate losses by seeking financial aid (Section 5.5). In 1812, this meant that the system focused on returning to the "status quo" in 1812 by replacing enslaved Africans lost, repairing property, and regaining merchant trust.

By returning to the status quo and to "normal", the island was not better prepared for the next volcanic eruption. This is due to not transforming the social system to be better prepared for the next hazardous event, which is generally achieved through adapting and diversifying (Burton *et al*., 1968; Klein *et al*., 2004; Lowe, 2010; Walker and Cooper, 2011).

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[172] The Advocate, "$750,000 in expenses", 25th April 1979
[173] The Advocate, "The agony of St. Vincent," 25th April 1979
[174] The Advocate, "The catastrophe of St. Vincent," 26th April 1979

Indeed, by the 1902-1903 eruption, the influence of the large landowners meant there was still a sole reliance on a state-wide sugar monoculture despite the increasing competition with sugar beet at this time (Spinelli, 1973). Coupled with ongoing colonial racism in 1902 that affected perceived and actual recovery rates, this caused disproportionate recovery across the different social groups. For example, a letter by a local named Mr. Dasent reinforced racial stereotypes, by stating that the peasants should be grateful for any assistance at all in finding alternative places to live due to: "…the Negro would find himself [more or less] at home everywhere".[175]

6.3 Evacuation and resettlement

6.3.1 Evacuation

Across the three eruptions, there were examples of voluntary self-evacuation. In 1812 and 1902, the Kalinago village of Morne Ronde, located 6 km west from La Soufrière (Figure 5.2) was one of the first communities to self-evacuate, first evacuating to Chateaubelair and then to Kingstown.[176] Based on the evidence, the group in 1902 evacuated eight days before a pyroclastic density current descended the western flank,[177] in response to feeling early (precursory) rumblings in the area (Section 4.4).

Other groups of people in the northern half of the island in 1902 were "…fleeing to the towns"[178] of Chateaubelair and Georgetown before moving onto Kingstown, reacting in response to each sighting of an explosion, that led to a flux of people evacuating south then returning north over the course of the eruption.[179] People on the leeward side felt the precursory earthquake activity and had moved out of the area by the morning of the 7th May. On the other hand those on the windward side did not respond as quickly, due to restricted visibility of the volcano (Pyle *et al*., 2018).

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[175] Dasent (1902) Letter from Mr. Dasent to Mr. Lucas, 16th December 1902, TNA: CO 321/214

[176] Public Ledger and Daily Advertiser, "Volcano in St. Vincent's," 1st July 1812; Oxford University and City Herald, "The following letter we have received from a gentleman of this university, giving a further account of the late dreadful eruption in the island of St. Vincent", 18th July 1812; Western Times, "Official news. Anxiety for our island of St. Vincent. 1,000 whites killed", 10th May 1902; Manchester Courier and Lancashire General Advertiser, "The St. Vincent volcano. Colonial office confirmation of renewed activity," 20th October 1902; Gloucester Citizen, "The volcano disaster. Renewed eruptions at St. Vincent and Martinique. Panic stricken inhabitants. Terrible scenes," 22nd May 1902; Pyle *et al*. (2018)

[177] Western Times, "Official news. Anxiety for our island of St. Vincent. 1,000 whites killed", 10th May 1902

[178] Yorkshire Evening Post, "St. Vincent devastated. Explosions herd 200 miles away. Springs dried up. Weird apparitions in the skies," 12th May 1902

[179] Gloucester Citizen, "The volcano disaster. Renewed eruptions at St. Vincent and Martinique. Panic stricken inhabitants. Terrible scenes," 22nd May 1902

Due to the longevity of the 1902-1903 eruption however, evidence suggests that the colonial government struggled to provide continued disaster relief for evacuees, although there is more evidence regarding the experiences of the Garifuna than the descendants of freed enslaved peoples. It was recommended that people should be encouraged to migrate to other Caribbean islands as a solution to this, and there was evidence that a small number of people requested to migrate to Dominica and Jamaica.[180]

> *"I would do everything to encourage voluntary emigration...I should stimulate the emigration of suitable persons by offering a bounty or outfit allowance, payable by instalments in their new quarters".*[181]

As things grew more desperate, encouragement turned to force. There was evidence in 1902 by the Administrator of the Windward Islands, on orders of Governor Llewellyn[182] of forced resettlement. For example, a letter dated 25th September 1902, regarding resettling families in Jamaica:

> *"…following demonstrations, riots and petitions, Robert Llewellyn plans to pay for passage, to resettle families in Jamaica, in housing similar to the new houses on St. Vincent. Names are gathered, discussion between Robert Llewellyn and Joseph Chamberlain on continuation of rations for those who refuse…"*[183]

In November, Everard Stephens made a petition asking for land for the Garifuna communities of Fancy and Owia to rebuild their livelihoods. Governor Llewellyn wrote to the Administrator "…emigration can be arranged only on compulsion. May I purchase some more land?", in discussions about the request. [184] The Governor was trying to find solutions to resettling those displaced by the eruption. Yet, the length of time away from their homes drew complaints from some Garifuna communities in 1903, which demonstrated the colonial government trying to force the community to migrate by stopping their disaster relief:

> *"After being huddled together for six months in the buildings referred to [government buildings in Kingstown], in which we have suffered greatly from overcrowding, the Governor ordered us to emigrate, which we declined to do, St. Vincent being our homeland and that of our Carib ancestors…As a punishment for*

[180] Nottingham Evening, "St. Vincent disaster. Darkness and death. Panic-stricken inhabitants," 13th May 1902; Llewellyn R. (1902) Letter from Governor Sir Robert Llewellyn to Acting-Governor Sidney Olivier, 9th January 1903, TNA: CO 321/218

[181] Dasent (1902) Letter from Mr. Dasent to Mr. Lucas, 16th December 1902, TNA: CO 321/214

[182] Manchester Courier and Lancashire General Advertiser, "The St. Vincent volcano. Colonial office confirmation of renewed activity," 20th October 1902

[183] Found in Pyle *et al*. (2018), referenced as BB2.40 (The National Archives reference – CO 884/7)

[184] See footnote 183.

our refusal to emigrate we are practically abandoned by the government who have stopped all rations and doles…"[185]

In 1979, the first movement of people was in reverse: people from the windward side saw volcanic ash first and promptly responded, while there was a slight delay on the leeward side due to an obstructed view of the summit (Section 4.5). At the first sign of ash fall at approximately 07:00 in 1979, interviewees located in Fancy, Owia, Sandy Bay, and one family in Chateaubelair at the time of the event self-evacuated. A man interviewed in Orange Hill was living alone in Fancy at the time of the eruption but had a girlfriend in the south of the island: "I did not have any quick means to get out, so I waited for a vehicle then went to my girlfriend's place".

Interestingly, the response of two women interviewed in Sandy Bay was informed by their family members telling them stories of the 1902-1903 eruption. One woman provided the 'Good Friday' quote on page 92.

In Chateaubelair however, one man who was interviewed in the adjacent area of Fitz Hughes, left for Barrouallie by foot with his family:

"…I came out to see what the fuss about when [people] was shouting: "Soufriere! Soufriere!" The moment I saw ash falling, I grabbed my wife and son and we walked down to Barrouallie. Later in the day, I got on a vehicle and went back to pick up t[h]ings like clothes, money and passports just in case".

In 1979, an evacuation order was issued promptly around the same time people started self-evacuating, resulting in an influx of 15,462[186] people to a variety of locations in the south of the island (Figure 6.1). Anyone above the evacuation line (Spring Village in the west and Bellevue in the east) was evacuated to makeshift centres in the south.

[185] Garifuna representatives (1903) Letter from Garifuna representatives to the Prince Reagent Edward VII, TNA: CO 321/220

[186] Statistical Office, part of the Central Planning Division (2001) St. Vincent and the Grenadines population and housing census report 2001: Population size and growth 1871-2001. Kingstown: Ministry of Finance, Planning and Development – 15,462 out of a total population of 97,845 in 1980 combined the census divisions of Georgetown (6,494), Sandy Bay (2,867) and Chateaubelair (6,101).

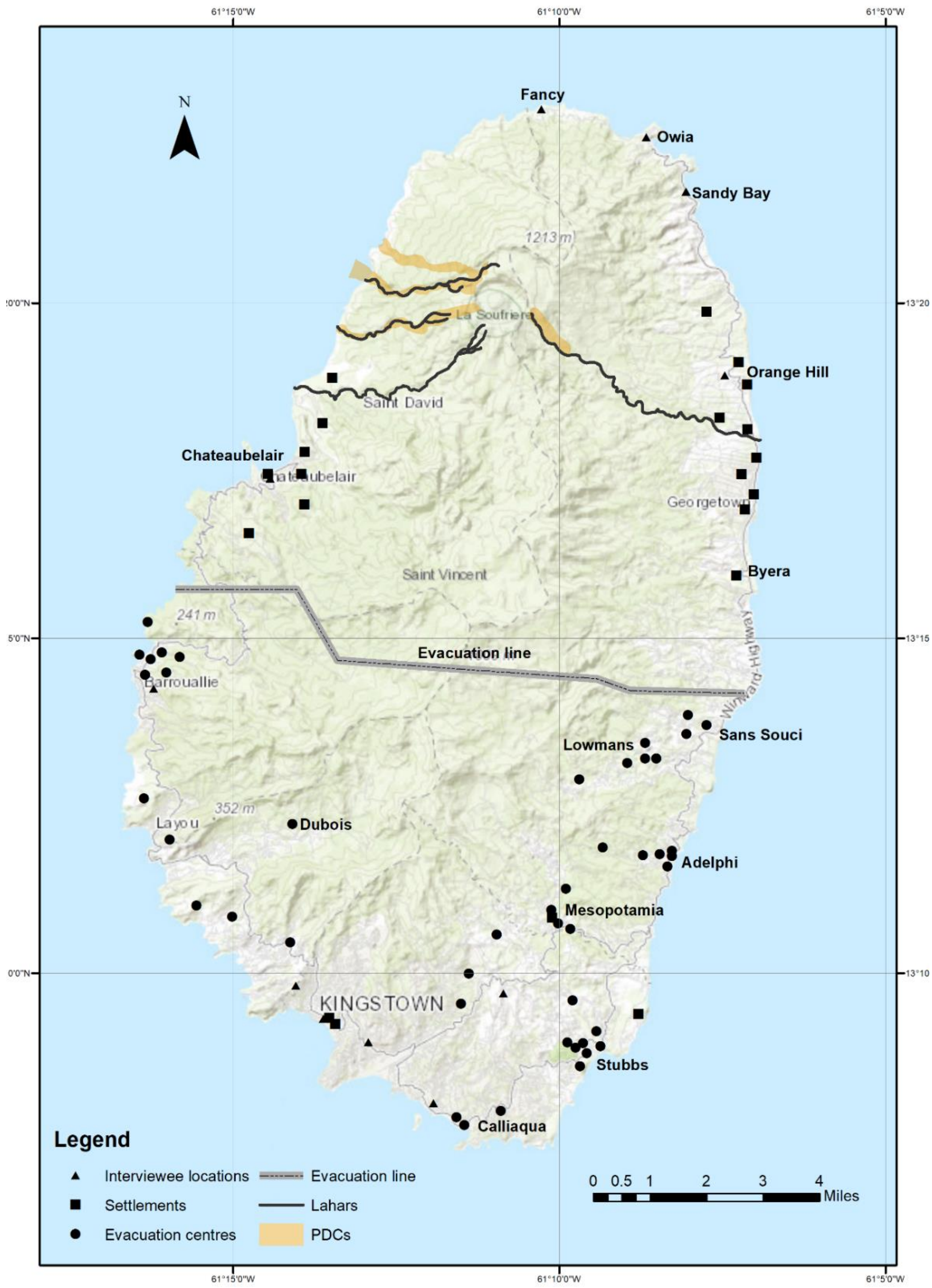

Figure 6.1. Map of evacuation centres and exclusion zone for the 1979 eruption of La Soufrière.[187] Locations above the evacuation line (grey and black line) were ordered to evacuate to evacuation centres (circles). People were also evacuated to the Grenadine island of Bequia, Trinidad and Tobago and Barbados.

A man who was interviewed in Sion Hill was a child at the time of the eruption but recalled his grandfather initially refusing to move:

[187] Government Information Services (1979) "La Soufrière eruption, 13th April 1979", NDAS-SVG: Volcanoes VI

> *"…when we knew what was going on, my auntie said: "oh God your granfader [grandfather]! He was at Chester Cottage you see…he was closer. Some went up to get him, but he refused to leave saying: "Nah [no] Soufrière cah [can] touch me!"*

Evacuations are viewed as the first response to an imminent natural hazard's impacts for saving lives and reducing injuries (Norris *et al*., 2008). They are common during volcanic crises, usually in an attempt to mitigate against proximal lahars and pyroclastic density currents (Wilson *et al*., 2012). They can either be an anticipatory or reactive form of a preparedness strategy (Drabek, 1991; Creutin *et al*., 2013; Tuswadi and Hayashi, 2013; Weichselgartner and Kelman, 2015; Lutoff *et al*., 2016; Morss *et al*., 2016). If a hazard is reoccurring (dependent on frequency and the memory of past events), evacuation can become ingrained in exposed communities, thereby becoming a community resilience method. It has also been considered in SIDS literature as a local-level adaptation strategy (Pelling and Uitto, 2001; Kempf, 2009; Kelman, 2014; Betzold, 2015).

The Kalinago of Morne Ronde, who originally self-evacuated in 1812 and 1902, permanently relocated to Rose Bank and abandoned Morne Ronde[188] (Figure 5.2). The fact that in two eruptions the same village evacuated before ash column collapse is indicative that there was in-depth knowledge of their environment and the volcano, enabling them to identify signs of impending volcanic activity. This behaviour has also been recognised at Manam Island Volcano, Papua New Guinea whereby earthquakes, unusual animal behaviour, grass dying at the volcano's summit, fig tree leaves falling, amongst other phenomena, indicates that an eruption is *likely* (Mercer and Kelman, 2010). In the case of St. Vincent and Manam, the geographical dispersal of the volcanic hazards shaped the development of environmental cues into how the populations reacted to different hazards (Cashman and Cronin, 2008). This links to the evidence presented for all three eruptions of La Soufrière, as most of the population located near the volcano responded to visual and "felt" signs.

Forced evacuations or migration can diminish the trust in those who order and implement them, leading to loss of resources and negative political fallout. For example, the 1999 eruption of Tungurahua in Ecuador saw 50 % of people evacuated forcefully by the military

[188] Anderson and Flett (1902); Found in Pyle *et al*. (2018) described as references BB1.2 and BB1.113 from Governor Llewellyn and BB1.82B from Chief of Police Calder W.J.

and the poor handling of the situation resulted in conflicts between the authorities and the surrounding communities that had to be evacuated (Tobin and Whiteford, 2002).

On the other hand, as 15,462 people evacuated in 1979, this indicates a strong social support network, with contacts and ties to communities (Perry, 1979) in the south, as opposed to a disconnected society which leads to a decreased likelihood to evacuate (Drabek and Boggs, 1968; Riad *et al.*, 1999). Indeed, two interviewees spoke of evacuating their own families to stay with friends and relatives in the south of the island.

A man from Chateaubelair took his wife and son to stay with friends in Prospect (Figure 5.2): "As soon as we knew what was going on, we packed some t[h]ings and drove to my friend's in Prospect…after that I volunteered to get the sick out of here to the hospital".

Another man, a teenager at the time from Montrose (Figure 5.2), travelled with his father to Owia to retrieve his grandmother: "I asked to go with my father to get my grandmother…it was a surreal experience driving through the ash".

The key difference between these two men and others interviewed is that they had a household vehicle readily available. A woman from Queensbury (Figure 5.2) who did not have family in the north, summarised the connectivity of those in the south to the north: "In terms of disasters, everyone always come together to help. Even if some don't have the money, they will find a way to help".

Those who housed evacuated family and friends were able to get relief from their nearest evacuation centre. However, people reflecting on the experience during interviews conducted for this study and informal discussions during the 'Volcano Awareness Week' on St. Vincent, noted how 'hectic' and uncoordinated the evacuation was for all members of society. This can lead to greater exposure to hazards and unpredictable behaviour (Zeng *et al.*, 2008; Marfai *et al.*, 2015).

6.3.2 Resettlement

All three eruptions in some instances caused people to permanently abandon their homes and resettle in new locations. Figure 6.2 documents the patterns of relocation after the 1902-1903 eruption,[189] whilst temporary movement and given examples of movements of

[189] Cameron E. (1903) Letter from Administrator Edward Cameron to Governor Sir Robert Llewellyn, 21st April 1903, TNA: CO 321/218; Llewellyn R. (1905) "Water supply at Layou and Rutland Vale", 1st May 1905, TNA: CO 321/227

families interviewed in response to the 1979 are shown in Figure 6.3. The 1812 eruption could not be mapped as people moved from Fraser's Estate and Duvallie's to new locations and where the rehoused enslaved persons from Grand Sable came from was not recorded within the archives.

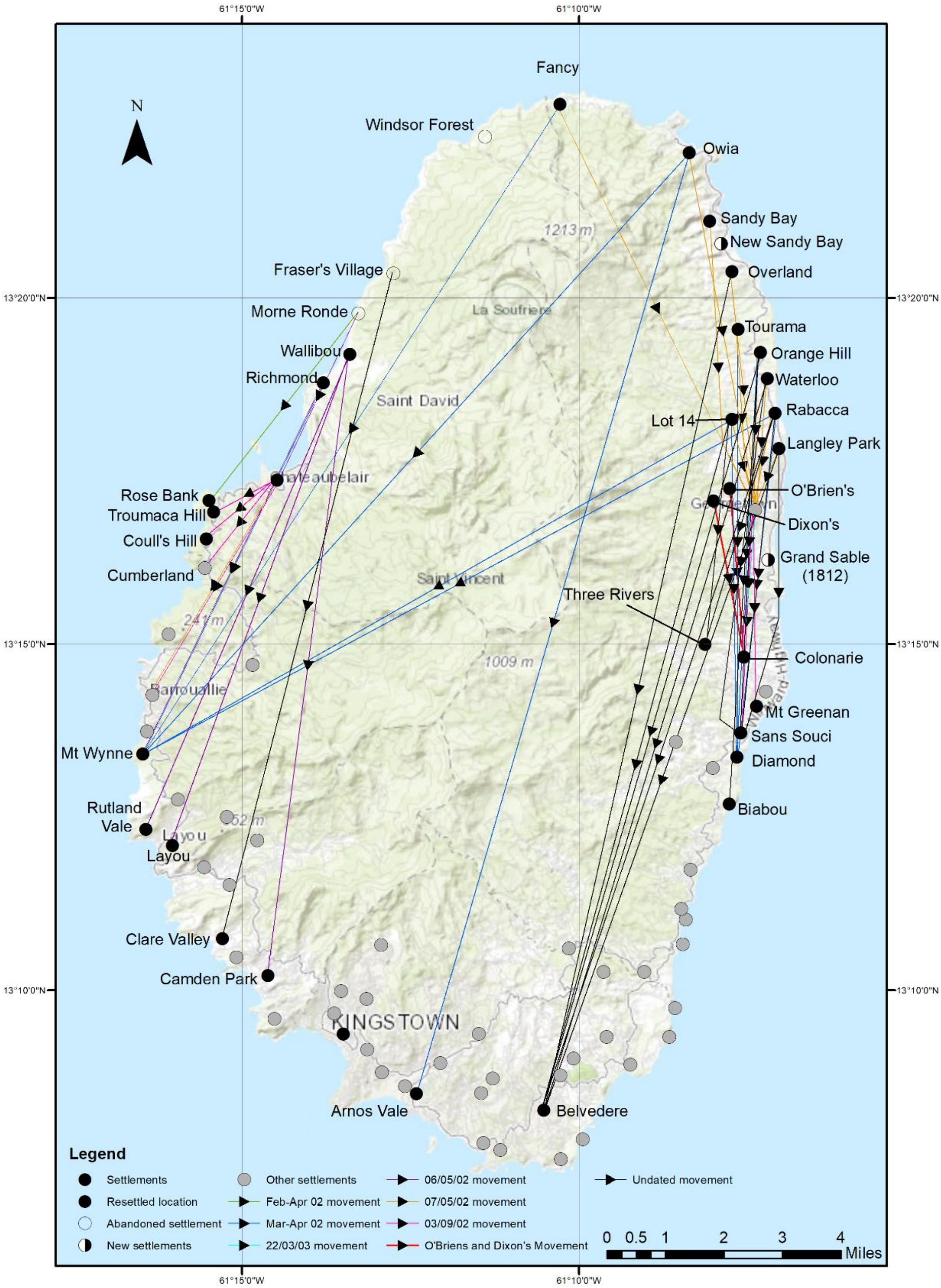

Figure 6.2. Patterns of movement and relocation during and after the 1902-1903 eruption, arrows and lines shown are a generalisation. Movement was complicated and happened in stages. Between February to April

1902 (green line), Morne Ronde residents moved to Rose Bank. Around the same time (March to April 1902, blue line), there was a large influx of people from Owia, Lot 14, Rabacca, Fancy and Richmond to Mt. Wynne. 6th May 1902 (purple line), people moved from Wallibou to Rutland Vale, Layou and Camden Park, whilst people from Richmond moved to Mt. Wynne and Morne Ronde people moved to Chateaubelair. The next day (orange line) many residents from north of Georgetown moved into the town. The next was the 3rd September (pink line), where people from Georgetown moved further south to Colonarie, Sans Souci and Mt. Greenan, while people on the western coast moved from Chateaubelair to Troumaca Hill, Cumberland, Coull's Hill and Barrouallie. Lastly, 22nd March 1903 (turquoise line), some people from Georgetown went to Colonarie.

Morne Ronde, Fraser's Village and Windsor Forest was permanently abandoned in 1902-1903. New Sandy Bay developed in 1911 when estate land was purchased at Sandy Bay to resettle families from Camden Park and Clare Valley (Pyle *et al.*, 2018). Mt. Young could not be located on maps.

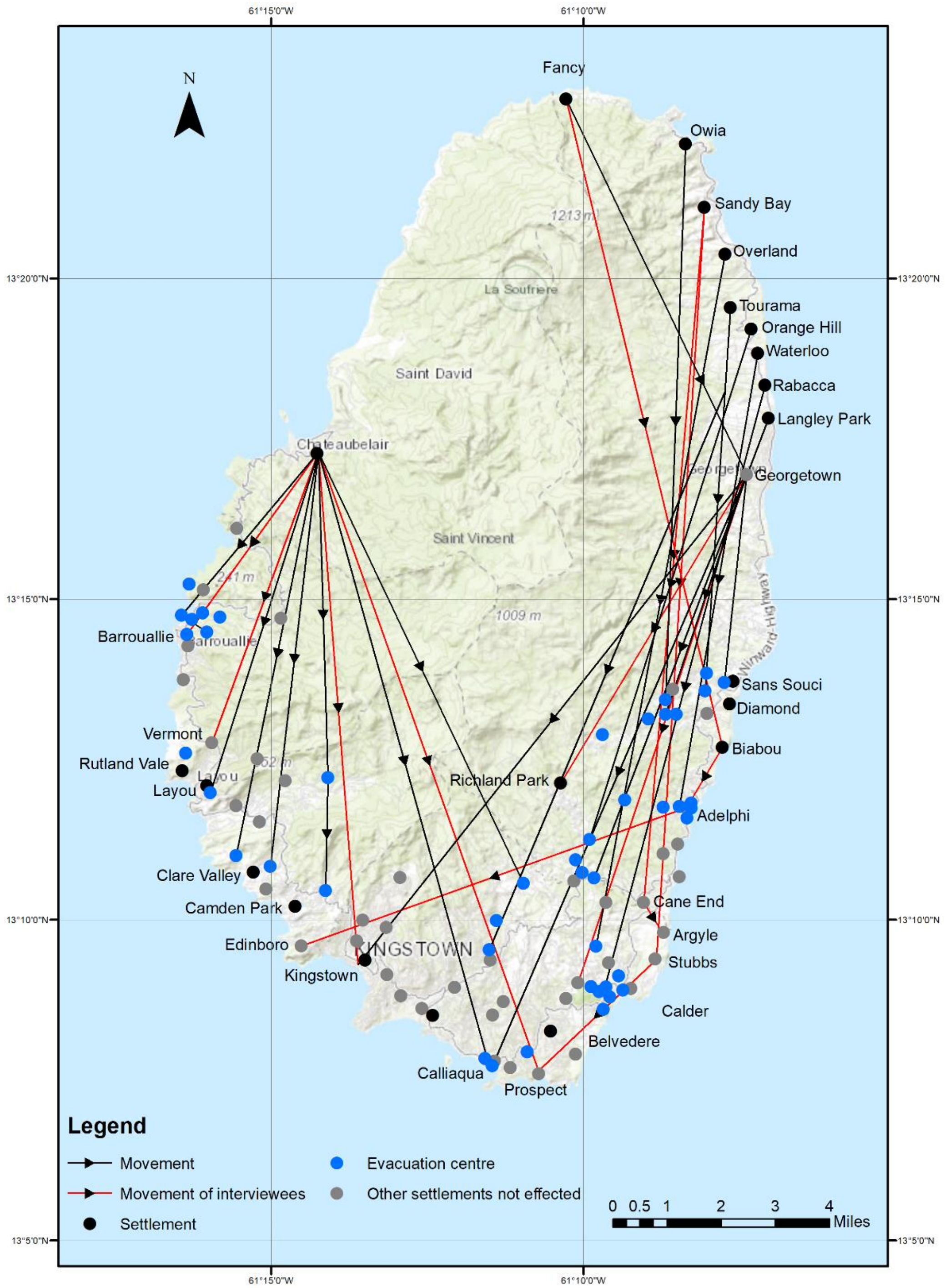

Figure 6.3. Patterns of movement from settlements to evacuation centres on the day of the 1979 eruption (13th April), in addition to patterns of movement of interviewees. arrows and lines shown are a generalisation.

The drivers for resettlement are different for each eruption and for different communities. In the aftermath of the 1812 eruption, some Kalinago families permanently relocated off the island in response to the destruction of their homes and provision grounds.[190] The letter

[190] Paul R. (1812) Letter from Robert Paul to Major General Monro, 3rd August 1812, TNA: CO 260/29

from the Administrator of the Windward Islands authorising the Kalinago's request to the Governor of Trinidad wrote:

> *"This unfortunate event has struck them with such terror that they cannot be persuaded to settle again in the island and there is no other crown land near the sea fit for inhabitation; they are therefore anxious to [leave for] the island of Trinidad…"*[195]

After the 1812 eruption, 132 acres of the Grand Sable estate was turned into a village to rehouse displaced enslaved Africans. In response to the 1902-1903 eruption, a series of letters between Governor Llewellyn, the Administrator Mr. Cameron, and the Land Commissioner Mr. Kernahan, revealed details of various resettlement locations.[198] On the 21st April 1903, 13 resettlement plots had houses already built upon them, all of which were in an approximate 3-mile radius of La Soufrière. As of 8th October 1903, additional confirmed resettlement locations were Mt. Greenan, Colonarie, and Mt. Young[191] (Figure 6.2).

All resettlement efforts appeared to have been successful, however in 1905 Governor Llewellyn wrote that Layou (Figure 6.2) had pressures on its water supply, which would have been a result of open, stagnated water.:

> *"I beg to recommend that this scheme for supplying the refugee settlers just outside the town of Layou [at Rutland Vale] with a supply of drinking water…The little town of Layou had its population doubled by the refugees from the village of Richmond…it seems equitable that a water supply and cemetery should be provided for these refugees from the eruption".*[192]

The pressures of the water supply were connected to a malaria outbreak in Layou:

> *"Towards the end of 1902 the question of the sufficiency and quality of the source of water supply at Layou first came up in connection with an outbreak of malarial fever among the refugees and the town's people. The medical officer…condemned the river water which was (and still is) the main source of supply".*[198]

During the 1979 eruption and mass evacuation, 67 churches, schools, and other public buildings were turned into makeshift evacuation centres that housed evacuees in the south of St. Vincent and on the Grenadine island of Bequia[193] (Figure 6.3). Whilst Figure 6.3 shows

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[191] Cameron E. (1903) Letter from Administrator Edward Cameron to Governor Sir Robert Llewellyn, 8th October 1903, TNA: CO 321/219
[192] Llewellyn R. (1905) "Water supply at Layou and Rutland Vale", 1st May 1905, TNA: CO 321/227
[193] Government Information Services (1979) "La Soufrière eruption, 13th April 1979", NDAS-SVG: Volcanoes VI

the general evacuation locations where communities went to, interviewees for this study reveal that the pattern of movement was more complex and not captured in official statistics. Those who did move from centre to centre, left due to low standard living conditions.

On the 21st April 1979, just over a week after the eruption started, The Advocate newspaper stated that: "Some of the shelters are bursting at the seams with the evacuees and efforts are now being made to siphon off some of them to forestall the likelihood of flaring tempers".[194] Whilst on the 6th May, it was reported: "…emergency shelters were extremely crowded. One could find 800 people crammed into a school designed to accommodate 200 pupils. People were sleeping on desks, benches, and on the floors under the school furniture".[195]

A short documentary, produced by the STREVA[196] project about people remembering the 1979 eruption, had four different people provide further details about some of their experiences of evacuation centre conditions:

> *"At the first shelter which was in Barrouallie, life was a little challenging. People who were accustomed to the busy all day got a little frustrated…People were a bit edgy cause they had to separate the males from the females, families were not together…What they wanted to do with their families they couldn't because they lost their privacy and so that created a lot of uneasiness. However, people were still complying with the rules of the shelter. Now my second experience at a different shelter was a little different. The shelter was smaller, people were more community spirited and we were better able to manage that smaller group".*

> *"It was an unpleasant life for people living in shelters. There was people living amongst people they didn't know…I was in a shelter for about four months and then we moved back home, and we settled and started working life again".*

> *"Well it wasn't so nice. Some of the people weren't nice to live with. Some of them when they went to the toilet would just go on the concrete, it was messy…Two to tree [three] months we stayed at Richland Park but my fader [father] stay about a week down at Cane End".*

> *"Some were pleased, happy. Others was not comfortable. Because if you were a family, you can't be comfortable in a small room with six, seven or eight persons".*

[194] The Advocate, "Vincentians flee the wrath of Soufriere," 21st April 1979

[195] Sunday Advocate News, "It's our moral duty to help St. Vincent," 6th May 1979

[196] STREVA Project (2014) Response and Recovery, La Soufrière Volcano St Vincent [video] https://youtu.be/kmqjY0Qf-Xc [Accessed date 03/12/18], "The Strengthening Resilience in Volcanic Areas" Project is an interdisciplinary project that works collaboratively to develop and apply a practical and adaptable means to analyse risk. La Soufrière St. Vincent has been used as a "forensic" volcano, by researching the 1902-1903 and 1979 eruptions.

These conditions would motivate some to move from one place to another either voluntarily or as an option offered by the centres. For example, one of the women interviewed from Sandy Bay stated that she first was in a centre in Cane End (Figure 6.3) for a month, and then moved onto Argyle (Figure 6.3). The other woman from Sandy Bay first evacuated to Stubbs (Figure 6.3) but then moved to Prospect (Figure 6.3): first in a private home but then an evacuation centre until the end of the eruption when she returned with her family. A further example was a woman from Fancy, who first evacuated to Biabou (Figure 6.3), then to New Adelphi and then to Edinboro (Figure 6.3) to locate the rest of her family.

The situation in the centres was appropriately summarised as "…sheer disorder, but not squalor".[197] Informal conversation with the woman from Queensbury (Figure 6.3) stated: "Many people from Low Leeward [Chateaubelair and neighbouring villages] moved from the Soufrière area down to here [Vermont] (Figure 6.3) and to town [Kingstown]…and afterwards, most are still down here". Furthermore, an interviewee from Barrouallie on the 17th March 2016 said "…some from Barrouallie who evacuated didn't come back". Furthermore, a man from Sion Hill knew people from Georgetown who evacuated and remained in Calder and Richland Park (Figure 6.3). Lastly, one of the women from Sandy Bay interviewed, who had young children at the time, stated:

> *"Yes, some families [I know] did. Most like my family and me came back here. But some stayed in Cane End and other places down there because they were scared [of the volcano] or found jobs".*

The decision to return home prematurely can be driven by numerous factors such as poor evacuation centre conditions, overcrowding, for example, unsanitary communal facilities, or a lack of resources (Tobin and Whiteford, 2002). Other reasons include no economic opportunities at the returning location/greater opportunities in the new location and, the uncertain benefits of returning and rebuilding (Tobin and Whiteford, 2002; Chamlee-Wright and Storr, 2011).

6.4 Social capital

Social capital is the measure of confidence that a contribution freely given will be reciprocated (Bankoff, 2015). The contributions are resources resulting from social cohesion

[197] The Advocate, "Boredom is big problem for evacuees," 11th May 1979

that have drawn upon by individuals for collective action and collective benefit (Lochner, Kawachi and Kennedy, 1999; Brune and Bossert, 2009; Ostrom, 2009). They usually arise when vulnerable marginalised groups (i.e. women, children, the elderly, those of lower social status etc.) are unable to penetrate the social networks to access aid in the same way/rate than non-marginalised groups (e.g. Buckland and Rahman, 1999; Dynes, 2006; Beaudoin, 2007; Aldrich and Crook, 2008; Hawkins and Maurer, 2010; Aldrich, 2012). Examples of social capital can be elucidated as a response to both the 1902 and 1979 eruptions.

The villages of Dixon's and O'Brien's (Figure 6.2) are located on the periphery of the eastern flank PDC flow paths. In 1902, 104 families negotiated to be temporarily resettled on the Colonarie Vale estate with 'moveable huts' (Figure 6.4) as temporary shelters.[198] This is an example of social capital, as the people are helping to move the huts.

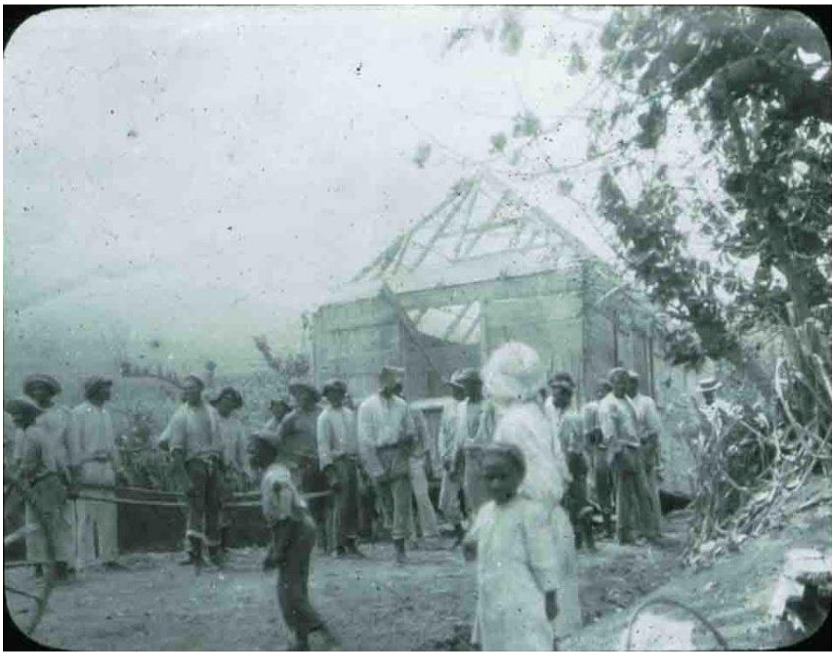

Figure 6.4. Titled: "Moving house to (or from) site" taken by Tempest Anderson, held at the Yorkshire Museum (TA131). The location of where this photograph was taken and who the people were not recorded.

Two interviewees spoke of activities that helped them to return and rebuild their homes after the 1979 eruption. Firstly, in response to the question: "What help was available after the eruption"? One of the women from Sandy Bay interviewed stated that the "Council Development of Carib Community" developed as a cultural exchange between the Garifuna of St. Vincent and Dominica. The council was an open membership and its main aim was to

[198] Llewellyn R. (1903) Letter from Governor Sir Robert Llewellyn to Administrator Edward Cameron, 4th May 1903, TNA: CO 321/218

build and maintain an existing social network between the two island communities but only lasted for two years due to funding running out. The woman said it brought the Garifuna closer together:

> *"I miss those times. We all came together, and it reminded you that you were part of something bigger. Having the Dominicans over here and we over there reminded us of our ancestral connection".*

The interviewee from Fancy provided a different instance of assistance when he responded to the same question of what help was available after the eruption. He engaged in "swap labour" – where people assist in a certain task in exchange for getting assistance in their own outstanding task. He said, "We call it swap labour. I helped rebuilding their homes and in return, they would give me a place to stay and something to eat". In 1902 and 1979, communities coming together to move houses from Dixon's and O'Brien's to Colonarie Vale (at least 4.3 km), forming a cultural exchange group, and engaging in swap labour are examples of mutual assistance that is a type of social capital.

Potential cooperative behaviour can emerge in communities after a disaster, whereby trust and reciprocity may increase (Fleming *et al*., 2014). Swap labour in St. Vincent's agricultural sector reduces the solitude and monotony of the work, and cancels "debt" between parties. However, this practice has since diminished due to a migrating population, political differences and an aging labour force (Rubenstein, 1987). Whilst swap labour has decayed over time, unfavourable conditions generated from a disaster impact can negatively impact reciprocity, as was found in affected villages during the 2010 Chilean earthquake (Fleming *et al*., 2014).

6.5 Corruption

Corruption is defined as "a public official acting for personal gain, violates the norms of public office and harms the interests of the public to benefit a third party who rewards the official for access to goods or services that the third party would not otherwise obtain" (Philp, 2007).

In disasters, corruption can increase vulnerability in various ways:

- Building inspectors accepting payment to overlook violations and/or construction contractors substituting approved building materials,

- Government employees side-tracking funding allocated to disaster mitigation and preparedness,
- Misusing loans resulting in underdevelopment and high in debt,
- Certain local people with political ties to government being able to secure funding for emergency management activities, while those without political influence being unable to secure enough funding and,
- The failure to follow safety regulations in order to cut operating costs (i.e. negligence) (Coppola, 2007).

New opportunities of corruption can also manifest from the large inflow of money and other forms of disaster relief, ranging from theft to the extremes of sexual abuse[199] and murder (Coppola, 2007).

There are some examples of corruption related to the eruptions of La Soufrière caused by the exacerbation of social/political issues relevant to the time of each volcanic eruption. Chapter 5 illustrated the political influence of plantation owners in 1812 and large landowners in 1902 who were able to secure funds to recover losses. However, due to (racist) colonial political structures, the enslaved and peasants had no political influence and therefore were unable to secure enough assistance to recover.

A common issue in disaster relief distribution, is where individuals claim for relief when they have not been directly impacted by an event (Quarantelli, 1994). A letter from Mr. MacDonald, the owner of Windsor Forest and Richmond Vale that were impacted by the 1902-1903 eruption, stated that those not displaced by the eruption: "...received food who had no claim whatever to it, and sold it subsequently, and that the quantity of first distributed as inadequate to the wants of the sufferers".

The focus of this section is on corruption behaviours during the 1979 eruption as there was more definition on what it looked like with respect to disaster relief. The term 'bodou' (pronounced: bow-dow or bow-doh) was first mentioned in Volcano Awareness Week,

[199] For example, Oxfam's final internal investigation report published in February 2018, concluded from 2011 allegations of "sexual misconduct and other unacceptable behaviour" during the organisation's humanitarian response to the 2010 Haiti earthquake, seven men involved in the humanitarian response were involved in sexual misconduct (https://www.oxfam.org.uk/what-we-do/about-us/plans-reports-and-policies/haiti-investigation-report). The disaster victims were already vulnerable, and people in positions of power – those who had the resources to help, exploited them further.

during a meeting of teachers in Kingstown, St. Vincent. Teachers on St. Vincent are involved in the management of evacuation centres. Discussions about the management of disaster relief in evacuation centres arose following questions of bodou. This led to participants exchanging experiences and suggestions of actions to improve. Upon asking what the term meant, the Director of the National Emergency Management Organisation (NEMO) stated:

> *"Supposedly one day someone was wearing some nice new pair of jeans, when the day before they were wearing a scruffy pair that you had seen them wearing for the whole time in the shelter, we would turn around and say: "those are bodou".*

Further conversations with participants in the meeting revealed that bodou described three activities related to disaster relief during the 1979 eruption:

- The large availability of disaster relief from various regional and international countries i.e. "…we got a lot of free stuff" (Interviewee from Chateaubelair),
- The suspicion individuals came under who were given relief items compared to those who did not and,
- The corruption of officials responsible for distributing disaster relief by stealing the relief and selling it on.

Bodou was created based on the "first noise the volcano made when it erupted," (as described by an interviewee in Kingstown who is from Richland Park) and is not officially in the dictionary. This word is unique due to:

a) Being a common term used by people who were either involved in the management of disaster relief resources or those who received it,

b) Created as an emergent pattern of disaster relief behaviours in the 1979 eruption and,

c) Describes three disaster relief behaviours that researchers traditionally view separately in the literature.

Interviewees were asked whether they knew what bodou was and if they had experienced examples of it during the eruption. The woman from Sandy Bay (Figure 6.2) who self-evacuated with her family to an evacuation centre recalled two out of three of behaviours:

"Bodou is the freeness of relief and the teething [stealing] of the relief from the shelters". A man from Belmont (Figure 6.2), who was a police officer involved in patrolling the restriction zone "border" at Georgetown (Figure 6.2), witnessed bodou occurring: "Yes, a fellow officer was teething [stealing] ham…I reported it to my senior officer". Lastly, the woman from Owia who was as a teacher involved in overseeing an evacuation centre and stated that she had encountered difficulties in dealing with it: "As a teacher, I oversaw a shelter. Bodou was hard to tackle on our own".

A newspaper article from Barbados also reported characteristics related to bodou: [200]

> *"…persons caught stealing blankets, cots, food stuff and clothes given for the evacuees. People put in position of trust are among the culprits it is rumoured. It is even said that some goods have been sold to shops".*

Although the evidence of stealing the relief is not substantial enough to generalise, it suggests that this was the most prevalent and negative aspect of the disaster relief during the eruption and was hard to police. Activities associated with bodou however, are not unique to St. Vincent. For example, a psychological investigation into the stresses caused by being evacuated during the eruption of Mt. Unzen, Japan from 1990 to 1992 found that participants began to realise how much was needed to rebuild livelihoods and that as the sense of fellowship between evacuees diminished, conflict and competition for assistance from the authorities increased (Ohta *et al*., 2003). The ramifications of corrupt officials before and during an event has been noted in the response to Hurricane Katrina in 2005 (Sobel and Leeson, 2006). There was a popular held perception of public sector corruption in New Orleans and the state of Louisiana. This perception led to mistrust from the public and FEMA in responding to the Hurricane Katrina emergency. FEMA were unable to determine the credibility and accuracy of claims made by the Mayor and Governor and in turn, led to a delayed response.

Trust and risk communication has been highlighted to be an important aspect of managing volcanic crises and all emergency situations (Manoj and Baker, 2007; Wallace and Wallace, 2008; McGuire *et al.*, 2009; Patterson, Weil and Patel, 2010; Barclay *et al.*, 2015). Indeed, as populations continue to rise on the flanks of active volcanoes, procedures and protocols to deal with future crises need to include seamless communication of information that are

[200] The Star, "The Soufriere experience," 28th April 1979

clearly understood before a crisis develops between various stakeholder groups and the public, which is particularly critical for small volcanic islands as options for managing a volcanic crisis are limited (Solana, *et al*., 2008; McGuire *et al.*, 2009). The overall responsibility of the authorities was to keep the evacuated people comfortable and safe during the 1979 eruption of La Soufrière. But, with a minority of people in authority stealing disaster relief that should have been given to the evacuees, it would have damaged the relationship of trust and cooperation (Arroyo, 2014). This could have a lasting impact on future natural hazard events that result in evacuation on the island.

6.6 Close relations

St. Vincent shares a "kinship" with the rest of the British West Indies that is a socio-political culture that extends not only in response to La Soufrière's eruptions but hurricanes as well (Thornton *et al*., 2012). Here, kinship is explored to explain the responsive behaviour by neighbouring islands following the three eruptions investigated and the recent example of the 2017 hurricane season.

In 1812, most of the aid came from Britain, but one instance in the archives was found that Barbados provided a sum of £2,000[201] (equivalent to £139,723.27 with inflation[202]). During and after the 1902-1903 eruption financial aid was received from most of the British West Indian colonies (Jamaica, Dominica, Turks and Caicos Islands, British Honduras, British Guiana, Barbados, Grenada, Trinidad, Dominica, Bermuda, Montserrat, Antigua, St. Kitts, Bahamas, Nevis, and St. Lucia) to a total of £5,389 (equivalent to £650,663.17 with inflation) (Pyle *et al*., 2018). In 1979, most of the relief came from Barbados and Trinidad and Tobago[203] however, other British West Indies islands and Caribbean-wide religious organisations also provided relief.[204] Total donations by the Afro-Caribbean community led

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[201] Paul R. (1812) "Letter from Robert Paul to the Earl of Liverpool", 16th May 1812, TNA: CO 260/29

[202] The inflation value of the money was calculated following guidance from https://www.measuringworth.com/index.php [accessed 24/10/2019] and the Bank of England's inflation calculator https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator [accessed 24/10/2019]

[203] The Advocate, "Packing clothing for St. Vincent", 17th April 1979; "Students start fund", 19th April 1979; "More aid going to St. Vincent", 22nd April 1979; "More aid for St. Vincent", 26th April 1979; "Trinidad sending rice, chicken to St. Vincent", 7th May 1979; "T-T $$ for St. Vincent", 16th May 1979

[204] The Advocate, "Adventists to give St. Vincent $10,000", 24th April 1979 (Eastern Caribbean Seventh Day Adventists Group); "Adventists give £15,000 to Soufriere victims", 29th April 1979 (Eastern Caribbean Seventh Day Adventists Group); "Vincentians need food and clothing", 30th April 1979 (Dominica); "Urgent need for food, clothing in St. Vincent", 8th May 1979 (The Church World Service and Anglican Diocese of Barbados); The Nation, "St. Vincent needs more", May 1979 (Caribbean Conference of Churches); "Supplies will be shipped to St. Vincent", May 1979 (Dominica) NDAS-SVG: Volcanoes VI

the relief fund to accumulate to EC$1,479,078.44[205] (£427,545.63) (equivalent to £2,179,432.47 with inflation) by 6th September 1979 (around the time evacuees returned home). With the increasing use of technology to communicate events between each eruption, recovery had a strong international dimension, similarly observed for the 1906 eruption of Vesuvius, Italy (Chester *et al.*, 2015).

For a present-day comparison, the 2017 Atlantic hurricane season showcased various ways other Caribbean islands came to the assistance to those impacted dominantly by the major hurricanes of Harvey (17th August-1st September), Irma (30th August-12th September), and Maria (16th-30th September).[206] The first two key examples in response to the hurricanes was in the form of insurance. The first was the Caribbean Catastrophe Risk Insurance Facility (CCRIF) that has a current membership of 16 Caribbean islands (including St. Vincent) in reinsurance protection to hurricanes, excess rainfall, and earthquakes. Following Hurricane Irma, the company paid out to Antigua and Barbuda, Anguilla, St. Kitts and Nevis, Turks and Caicos Islands, Haiti, and The Bahamas a collective total of US$31.2 million (£243,555) and following Hurricane Maria, Dominica received US$19 million (£148,318.75).[207] The second insurance example was US$31.2 billion reinsurance costs for Bermuda Re/insurance in response to the losses sustained from hurricanes Harvey, Irma and Maria, with the majority paid out to the US and Puerto Rico.[208] The last example was in response to the 2017 hurricane season that had a similar approach observed for the three eruptions of La Soufrière. A comprehensive list that coordinated relief efforts for Dominica in response to Hurricane Maria detailed locations, open times and contact information in Trinidad and

[205] The Star, "Relief Fund", 8th September 1979 – on the 2nd May it stood at EC$508,874.67 (The Star, 5th May 1979); the following day it had increased to EC$586,381.56 (The Star, 5th May) and on the 18th July, it was reported to stand at EC$1,268,468.27 (The Star, 21st July), NDAS-SVG: Volcanoes VI

[206] Hurricane Harvey affected Barbados, St. Vincent, Suriname, Guyana, and the US states of Texas, Louisiana, Arkansas, Alabama, Tennessee and North Carolina. Hurricane Irma affected Antigua and Barbuda, St. Martin, Anguilla, St. Barthélemy, US and British Virgin Islands, Puerto Rico, the Dominican Republic, Haiti, Turks and Caiscos Islands, The Bahamas, Cuba, St. Lucia, Barbados, Guadeloupe, St. Kitts and Nevis, Saba, St. Eustatius and the US states of Florida, Georgia, North and South Carolina and Tennessee. Lastly, Hurricane Maria affected Dominica, the Dominican Republic, Guadeloupe, Haiti, Martinique, St. Kitts and Nevis, Puerto Rico, US Virgin Islands, St. Lucia, and Barbados. National Hurricane Center (2017) 2017 Atlantic Hurricane Season: National Oceanic and Atmospheric Administration [online] https://www.nhc.noaa.gov/data/tcr/index.php?season=2017&basin=atl [accessed 26/11/18]

[207] CCRIF SPC (2017) CCRIF reaches US$100 million milestone in payouts: The Caribbean Catastrophe Risk Insurance Facility [online] https://www.ccrif.org/news/ccrif-reaches-us100-million-milestone-payouts [accessed 26/11/18]; CCRIF SPC (2017) CCRIF to make payout to Dominica of US$19 million following the passage of Hurricane Maria: The Caribbean Catastrophe Risk Insurance Facility [online] https://www.ccrif.org/news/ccrif-make-payout-dominica-us19-million-following-passage-hurricane-maria [accessed 26/11/18]

[208] The insurance company stated that they would pick up 30 % of the losses from the three hurricanes, covering insurance and reinsurance and stated that they play a key role in the supply of risk capacity for the US; Bermuda Re/insurance (2017) BMA data reveals scale of Bermuda payments for US losses [online] https://www.bermudareinsurancemagazine.com/news/bma-data-reveals-scale-of-bermuda-payments-for-us-losses-3636 [accessed 26/11/18]

Tobago, Barbados and key locations of the wider diaspora in New York, New Jersey, Texas, Chicago, Florida, and London.[209]

Kinship not only means blood relations but having a common bond and understanding. In disaster literature, kinship usually refers to the local level (Smit and Wandel, 2006) and not the regional level. Kinship has been described as helping isolated and vulnerable populations confront challenges quickly and cohesively, by having a strong sense of community through blood or financial relations. Also, a strong kinship network can increase adaptive mechanisms by buffering psychological stress, offer supplementary labour and allow greater access to economic resources (Smit and Wandel, 2006). Furthermore, communities who do have a strong connection to their neighbours (in or outside the country) usually adapt better to disruptions caused by volcanic crises (Black, 1981; Diamond, 2005; Neall *et al*., 2008; Cashman and Giordano, 2008).

The connectivity of the Caribbean Islands predates European contact, as archaeological evidence suggests that the Caribbean Sea served as an 'aquatic motorway' (e.g. Watters and Rouse, 1989; Berman and Gnivecki, 1995; Hofman and Bright, 2008; Hofman *et al*., 2014). This therefore contradicts the notion of "insularity" – a typically "western" perspective of framing island vulnerability (Hau'ofa, 2003; Barnett and Campbell, 2010), which in itself reinforces colonial preconceptions of the Caribbean's Amerindian past (Wilson, 2001; Hofman *et al*., 2014).

6.7 Conclusion

The investigation of various components that showcased how adaptive social behaviours of the colonial society was to La Soufrière, demonstrated the complex interrelationship between the dynamics of active volcanism, societal development, cultural change, risk, vulnerability, and resilience. Viewing the data from an interdisciplinary perspective allowed a detailed insight into key factors that have shaped Vincentian society living with La Soufrière's active volcanism over time. This is a key perspective when exploring the social and historical context of volcanic eruption impacts to an exposed society. A defining issue on the influences of La Soufrière on (re)settlement, livelihood, evacuation, corruption, and

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[209] Dominica News Online (2017) Comprehensive list: Hurricane Maria relief efforts, contact information, 22nd September 2017 [online] http://dominicanewsonline.com/news/homepage/news/comprehensive-list-hurricane-maria-relief-efforts-contact-information/ [accessed 26/11/18]

close relations with the wider Caribbean is the colonial history of St. Vincent. The volcanic hazard impacts, St. Vincent's smallness, social capital, and opportunities influenced whether people returned to their homes, stayed in evacuated locations, or migrated off-island. The island also shares typical coping adaptive strategies of SIDS such as migration/resettlement within and off the island and, temporary and permanent abandonment, which evolved from the loss of indigenous knowledge.

Chapter 7 – Conclusion

7.1 Overview

In this thesis, the eruptive history of La Soufrière volcano on a background of social change was examined. The study's main argument is that colonialism made the society of St. Vincent more vulnerable to La Soufrière. This thesis asks, "how did the colonial society of St. Vincent adapt to the volcanic eruptions of La Soufrière?". A mixed-methods approach was used to reconstruct the 1812, 1902-1903, and 1979 eruptions of La Soufrière in order to understand what volcanic hazard impacted where, which informed the analysis of the impacts and adaptations on the agricultural sector and identifying major social adaptive behaviours of St. Vincent's colonial human-volcano system. The contributions of the thesis are: 1) the refinement of the historical and social narrative of La Soufrière's eruptive history, especially by including the reconstruction of the 1812 eruption. 2) The different ways La Soufrière's eruptions exacerbated social issues relevant to the slavery era (1812), post-emancipation (1902-1903) and on the eve of gaining Independence (1979). Lastly 3), the importance of the role colonialism has in historical and social volcanology investigations.

The timing of each eruption was key in highlighting specific social issues of St. Vincent. Whilst culture was harder to determine, the loss of indigenous knowledge and the development of a (post)colonial society was a major cultural factor. This study concludes that the Vincentian society is reactive to the volcanic eruptions but adapted recovery strategies. The key themes that have emerged are La Soufrière's influence, the role of colonialism, and how St. Vincent adapted to coexistence with the volcano. The chapter also reflects on conducting an interdisciplinary project, the contributions and, limitations that exist, and further avenues of research.

7.2 La Soufrière's influence

Reconstructing the eruptions of 1812, 1902-1903, and 1979 revealed that whilst the three main volcanic hazards of ash fall, lahars, and pyroclastic density currents impacted similar locations in each eruption, there are differences in the extent of the zones impacted, dependent upon the magnitude and duration of explosive activity.

La Soufrière's physical presence dominates the northern half of the island and influenced where plantations-turned-settlements developed. Today, it poses significant limitations on development in a growing society where policies are now shifting focus from expanding the south's urban environment to the rural north. Essentially, due to the flatter terrain, all developmental efforts were constrained to the base of the eastern flank of the island, where over the three eruptions a high concentration of lahars and pyroclastic density currents occurred. As there is only one highway connecting the north to the south, this poses a high future risk to life and properties, making it vital that communication and evacuation of the exposed population is timely.

La Soufrière's presence and fertile soils influenced the benefits-outweigh-the-risks mentality within the agricultural sector, particularly for the 1812 and 1902-1903 eruptions. Being reactive to the eruptions and not adapting agricultural practices does increase risk for future events. But this does depend on the perception of loss, as 40 % of estates in 1812 saw an increase in sugar production the year after the eruption, feeding into the mentality of benefits outweigh the costs (Paton *et al.*, 2008). Also relevant to 1812 and 1902-1903, are adapting recovery methods for the agricultural sector that were dependent on the political influence and the control of land, which led to some people in the sector rebuilding their livelihoods quicker than others. Overall, volcanic eruptions appear to have limited impact on St. Vincent's agricultural economy and the sector quickly recovers within a few years.

Investigating La Soufrière in the wider context of impacting a volcanic Small Island Developing State (SIDS) has been important as impacts reflect the challenges of smallness, limited space for development, a lack of agricultural diversification, and a high relief dependency. The impacts reflected support the growing literature on the developmental challenges that are faced by volcanic SIDS and utilising eruptions as a snapshot into investigating underlying social issues in history.

7.3 Colonialism

In the context of St. Vincent and the eruptions of La Soufrière, colonialism influenced development, socioeconomic mobility, and disaster response and recovery. Colonialism on St. Vincent created a marginalised social group of the Garifuna and Kalinago. The groups were forced into high risk zones as a result and lacked support in the recovery phase. It also ended any indigenous knowledge of the island and the volcano. Colonialism also influenced the location of plantations and settlements, particularly of those in proximity to the volcano.

It also created socioeconomic issues within the agricultural sector, including the limited diversity of cash crops.

Colonialism created the SIDS issues of insularity and a high dependence on foreign markets that exist today, which closely correspond to livelihood options. This led to opportunities for corruption in the aftermath of the eruptions and due to colonial racism, caused a hindrance to disaster recovery for some however, colonial racism had vastly diminished by the time of the 1979 eruption.

European colonialism existed for up to 500 years and during that time, there were many volcanic eruptions in occupied territories such as in the Americas. La Soufrière and St. Vincent are only one of many possibilities of investigating the role of colonialism in adaptive strategies to volcanoes. There has been research done on the impacts of colonialism on occupied societies but, specific research on how colonialism has impacted disaster-prone countries that were once occupied, has been limited to Montserrat, Java, and Papua New Guinea (Skinner, 2004; Wood, 2008; Johnson, 2020), and therefore would be a natural step for further research to investigate other occupied countries, as countries have different histories and so do the volcanoes within them.

7.4 St. Vincent coexisting with volcanism

St. Vincent's turbulent recorded history, from conflicts between the Kalinago, Garifuna, and two European colonial powers, and being impacted by multiple natural hazards has influenced how the society has persisted in a hazardous environment.

The timing of La Soufrière's eruptions, as well as the influences described in Section 7.2, have been key determinants into the development of St. Vincent coexisting with volcanism. This is coupled with the dominant negative social issues that were highlighted in each eruption, showcasing the complexity of volcanic risk, vulnerability, and resilience and how this leads to the impacts of each eruption being slightly different.

But has today's society learned the lessons from the past? Based on the semi-structured interviews conducted for the 1979 eruption, it does depend on the person. For example, two women from Sandy Bay were told stories of the 1902 eruption from their mothers and grandmothers, so reacted and responded differently compared to others who had no stories of the previous eruption. At the national level great efforts are being made to not only remember and educate about the eruptions of La Soufrière, but also to use this knowledge to build resilience within the communities of the island.

Based on the concept that human and environmental systems are inseparable and interlinked by diverse processes, a society coexisting with volcanism is a dichotomous system whereby the volcano and its hazards influence societal behaviour in implicit and explicit ways. However, it is dependent on the frequency and nature of volcanic eruptions and the time to achieve an equilibrium between the negative and the positive to become a sustainable human-volcano system. On the other hand, due to social change, a coexisting society can tip the balance between the negative and positive, thus making each coexisting society unique. This study has revealed how colonialism can change the course of societal coexistence by dismantling the pre-existing (indigenous) human-volcano system and then redeveloping the coexisting processes through the social conditions imposed by colonialism.

7.5 Reflections

Conducting interdisciplinary research is no small feat. Connecting transdisciplinary knowledge and perspectives from a diverse supervisory team is a skill that can be rewarding but not without its challenges. There has been frustrations and misunderstandings but also lightbulb moments in bridging the gap between the ideas and concepts in one discipline to another. Upon the completion of this project, I believe that as our world becomes increasingly globalised, research should reflect this by integrating the physical and social sciences more to address the complex problem of how humans have lived and live within hazardous environments.

The major limitation within this study was the lack of diverse voices from enslaved Africans, their free descendants, women, and children, the disabled, and other marginalised groups for the 1812 and 1902-1903 eruptions. Society is not a homogenous system and for the two eruptions, the data available did not wholly reflect the different experiences and knowledge an individual, household, or community on St. Vincent had in responding and recovering from La Soufrière's eruptions. Understanding different social groups' disaster narratives is vital in pinpointing the directions of volcanic risk reduction. However, the different narratives drove the ideas surrounding the role of colonialism and marginalisation in volcanic eruption impacts and the importance of conducting semi-structured interviews from diverse participants. This does open further avenues of research into historical and social volcanology in focusing on capturing the diverse voices of different social groups within a given society, not just in what St. Vincent looks like today.

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Contents

Appendix A: Archive sources

Table A1: Sources obtained from the British Library

Table A1. All sources consulted for the thesis from the British Library.

Author	Year	Title	Resolution	Shelfmark	Source type	Location	Connections to other sources	Comments
The gazette office	1801-1818	An account of the number of slaves employed, and quantity of produce grown, on the several estates in the Island of Saint Vincent and its dependencies, from the year 1801 to 1818; and from that period to 1824, inclusive.	N/A	Document supply MFR/8397	Book	SVG	8229.aaa.25.	
?	1819-1825	An Account of the Number of Slaves employed and Quantity of Produce grown on the several Estates in the Island of Saint Vincent and its dependencies from ... 1801 to ... 1824 inclusive. Compiled from the official returns.	N/A	General Reference Collection 8229.aaa.25.	Online book	SVG	MFR/8397	1819-1825 is page 177 onwards
?	1863	West Indies. Saint Vincent. Surveyed ... 1863.	N/A	Cartographic Items Maps SEC.8.(791.)				
Great Britain: War Office, Intelligence Division	1898	St. Vincent [showing admin. And infrastructure boundaries], IDWO 1477.	1: 726 000	Maps MOD IDWO 1477	Map	SV		
Great Britian: War Office, Intelligence Division	1902	St. Vincent, shewing area devastated by volcanic eruption, IDWO 1636	1: 115 200	Maps MOD IDWO 1636	Map	North SV		Has estimated numbers of people affected

London: Admiralty	1908	West Indies. St. Vincent and the Northern part of the Grenadines…1861…1889	N/A	Maps SEC.8.(791.)	Map	SVG		
Anderson R.M.	1911	The Saint Vincent Handbook, Directory and Almanac for the year 1911 (1914). Edited by Robert M. Anderson, etc.	N/A	General Reference Collection X.808/9862.	Book	SV		Refer to pictures taken in 'British Library' folder
Tolworth: Directorate of Overseas Surveys	1965	Kingstown, St. Vincent, D.O.S. (Misc.) 414	1:2 500	Maps X.2419	Map	Kingstown	X.2940.	
Tolworth: Directorate of Overseas Surveys	1974	St. Vincent, D.O.S.017.	1:2 500	Maps 82480.(8.)	Map	SV	82480.(9.)	Need permission to obtain copies as it is in copyright
Tolworth: Directorate of Overseas Surveys	1978	St Vincent / Grenadines 1:2,500, photogrammetric plot, not field completed, series D.O.S.044.	1:2 500	Maps 82480.(9.)	Map	SV	82480.(8.)	Need permission to obtain copies as it is in copyright
Tolworth: Directorate of Overseas Surveys	1978	St Vincent/Grenadines 1:5,000 photogrammetric plot, not field completed, series D.O.S. 144.	1:5 000	Maps 82480.(8.)	Map	SV	82480.(9.)	Need permission to obtain copies as it is in copyright
Tolworth: Directorate of Overseas Surveys	1983	Saint Vincent and the Grenadines 1:25,000, E803 (DOS 1317) /Directorate of Overseas Surveys	1:25 000	Maps 82480.(13.)	Map	SVG	82480.(3.)	
Tolworth: Directorate	1972-1977	Kingstown, St. Vincent, D.O.S. 2713	1:50 000	Maps X.2940.	Map	Kingstown	X.2419.	

of Overseas Surveys								
Le Breton A.	1998	Historic account of Saint Vincent, the Indian Youroumaÿn, the island of the Karaÿbes / written by Adrien Le Breton	N/A	General reference collection YA.2000.a.41358			2000.a.418.)	
Adams E.	2002	People on the move : the effects of some important historical events on the people of St. Vincent and the Grenadines	N/A	General Reference Collection YA.2003.b.2238	Book	SV	2003.b.20.)	Refer to word document and photographs

Table A2: Sources obtained from The National Archives

Table A2. All sources consulted for the thesis from The National Archives.

Author	**Year**	**Title**	**Resolution**	**REF**	**Weblink**	**Source type**	**Location**	**Connections to other sources**	**Comments**
?	1810	A Sketch of the Charib Country, St. Vincent. MS. 1 inch to 40 chains	1 inch to 40 chains	CO 700/SaintVincent7	http://discovery.nationalarchives.gov.uk/details/r/C3478152	Map	NE (From Byera to Cow & Calves)	SaintVincent6/9	23 landowners named, incl. acreage
Laurie &	1810	St. Vincent, from an	1 1/4 inches to 1 mile	CO 700/SaintVincent6	http://discovery.nationalarchives.gov.uk/details/r/C3478151	Map	SV	SaintVincent7/9	Shows parishes: St

Whittle		actual Survey made in 1773, after the Treaty with the Caribs. New edition. 1¼ inches to 1 mile. Published by Laurie & Whittle, London							George, Patrick, Andrew & David. Charlotte is not named at this stage. Some settlements/estates visible
?	1812	Reports peculiar and alarming conditions in Barbados, first thought to be the result of military action, which were	n/a	CO 28/81/19	http://discovery.nationalarchives.gov.uk/details/r/C10523572	Gov. despatches	Barbados		

		known only some days later to be caused by volcanic eruption in St Vincent.							
?	1812	Despatches, offices and individuals	n/a	CO 260/29	http://discovery.nationalarchives.gov.uk/details/r/C2702925	Gov. despatches	SV/'Carib land' /Grand Sable		10th Mar (population)/16th May (volcano) /23rd May (cost of damage to landowners)/20th Jun (no. of caribs)/22nd Aug (relief)/28th Sept (caribs)/8th Jul (caribs)/3

									rd Aug (caribs)/6th Nov (est. of church at GS)
Mason T. and Cayley T.	1814	Documents unconnected with the Kerguelen papers, in English, and generally of a later date (ff362-381, unnumbered, and 1-74 of a new sequence): From Thomas Mason and Thomas Cayley in	n/a	SP 46/147/362-363	http://discovery.nationalarchives.gov.uk/details/r/C7713122	Letters			

		St Vincent, WI, to John Moss in Liverpool with names of members of a committee to report on losses sustained in a volcanic eruption in 1812, and recommended amounts of compensation to be paid							
?	1817	I. St. Vincent. Slave register	n/a	T 71/493	http://discovery.nationalarchives.gov.uk/details/r/C2584597	Book	SV	MFR/8397 (BL)	Gives male, female, age, job, ethnicity

									(Arican or Creole), name, ownership - only used estate name and number of slaves, including number of runaways
Byres J.	1828	Plan of the Island of St. Vincent by J. Byres. Republished 8 Oct 1828. 1 inch to 2 miles	1 inch to 2 miles	CO 700/SaintVincent9	http://discovery.nationalarchives.gov.uk/details/r/C3478154	Map	SV	SaintVincent6/7	
Dickson T.	1828	Diagram of 6000 acres of	1 inch to 10 chains	MPD 1/97	http://discovery.nationalarchives.gov.uk/details/r/C3982416	Map	NE (From	SaintVincent7	Shows land

		land formerly in possession of the Charibs					Byera to Cow & Calves)		ownership
?	1831	St Vincent. 'Outline Map, shewing the situation of all the fortifications, government lands and buildings at Saint Vincent 1831'. Reference table. Scale: 2 inches to 1 mile. Compass indicator	2 inches to 1 mile	MPH1/621	http://discovery.nationalarchives.gov.uk/details/r/C4562428	Map	SV		Rather general, but does highlight settlements and rivers

Arrowsmith J.	1842	Map of the Windward Islands; comprising Barbados, St Vincent, Grenada, Tobago, St Lucia and Trinidad …compiled principally from documents in the colonial office and admiralty. By John Arrowsmith, London. 1 inch to	1 inch to 15 miles	CO 700/WindwardIslands3	http://discovery.nationalarchives.gov.uk/details/r/C3478811	Map	SV	WindwardIslands4	Similar to WWI3, adds parishes

		about 15 miles							
3 inches to ~500 feet	MPH 1/1131/5	At location	http://discovery.nationalarchives.gov.uk/details/r/C9414876	Map			3 inches to ~500 feet	MPH 1/1131/5	At location
n/a	CO 700/WindwardIslands4	At location	http://discovery.nationalarchives.gov.uk/details/r/C3478812	Map	SV	WindwardIslands3	n/a	CO 700/WindwardIslands4	At location
n/a	CO 28/215/25	At location	http://discovery.nationalarchives.gov.uk/details/r/C10060307	Gov. despatches	SV		n/a	CO 28/215/25	At location
n/a	CO 321/39/62	At location	http://discovery.nationalarchives.gov.uk/details/r/C10648391	Gov. despatches	SV		n/a	CO 321/39/62	At location
n/a	CO 321/58/10	At location	http://discovery.nationalarchives.gov.uk/details/r/C10721794	Gov. despatches			n/a	CO 321/58/10	At location
n/a	CO 321/64/8	At location	http://discovery.nationalarchives.gov.uk/details/r/C10648747	Gov. despatches	SV/Wallibou		n/a	CO 321/64/8	At location
n/a	CO 1069/388	At location	http://discovery.nationalarchives.gov.uk/details/r/C11443630	Photos	N	CO 295/410/69; Tempest Anderson collection	n/a	CO 1069/388	At location

n/a	CO 884/6/2	At location	http://discovery.nationalarchives.gov.uk/details/r/C8914938	Gov. despatches	SV/Hope Garden		n/a	CO 884/6/2	At location
n/a	CO 321/202	At location	http://discovery.nationalarchives.gov.uk/details/r/C2975667	Gov. despatches	SV/Park Hill/Adelphi/Richmond Hill		n/a	CO 321/202	At location
n/a	MT 23/141/2	At location	http://discovery.nationalarchives.gov.uk/details/r/C6637544	Gov. despatches	SV	CO 321/227	n/a	MT 23/141/2	At location
n/a	CO 152/275/6	At location	http://discovery.nationalarchives.gov.uk/details/r/C10744544	Gov. despatches	Dominica		n/a	CO 152/275/6	At location
n/a	CO 295/410/69	At location	http://discovery.nationalarchives.gov.uk/details/r/C10720949	Gov. despatches	N	CO 1069/388; Tempest Anderson collection	n/a	CO 295/410/69	At location
n/a	CO 28/257/30	At location	http://discovery.nationalarchives.gov.uk/details/r/C9504305				n/a	CO 28/257/30	At location
n/a	CO 321/214	At location	http://discovery.nationalarchives.gov.uk/details/r/C2975679	Gov. despatches	SV/HMS Indefutigable/Wallilabo/Kearten's Estate/Windsor Forest/Dominica	CO 321/218	n/a	CO 321/214	At location
n/a	CO 321/220	At location	http://discovery.nationalarchives.gov.uk/details/r/C2975685	Gov. despatches	Buccament/SV/Akers estate/Owia/Fancy/Kernahan		n/a	CO 321/220	At location
n/a	CO 321/218	At location	http://discovery.nationalarchives.gov.uk/details/r/C13508535	Gov. despatches	SV/Jamaica	CO 321/214	n/a	CO 321/218	At location

n/a	CO 321/219	At location	http://discovery.nationalarchives.gov.uk/details/r/C13508621	Gov. despatches	SV		n/a	CO 321/219	At location
n/a	CO 884/8/3	At location	http://discovery.nationalarchives.gov.uk/details/r/C8915137	Gov. letters	SV		n/a	CO 884/8/3	At location
n/a	CO 321/227	At location	http://discovery.nationalarchives.gov.uk/details/r/C13508678	Gov. despatches	Layou/'Carib' country	MT 23/141/2	n/a	CO 321/227	At location
n/a	CO 321/232/61	At location	http://discovery.nationalarchives.gov.uk/details/r/C13508793	Gov. despatches	Park Hill/New Adelphi/'Carib' country/between Richmond & Richmond Vale		n/a	CO 321/232/61	At location
n/a	CO 321/238	At location	http://discovery.nationalarchives.gov.uk/details/r/C2975703	Gov. despatches	SV/NW		n/a	CO 321/238	At location
n/a	CO 321/270	At location	http://discovery.nationalarchives.gov.uk/details/r/C2975735	Gov. despatches	Belair estate/SV		n/a	CO 321/270	At location
2.62 miles to an inch	CO 1047/836	At location	http://discovery.nationalarchives.gov.uk/details/r/C3004609	Map	SV/N		2.62 miles to an inch	CO 1047/836	At location
n/a	CO 318/334/1	At location	http://discovery.nationalarchives.gov.uk/details/r/C10329121	Gov. despatches	SV		n/a	CO 318/334/1	At location
n/a	CO 321/344/8	At location	http://discovery.nationalarchives.gov.uk/details/r/C8676912	Gov. report	SV	CO 321/391/4; CO 321/412/5	n/a	CO 321/344/8	At location
n/a	CO 321/350/7	At location	http://discovery.nationalarchives.gov.uk/details/r/C8678190	Gov. report	Chateaubelair/Georgetown		n/a	CO 321/350/7	At location

n/a	CO 321/359/5	At location	http://discovery.nationalarchives.gov.uk/details/r/C8840410	Gov. report	SV		n/a	CO 321/359/5	At location
n/a	CO 321/377/6	At location	http://discovery.nationalarchives.gov.uk/details/r/C8869854	Gov. report	SV		n/a	CO 321/377/6	At location
n/a	CO 321/391/4	At location	http://discovery.nationalarchives.gov.uk/details/r/C8908027	Gov. report	SV		n/a	CO 321/391/4	At location
n/a	OD 6/214	At location	http://discovery.nationalarchives.gov.uk/details/r/C1721742	Map	SV		n/a	OD 6/214	At location
n/a	CO 1042/381	At location	http://discovery.nationalarchives.gov.uk/details/r/C2050225	Gov. report	SV		n/a	CO 1042/381	At location
n/a	CO 321/412/5	At location	http://discovery.nationalarchives.gov.uk/details/r/C8908890	Gov. report	SV	CO 321/344/8; CO 321/391/4	n/a	CO 321/412/5	At location
n/a	CO 321/414/1	At location	http://discovery.nationalarchives.gov.uk/details/r/C8908910	Gov. report	SV		n/a	CO 321/414/1	At location
n/a	CO 321/437/7	At location	http://discovery.nationalarchives.gov.uk/details/r/C8908688	Gov. report	SV		n/a	CO 321/437/7	At location
n/a	CO 1031/1409	At location	http://discovery.nationalarchives.gov.uk/details/r/C341107	Gov. report	SV		n/a	CO 1031/1409	At location
n/a	OD 6/216	At location	http://discovery.nationalarchives.gov.uk/details/r/C1721744	Gov. report	SV		n/a	OD 6/216	At location

n/a	FCO 63/610	At location	http://discovery.nationalarchives.gov.uk/details/r/C10964881	Gov. report	SV		n/a	FCO 63/610	At location

Table A3. Sources obtained from The National Document and Archive Service of St. Vincent and the Grenadines

Table A3. All sources consulted for the thesis from The National Document and Archive Service of St. Vincent and the Grenadines.

Author	Year	Title	Resolution	REF	Source type	Location	Comments
Floyd W.	1796	Disaster relief letter	N/A	AA2.1.6	Letter	N/A	
Lt. A.C. Robinson	1812	N/A	N/A	Volcanoes VI	Letter	Wallibou	
?	1813-1814	Despatches	N/A	AA1.8.67	Government correspondence	N/A	
Various	1813	Petition to the house of commons	N/A	AA4.1.1	Letters	N/A	
?	1823	Slave population of St Vincent	N/A	AA4.1.3	Report	N/A	
?	1845	Population census	N/A	AA7.1.93	Report	N/A	
?	1898	Colonial report for 1898	N/A	AA7.1.45	Report	N/A	
?	1899	Colonial report for 1899	N/A	AA7.1.46	Report	N/A	
?	1900	Handing back the Cumberland & Mt Hope estates to Mr Simmons	N/A	AA.11.55	Government correspondence	N/A	
Various	1902	Executive council minutes	N/A	AA1.13.27	Government correspondence	N/A	
?	1902	Correspondence relating to the volcanic eruptions in St Vincent and Martinique in May, 1902	N/A	AA4.1.24	Government correspondence	N/A	
?	1902	Bluebook of statistics	N/A	N/A	Report	N/A	
Dickson H.N.	1902	The eruptions in Martinique and St Vincent	N/A	AA4.1.26	Journal article	N/A	
Russel I.C.	1902	Volcanic eruptions on Martinique and St Vincent	N/A	Volcanoes VI	Journal article	N/A	The national geographical magazine. Vol. XIII

?	1902-1903	Colonial report for 1902-1903	N/A	AA7.1.49	Report	N/A	
Various	1903	Executive council minutes	N/A	AA1.13.28	Government correspondence	N/A	
?	1903	Further correspondence relating to the volcanic eruptions in St Vincent and Martinique in 1902 and 1903	N/A	AA4.1.25	Government correspondence	N/A	
?	1903-1904	Colonial report for 1903-1904	N/A	AA7.1.50	Report	N/A	
?	1904-1905	Colonial report for 1904-1905	N/A	AA7.1.51	Report	N/A	
Various	1904	Executive council minutes	N/A	AA1.13.29	Government correspondence	N/A	
?	1905-1906	Colonial report for 1905-1906	N/A	AA7.1.22	Report	N/A	
?	1905-1920	Lands	N/A	AA6.1.11	Government correspondence	N/A	
Agriculture department	1905-1937	Agriculture department report	N/A	N/A	Report	N/A	
?	1906-1907	Colonial report for 1906-1907	N/A	AA7.1.23	Report	N/A	
?	1907-1908	Colonial report for 1907-1908	N/A	AA7.1.24	Report	N/A	
?	1907-1908	Carib country	N/A	CONF 2/1908	Report	N/A	
?	1907	Sale of Mr Porter's estates	N/A	AA1.11.56	Letter	N/A	
?	1908-1909	Colonial report for 1908-1909	N/A	AA7.1.25	Report	N/A	
Sands W.N.	1911	An account of the working of the land settlement scheme	N/A	OR5.1.1	Journal article	N/A	
?	1912	The laws of Saint Vincent: Vol. 1 1784-1898	N/A	DP61.4.2	Book	N/A	

Sands W.N.	1915	Methods of working small holdings	N/A	OR5.1.6	Journal article	N/A	
?	1931	Annual report on social and economic progress	N/A	AA7.1.76	Report	N/A	
?	1938	Arrowroot industry	N/A	AA1.11.87	Report	N/A	
?	1940	Development and use of eruption fund	N/A	AA6.50.5	Government correspondence	N/A	
?	1946	Soufriere activity	N/A	AA1.11.67	Report	N/A	
Roberts G.W.	1946	Population trends in the British Caribbean	N/A	AA1.11.76	Report	N/A	
?	1961	Redemption Sharpes housing scheme	N/A	AA6.47.8	Government correspondence	N/A	
Land and surveys department	1964	Lands and surveys department annual report	N/A	AA1.14.26	Report	N/A	
Various	1966	Hurricanes, storms & other natural disasters: precautionary measures and relief procedure	N/A	AA6.27.2	Government correspondence	N/A	
?	1967	Suggestions for improvement of St Vincent	N/A	AA6.31.14	Government correspondence	N/A	
Department of public works	1967	Public works department 1967	N/A	AA1.10.7	Report	N/A	
Premier	29th Feb 1972	Press release	N/A	Volcanoes VI	Press release	Kingstown	
Aspinall et al	1972	Eruption of Soufriere volcano on St Vincent island, 1971-72	N/A	Volcanoes VI	Report	N/A	Volcanologist report on the effusive eruption
Kirby I.A.E.	1973	The sugar mills of St Vincent. Their sites 172-to 1962	N/A	RBK 605	Book	N/A	
Statistics unit	1975	Statistics for 1975	N/A	AA1.10.2	Report	N/A	
?	15th Apr 1979	Brief report	N/A	Volcanoes VI	Report	Kingstown	

Premier Cato	16th Apr 1979	Report to the nation	N/A	Volcanoes VI	Press release	Kingstown	
?	17th Apr 1979	News	N/A	Volcanoes VI	Press release	N/A	
?	19th Apr 1979	Soufriere report	N/A	Volcanoes VI	Report	N/A	
Premier Cato	29th Apr 1979	Press release	N/A	Volcanoes VI	Press release	Kingstown	
Premier Cato	29th Apr 1979	Press release	N/A	Volcanoes VI	Press release	Kingstown	
Premier Cato	30th Apr 1979	Press release	N/A	Volcanoes VI	Press release	Kingstown	
Belmont Observatory	7th May 1979	Belmont Observatory report	N/A	Volcanoes VI	Report	Belmont	
?	8th May 1979	Press release	N/A	Volcanoes VI	Press release	N/A	
Belmont Observatory	9th May 1979	Volcano observatory report	N/A	Volcanoes VI	Report	Belmont	
Belmont Observatory	10th May 1979	Volcano observatory report	N/A	Volcanoes VI	Report	Belmont	
Belmont Observatory	30th Jun-3rd Jul 1979	Scientific report no 7	N/A	Volcanoes VI	Report	Belmont	
Belmont Observatory	3rd Jul-13 Aug 1979	Scientific report no 8	N/A	Volcanoes VI	Report	Belmont	
Almorales H.	6th-9th Jul 1979	Belmont Observatory report	N/A	Volcanoes VI	Report	Belmont	
Belmont Observatory	14th Aug-4th Oct 1979	Scientific report no 9	N/A	Volcanoes VI	Report	Belmont	

Belmont Observatory	6th-27th Oct 1979	Scientific report no 10	N/A	Volcanoes VI	Report	Belmont	
Agriculture department	1979	Department of Agriculture report	N/A	OP17.1979	Report	N/A	
?	1979	Soufriere report	N/A	N/A	Press release	N/A	Premier Cato address, 16th Apr 1979
Keane S.	1979	The volcano suite: a series of five poems	N/A	RBK 051	Poem	N/A	
?	1979	Soufriere report	N/A	AA6.45.9	Press release	N/A	
Government information service	1979	La Soufriere eruption 13th April 1979	N/A	Volcanoes VI	Report	N/A	
?	1979-1980	Estimates of revenue and expenditure	N/A	AA1.15.24	Report	N/A	
Tomblin et al	?	Scientific observations at Sourfiere volcano, St Vincent	N/A	Volcanoes VI	Report	Belmont	
Seismic Research Unit	?	Volcanic hazard leaflet	N/A	Volcanoes VI	Leaflet	N/A	
Belmont Observatory	?	Soufriere report no 19: prediction of the future course of the present eruption	N/A	Volcanoes VI	Report	Belmont	
?	?	Surveillance of Soufriere volcano, St Vincent by the seismic research unit, university of the west indies: 1953-1980	N/A	Volcanoes VI	Report	N/A	
?	?	People appointed to coordinate evacuation centres	N/A	Volcanoes VI	Report	N/A	
?	?	News release: vandalism of equipment	N/A	Volcanoes VI	Press release	Kingstown	
Belmont Observatory	?	Seismologist report	N/A	Volcanoes VI	Report	Belmont	

?	1980-1981	Estimates of revenue and expenditure	N/A	AA1.15.27	Report	N/A	
Rubenstein H.	1987	Coping with poverty: adaptive strategies in a Caribbean village	N/A	RBK 287	Book	N/A	
Ward J.R.	1985	Poverty and progress in the Caribbean 1800-1960	N/A	RBK 347	Book	N/A	
Government information service	8th Apr 1988	News release	N/A	Volcanoes VI	Press release	Kingstown	
Richardson G.C.	1989	Catastrophes and change on St Vincent	N/A	OR2.1.8	Journal article	N/A	National geographic research. Vol. 5. pg. 111-125
Robertson R.E.A.	1992	Volcanic hazard and risk assessment of Soufriere volcano, BWI	N/A	N/A	Mphil thesis	N/A	Leeds: University of Leeds
John K.	2006	Land reform in small island developing states: a case study on St Vincent, West Indies: 1890-2000	N/A	RBK 501	Book	N/A	
Minister of Finance	2013	St Vincent and the Grenadines national economic and social development plan: 2013-2025	N/A	N/A	Report	N/A	

Table A4. Sources obtained from the Virginia Historical Society

Table A4. All sources consulted for the thesis from the Virginia Historical Society. Handwriting was not eligible to prove of use.

Author	Year	Title	Resolution	REF
Keane Family	1787-1869	Papers of three generations of the Keane family of St. Vincent, British West Indies.	n/a	Mss1 K197 a
Keane Family	1787-1869	Papers, 1787-1869. Section 3. [25 items]	n/a	Mss1 K197 a 31-55
Keane Family	1790-1854	Papers, 1790-1854. [4 items]	n/a	Mss2 K1995 b

Keane H.P.	1789, 1792-1809, 1811-1819	Diary, 1789 January 1-December 31; 1792 January 1-1809 December 31; and 1811 January 1-1819 December 31. [28 volumes]	n/a	Mss1 K197 a 3-30
Keane H.P.	1810	Diary, 1810 January 1-December 31.	n/a	Mss5:1 K1993:1

Table A5. Sources obtained from the British Newspaper Archives, The New York Times archives and various St. Vincent and Barbados newspapers

Table A5. All sources consulted for the thesis from the British Newspaper Archives, The New York Times archives and St. Vincent and Barbados newspapers.

Newspaper	Date of newspaper	Title	Date of abstract	Location of report	Comments
Leicester Chronicle	19 June 1812	N/a	n/a	Nevis	
Caldedonian Mercury	22 June 1812	Volcanic eruption. Extract of a letter from St. Vincent, dated 1st May, received by a vessel arrived in the Clyde on Friday	1 May 1812	Grenada	
Kentish Gazette	23 June 1812	N/a	9 May 1812	Nevis	
Public Ledger and Daily Advertiser	23 June 1812	N/a	9 May 1812	Nevis	Same to 22nd Jun Kentish Gazette
Morning Post	23 June 1812	N/a	n/a	n/a	
Morning Chronicle	23 June 1812	N/a	9 May 1812	Nevis	Same to 22nd Jun Kentish Gazette
Hereford Journal	24 June 1812	n/a	22 June 1812	London	
Bath Chronicle and Weekly Gazette	25 June 1812	N/a	n/a	n/a	Same as 25th Jun Worcester Journal
Caldedonian Mercury	25 June 1812	N/a	9 May 1812	Nevis	Same as 22nd Jun Kentish Gazette

Perthshire Courier	25 June 1812	West Indies. Volcanic convulsion in St. Vincent's	2 May 1812	Barbados	Similar to 25th Jun Worcester Journal, but provides additional extracts from same letter
Worcester Journal	25 June 1812	N/a	2 May 1812	Barbados	
Cheltenham Chronicle	25 June 1812	N/a	n/a	Grenada	Same as 22nd Jun Caledonian Mercury
Liverpool Mercury	26 June 1812	Volcanic eruption - extract of a letter from St. Vincent, dated 1st May, received by the ship John Campbell, arrived in the Clyde this morning, from Grenada	1 May 1812	Grenada	
Public Ledger and Daily Advertiser	26 June 1812	Volcano at St. Vincent's	n/a	n/a	
Stamford Mercury	26 June 1812	N/a	1 May 1812	Grenada	Same as 22nd Jun Caledonian Mercury
Kentish Weekly Post or Canterbury Journal	26 June 1812	N/a	1/2 May 1812	n/a	Similar to 25th Jun Worcester Journal & 22nd Jun Kentish Gazette, but provides additional extracts from same letters
Kentish Gazette	26 June 1812	Extract of a letter from St Vincent, dated May 1. received by the ship John Cumpbell, arrived in the Clyde, on Saturday morning, from Grenada	1 May 1812	Grenada	Same as 22nd Jun Caledonian Mercury

Kentish Weekly Post or Canterbury Journal	26 June 1812	Volcano at St. Vincent's. Extract of a letter from St. Vincent's, dated May 1	1 May 1812	Grenada	Same as 22nd Jun Caledonian Mercury
Bristol Mirror	27 June 1812	Awful phenomenon	5 May 1812	Barbados	
Oxford University and City Herald	27 June 1812	N/a	8 May 1812	Nevis	Adds accounts of the 1718 eruption
Hull Advertiser and Exchange Gazette	27 June 1812	N/a	n/a	n/a	Same to 25th Jun Worcester Journal
Lancaster Gazette	27 June 1812	Extract of a letter from St. Vincent, dated 1st May, received by the ship John Campbell, arrived in the Clyde this morning from Grenada	1 May 1812	Grenada	
The Suffolk Chronicle; or Weekly General Advertiser & County Express	27 June 1812	Volcanic eruptions	9 May 1812	Nevis	Similar to 25th Jun Worcester Journal & 22nd Jun Kentish Gazette, but provides additional extracts from same letters
Staffordshire Advertiser	27 June 1812	N/a	n/a	n/a	Same to 25th Jun Worcester Journal
Belfast Commercial Chronicle	29 June 1812	Extraordinary phenomenon	5 May 1812	Barbados	
Hull Packet	29 June 1812	N/a	9 May 1812	Nevis	
Sussex Advertiser	29 June 1812	Volcano in the West Indies	n/a	n/a	
Hampshire Chronicle	29 June 1812	N/a	n/a	n/a	Same as 22nd Jun Caledonian Mercury
Chester Courant	30 June 1812	N/a	9 May 1812	Nevis	Same to 25th Jun Worcester Journal

Manchester Mercury	30 June 1812	N/a	n/a	Grenada	Same as 22nd Jun Caledonian Mercury
Cumberland Pacquet, and Ware's Whitehaven Advertiser	30 June 1812	Extract of a letter from St. Vincent, dated May 1	1 May 1812	St. Vincent	Same as 25th Jun Worcester Journal
Kentish Weekly Post or Canterbury Journal	30 June 1812	Volcano at St. Vincent's	n/a	n/a	Same as 22nd Jun Caledonian Mercury
Hereford Journal	1 July 1812	N/a	n/a	n/a	Same as 25th Jun Worcester Journal
Morning Chronicle	1 July 1812	Volcano at St. Vincents	6 May 1812	St. Vincent	Continues 1st Jul Public Ledger letter
Public Ledger and Daily Advertiser	1 July 1812	Volcano in St Vincent's	6 May 1812	St. Vincent	Cuts off
Belfast Commercial Chronicle	1 July 1812	Description of the eruption of the Souffrier mountain, on Thursday night, the 30th April, 1812, in the island of St Vincent	6 May 1812	St. Vincent	Same as 1st Jul Public Ledger
Taunton Courier, and Western Advertiser	2 July 1812	N/a	n/a	n/a	Same as 25th Jun Worcester Journal
Perthshire Courier	2 July 1812	Miscellaneous. Further particulars of the eruption of the Souffrier Mountain, St Vincent's	2 May 1812	St Vincent	
Kentish Gazette	3 July 1812	Volcanic eruption. Description of the eruption of the Souffrier mountain, on Thursday night, the 30th April, 1812, in the island of St Vincent	n/a	n/a	

Hampshire Chronicle	6 July 1812	Volcano at St. Vincents	n/a	n/a	Same as 1st Jul Public Ledger
Caldedonian Mercury	6 July 1812	Volcanic eruption. Description of the eruption of the Souffrier mountain, on Thursday night, the 30th April, 1812, in the island of St Vincent	n/a	n/a	
Chester Courant	7 July 1812	The late phenomenon in the West Indies	n/a	n/a	Same as 1st Jul Public Ledger
Hereford Journal	8 July 1812	Volcano in St Vincent	6 May 1812	Kingstown	
Stamford Mercury	10 July 1812	Renewed volcano at St. Vincent	n/a	n/a	Same as 1st Jul Public Ledger
Kentish Gazette	10 July 1812	N/a	n/a	Grenada	
Hull Advertiser and Exchange Gazette	11 July 1812	Volcanic eruption. Description of the eruption of the Souffrier mountain, on Thursday night, the 30th April, 1812, in the island of St Vincent	n/a	n/a	
Lancaster Gazette	11 July 1812	Island of St Vincent	n/a	St. Vincent	Same as 1st Jul Public Ledger
The Suffolk Chronicle; or Weekly General Advertiser & County Express	18 July 1812	St. Vincent's volcano	18 May 1812	St. Vincent	
Oxford University and City Herald	18 July 1812	To the editor of the Oxford Herald. The following letter we have received from a gentleman of this	24 May 1812	Nevis	

		University, giving a further account of the late dreadful eruption in the island of St. Vincent			
Belfast Commercial Chronicle	18 July 1812	Extradordinary phenomenon	24 May 1812	St. Vincent	
Norfolk Chronicle	5 Sept 1812	N/a	n/a	n/a	
Perthshire Courier	3 Dec 1812	Extract of a letter from a gentleman in St. Vincents, to his brother in Perth	n/a	St. Vincent	
Morning Chronicle	15 Dec 1812	Extract of a letter from the island of St Vincent	n/a	St. Vincent	
New York Times	8th May 1902	Earthquake in west indies. Communication with southern islands cut off - fire and smoke from st. vincent volcano seen from far away	n/a	n/a	
New York Times	10th May 1902	Fears for other islands; it is believed Dominica and St. Vincent have suffered severely - volcano in latter island active	n/a	n/a	
Western Times	10th May 1902	Official news. Anxiety for our island of St. Vincent. 1,000 whites killed	n/a	n/a	
Dundee Courier	10th May 1902	Official message. Worst fears confirmed	n/a	n/a	

Derby Daily Telegraph	10th May 1902	A mountain explodes	9th May	New York	
New York Times	11th May 1902	The island of st. vincent	n/a	n/a	
New York Times	11th May 1902	Eruption begins on st. vincent, great devastation wrought on the island, thirty deaths reported, the volcano La Soufriere had been active nine days, ashes were two feet thick, downfall of dust very heavy in barbados, loud reports resembling artillery heard on that island	n/a	n/a	
Gloucester Citizen	12th May 1902	The outburst at St. Vincent. Third of the island burning. Great loss of life	n/a	n/a	
Dundee Evening Post	12th May 1902	At St Vincent. 500 people killed. Souffriere's terrifying outbreak. Burning clouds and hail of fire. Shocks felt 100 miles away. Fears for safety of Kingston. Island unapproachable	11th May	St. Lucia	*Words cut off
Aberdeen Journal	12th May 1902	The eruption in St Vincent. Terrifying experiences	11th May	Dominica	

Yorkshire Evening Post	12th May 1902	St. Vincent devastated. Explosions herd 200 miles away. Springs dried up. Weird Apparitions in the skies	10th May	Kingstown	
Manchester Courier and Lancashire General Advertiser	12th May 1902	The fate of St. Vincent. Unable to approach the British island	10th May	St. Lucia	Unable to read
New York Times	12th May 1902	Hundreds dead in st. vincent, it is believed that about 500 have perished, volcano is still active	n/a	n/a	
New York Times	12th May 1902	The st. vincent eruption - a weird and awful scene	n/a	n/a	
Derby Daily Telegraph	13th May 1902	The volcano disaster. The position at St. Vincent. Barbadoes in total darkness	n/a	New York	
Gloucester Citizen	13th May 1902	St. Vincent outburst. Message from the King	12th May	London, Kingstown	
New York Times	13th May 1902	The st. vincent eruption; canoes crowded with refugees arriving at Dominica - the Soufriere active since Wednesday	n/a	n/a	
New York Times	13th May 1902	Latest st. vincent news; 500 were dead up to Friday night - a boat unable to approach the shore	n/a	n/a	

New York Times	14th May 1902	Dead in st. vincent now number 2,000; conditions there are said to have become worse. Two earthquakes reported most of the dead are carib indians	n/a	n/a	
Nottingham Evening Post	13th May 1902	St Vincent disaster. Darkness and death. Panic-stricken inhabitants	10th May	Castries	
Falkirk Herald	14th May 1902	Island of St Vincent and its volcano. History of previous outbreaks	n/a	n/a	
Gloucester Citizen	14th May 1902	Will St Vincent subside?	n/a	n/a	
Aberdeen Journal	14th May 1902	The mortality in St Vincent. Destruction of property	13th May	Dominica	
Sheffield Daily Telegraph	14th May 1902	The St. Vincent eruption. 1,600 lives lost. Hundreds of bodies unburied. Refugees at Dominica	12th, 13th May	Fort de France, Port Castries, St Thomas, New York	
Dundee Evening Telegraph	14th May 1902	The St Vincent eruption. 2000 victims. A river of boiling mud	13th May	Fort de France	
Lancashire Evening Post	15th May 1902	St Vincent volcano. Eruption more extensive than at Martinique. A wall of fire. Sea a boiling	15th May	New York	

		cauldron. Inhabitants dying of thirst			
Gloucestershire Echo	15th May 1902	West Indies calamities	n/a	New York	
Edinburgh Evening News	15th May 1902	St Vincent volcano quieter	n/a	Port Castries (St Lucia)	
Western Times	15th May 1902	W.I. Disaster. St Vincent practically destroyed. Eruptions continue. Exact number of deaths never known. Official telegrams	13th May	St. Vincent	
Exeter and Plymouth Gazette	15th May 1902	The West Indies disaster. Devastation at St Vincent. The death-roll increasing. Earthquake at St. Thomas. Incidents in Martinique. Pathetic scenes on the Roraima	13th May	n/a	
Gloucester Citizen	15th May 1902	The volcano disaster. The St Vincent eruption	n/a	n/a	
Cornishman	15th May 1902	Volcano disaster at Martinique	n/a	n/a	
New York Times	15th May 1902	North st. vincent a mass of flame; the volcano was still active on Tuesday	n/a	n/a	
New York Times	15th May 1902	Fund for st. vincent victims; opened at the london mansion house	n/a	n/a	

		- british government blamed for inactivity			
New York Times	16th May 1902	St. vincent fears further disaster; scientists predict another eruption soon	n/a	n/a	
Stamford Mercury	16th May 1902	Loss of life St. Vincent	n/a	n/a	
Sevenoaks Chronicle and Kentish Advertiser	16th May 1902	How St Vincent suffered	n/a	n/a	
Sussex Agricultural Express	16th May 1902	Terrible volcanic disaster	n/a	n/a	
Northampton Mercury	16th May 1902	The volcano calamity. Worst fears confirmed. Awful loss of life	n/a	n/a	
Gloucester Citizen	16th May 1902	The volcano disaster. St Vincent's wall of fire. People dying of thirst. Probable abandonment of the island	n/a	n/a	
Nottingham Evening Post	16th May 1902	St. Vincent. Another eruption predicted	13th May	Kingstown	
Western Gazette	16th May 1902	Havoc in St. Vincent. La Soufriere in violent eruption. 2,000 people perish. Great distress in the island. King's sympathetic message	11th May	Barbados	
New York Times	17th May 1902	Eruptions cease on st. vincent, inhabitants of the stricken island becoming reassured	n/a	n/a	

New York Times	17th May 1902	Desolation in st. vincent - it is belived La Soufriere will remain active	n/a	n/a	
New York Times	17th May 1902	West indian situation; commander McLean reports conditions at st. vincent as serious - less excitement in martinique	n/a	n/a	
New York Times	17th May 1902	Devastation in st. vincent; ash-covered area exceeds that in martinique - the negores indifferent to the disaster	n/a	n/a	
Framlingham Weekly News	17th May 1902	How St Vincent suffered	n/a	n/a	
Worcestershire Chronicle	17th May 1902	St. Vincent's terrible plight. Estimated deaths 1,600	n/a	n/a	
Gloucestershire Chronicle	17th May 1902	Terrible volcanic eruption in the West Indies. Towns destroyed. Immense destruction of property. Hundreds of deaths	n/a	n/a	
Cheltenham Chronicle	17th May 1902	Volcanos' victims	n/a	n/a	
Gloucester Citizen	17th May 1902	The volcano disaster. Scenes in St Vincent. Ashes like snowdrifts	n/a	Kingstown	

London Daily News	17th May 1902	St. Vincent. Extent of the devastation. Danger not over - official account	16th May	St. Vincent	
Western Times	19th May 1902	The volcano havoc. The scene in St. Vincent	n/a	n/a	
Dundee Evening Telegraph	20th May 1902	St Vincent volcano. La Soufriere still smoking	19th May	New York	
Nottingham Evening Post	20th May 1902	St Vincent eruption. Volcano still active	n/a	St. Vincent	
Leighton Buzzard Observer and Linslade Gazette	20th May 1902	Eruption in St. Vincent	17th May	Barbados	
Manchester Courier and Lancashire General Advertiser	21st May 1902	The St. Vincent eruption. Details for the relief of the homeless	17th May	London	*Words not clear
Manchester Courier and Lancashire General Advertiser	22nd May 1902	Panic at St Vincen. The Soufriere volcano again active	19th May	Kingstown	
Gloucester Citizen	22nd May 1902	The volcano disaster. Renewed eruptions at St Vincent and Martinique. Panic stricken inhabitants. Terrible scenes.	n/a	n/a	
Cornishman	22nd May 1902	The St Vincent disaster. 3000 under relief	n/a	n/a	
New York Times	22nd May 1902	Terror in st. vincent; panic caused by another violent eruption. Villagers pouring into kingstown	n/a	n/a	

		- report that a volcano near there is becoming active			
New York Times	23rd May 1902	A visit to st. vincent - how the warnings of the volcano were acted upon	n/a	n/a	
Northampton Mercury	23rd May 1902	The volcano calamity. Fresh eruptions. People panic stricken	n/a	n/a	
New York Times	24th May 1902	St. vincent volcano active; lava flowing into the sea - lava dust causes fatal diseases - more refugees at kingstown	n/a	n/a	
Western Daily Press	24th May 1902	St Vincent relief fund. Letter from M. Cambon. A disquieting telegram	n/a	n/a	
Manchester Courier and Lancashire General Advertiser	24th May 1902	Volcano disasters. Fresh eruption of Mont Pelee. Exciting scenes	n/a	n/a	
New York Times	26th May 1902	Terror in st. vincent; second eruption caused a panic at Chateaubelair	n/a	n/a	
Berwickshire News and General Advertiser	27th May 1902	n/a	n/a	n/a	
Nottingham Evening Post	27th May 1902	The volcano disasters. Scientific report. How the victims were killed. Interesting discoveries	n/a	n/a	

Sheffield Daily Telegraph	27th May 1902	The situation in St. Vincent	24th May	Kingstown	
New York Times	28th May 1902	Flood in st. vincent; houses washed away and two lives lost - volcano's appearance caused fear of another eruption	n/a	n/a	
Sheffield Independent	28th May 1902	Lumber for St Vincent	n/a	Kingstown	
Sheffield Daily Telegraph	28th May 1902	n/a	27th May	Washington	
Northampton Mercury	30th May 1902	The volcano calamities. Fresh eruptions. Survivors' thrilling narratives	n/a	n/a	
London Daily News	30th May 1902	Volcanoes still active	29th May	St. Vincent	
Western Daily Press	30th May 1902	Situation at St. Vincent. Telegrams from the governor. "I hope the worst is over"	29th May	n/a	
Gloucester Citizen	30th May 1902	St Vincent disaster. "The worst over"	29th May	n/a	
New York Times	30th May 1902	Conditions in st. vincent	n/a	n/a	
New York Times	2nd Jun 1902	La Soufriere still active; eruption on st. vincent accompanied an earthquake - indications that the island may subside	n/a	n/a	
New York Times	3rd Jun 1902	The sterling's relief work; commander of the ship sends report	n/a	n/a	

		of assistance rendered at martinique and st. vincent			
Sheffield Daily Telegraph	3rd Jun 1902	West Indian volcanoes. Another eruption in St. Vincent	30th May	Kingstown	
Manchester Courier and Lancashire General Advertiser	3rd Jun 1902	The St Vincent volcano	9th Jun	New York	
New York Times	6th Jun 1902	A look into the crater of an active volcano - Prof. Hovey's daring ascent of the Soufriere	n/a	n/a	
New York Times	7th Jun 1902	Pelee's violent eruption - smoke issued simultaneously from La Soufriere	n/a	n/a	
Manchester Courier and Lancashire General Advertiser	10th Jun 1902	The St. Vincent eruption. Leyland liner's remarkable experience	n/a	n/a	
Nottingham Evening Post	16th Jun 1902	St. Vincent. Uncomplaining sufferers	28th May	Kingstown	
Nottingham Evening Post	30th Jun 1902	The St Vincent eruption. Leyland liner's remarkable experience	30th May	Kingstown	
Nottingham Evening Post	2nd Jul 1902	The crater of the St. Vincent volcano	n/a	n/a	
London Daily News	2nd Jul 1902	Towns near volcanoes	n/a	n/a	
The Cornishman	10th Jul 1902	La Soufriere	n/a	n/a	

New York Times	13th Jul 1902	Scientists in peril from a volcano; stream of hot mud almost overwhelms them. They are making observations of La Soufriere on the island of st. vincent	n/a	n/a	
Dundee Evening Post	5th Aug 1902	The eruptions in the West Indies. Return of the scientific commission	n/a	n/a	
Falkirk Herald	6th Aug 1902	The eruptions in the West Indies	n/a	n/a	
Northants Evening Telegraph	16th Aug 1902	Volcanoes as benefactors	n/a	n/a	
Sheffield Daily Telegraph	5th Sept 1902	The West Indian volcanoes. Another eruption in St Vincent. The devastation in Martinique	4th Sept	New York	
Western Times	8th Sept 1902	La Soufriere. St Vincent's violent volcano. A scene of terror	6th Sept	New York	
Manchester Courier and Lancashire General Advertiser	8th Sept 1902	St Vincent's trails. A prolonged eruption of La Soufriere	6th Sept	New York	
Lancashire Evening Post	9th Sept 1902	St. Vincent's volcano. A stream of fire. Many estates destroyed	6th Sept	Kingstown	
New York Times	11th Sept 1902	Eruption on st. vincent - La Soufriere's new	n/a	n/a	

		crater throwing out black smoke after a period of inactivity			
Sheffield Independent	15th Sept 1902	St. Vincent volcano. The new quiet	13th Sept	New York	
Western Times	23rd Sept 1902	Volcano still violent	22nd Sept	New York	
Sevenoaks Chronicle and Kentish Advertiser	26th Sept 1902	Eruption in St. Vincent	21st May	n/a	
Yorkshire Evening Post	27th Sept 1902	Destruction by volcano	n/a	n/a	
New York Times	30th Sept 1902	Discontent in st. vincent over relief distribution; maladminstration is alleged and colonial secretary chamberlain has ordered an inquiry	n/a	n/a	
Portsmouth Evening News	17th Oct 1902	Renewed eruption. St. Vincent volcano busy	18th Oct	Barbados, New York	
New York Times	17th Oct 1902	More volcanic activity - terrific eruption of La Soufriere	n/a	n/a	
New York Times	18th Oct 1902	St. Vincent in distress - fourth eruption of Soufriere has almost devastated the island	n/a	n/a	
Manchester Courier and Lancashire General Advertiser	20th Oct 1902	The St Vincent volcano. Colonial office confirmation of renewed activity	16th Oct	New York	
Cornishman	30th Oct 1902	Eruptions in St. Vincent	n/a	n/a	
New York Times	30th Oct 1902	Visit volcano soufriere - explorers find the crater active	n/a	n/a	

Western Times	23rd Sept 1902	Volcano still violent	22nd Sept	New York	
New York Times	15th Nov 1902	Scientist tells of the acent of people of pelee; dr. hovey's lecture on eruptions at martinique and st. vincent	n/a	n/a	
Yorkshire Evening Post	19th Nov 1902	The fate of St. Vincent	n/a	n/a	
Sheffield Daily Telegraph	19th Nov 1902	Devastated St Vincent. Is the island safe? Desponding official despatch	23rd Oct	n/a	
Western Times	19th Nov 1902	Volcano's havoc. Distressing reports from St. Vincent	n/a	n/a	
New York Times	27th Nov 1902	La Soufriere in eruption; fifth outbreak of the volcano since may 7 convulses island of st. vincent	n/a	n/a	
Fife Free Press and Kirkcaldy Guardian	29th Nov 1902	n/a	n/a	n/a	
Taunton Courier and Western Advertiser	3rd Dec 1902	Volcano eruption in St. Vincent. Two towns deserted	n/a	n/a	
New York Times	16th Dec 1902	Volcanic disturbance on st. vincent			
Leeds Mercury	3rd Jan 1903	The year's earthquakes. A remarkable record	n/a	n/a	

Nottingham Evening Post	3rd Jan 1903	Rivers of black mud. Visit to St Vincent and Martinique	n/a	n/a	
Manchester Courier and Lancashire General Advertiser	3rd Jan 1903	A year's earthquakes. Memorable records of eruptions and tremors	n/a	n/a	
Yorkshire Post and Leeds Intelligencer	13th Jan 1903	Geographical changes in the West Indies. A new theory of the eruptions.	n/a	n/a	
Western Daily Press	14th Jan 1903	The eruptions in the West Indies	n/a	n/a	Similar to 13th Jan article
Reading Mercury	17th Jan 1903	Adventures in volcano-land	n/a	n/a	
Portsmouth Evening News	23rd Jan 1903	Fresh eruption in St. Vincent	n/a	Kingstown	Similar to other 23rd Jan news
Aberdeen Journal	23rd Jan 1903	Another volcanic eruption in St Vincent	22nd Jan	New York	Similar to other 23rd Jan news
Western Times	23rd Jan 1903	Soufriere once more	n/a	n/a	Similar to other 23rd Jan news
Sheffield Daily Telegraph	23rd Jan 1903	Another eruption of the Soufriere	22nd Jan	New York	Similar to other 23rd Jan news
Leeds Mercury	23rd Jan 1903	La Soufriere in eruption	22nd Jan	New York	
Leamington Spa Courier	23rd Jan 1903	n/a	n/a	n/a	Similar to other 23rd Jan news
Sheffield Daily Telegraph	23rd Jan 1903	Summary of news	n/a	n/a	
Manchester Courier and Lancashire General Advertiser	23rd Jan 1903	Eruption in St Vincent. Renewed activity of the Soufriere	22nd Jan	New York	Similar to other 23rd Jan news
Gloucester Citizen	23rd Mar 1903	La Soufriere in eruption again	n/a	New York	
Western Daily Press	23rd Mar 1903	Activity of volcanoes	22nd Mar	New York	

Edinburgh Evening News	23rd Mar 1903	West Indian volcanoes again active	n/a	St. Thomas	
Lancashire Evening Post	24th Mar 1903	n/a	n/a	n/a	
Western Times	24th Mar 1903	Volcanoes active. Continual eruptions in the West Indies	n/a	New York, Barbados	
Dundee Courier	24th Mar 1903	Soufriere volcano again active. Several deaths reported	n/a	New York	
Aberdeen Journal	24th Mar 1903	Island in darkness. Several casualties	23rd Mar	New York, Barbados	
London Daily News	24th Mar 1903	Volcanic eruptions. St Vincent in darkness	23rd Mar	New York, Barbados	
Shields Daily Gazette	24th Mar 1903	Soufriere again in eruption	22nd, 23rd Mar	New York	
Exeter and Plymouth Gazette	24th Mar 1903	West Indies. Renewed volcanic disturbances. Barbadoes in darkness	22nd Mar	Grenada, Barbados	
Sheffield Daily Telegraph	24th Mar 1903	Volcanic activity in the West Indies. Another eruption in St Vincent	23rd Mar	New York, Barbados	
Yorkshire Post and Leeds Intelligencer	24th Mar 1903	Eruptions in St. Vincent. The island in darkness	22nd Mar	Grenada, Barbados	
Western Daily Press	24th Mar 1903	Terror at Kingstown. La Soufriere active. Darkness at Barbadoes	23rd Mar	New York, Barbados	
Manchester Courier and Lancashire General Advertiser	24th Mar 1903	Soufriere active. Violent eruption in St Vincent. Dust drifting to Barbados. A fall of stones	n/a	Grenada, Barbados, New York	

Dundee Courier	25th Mar 1903	The dread volcano	23rd Mar	New York	
Western Times	25th Mar 1903	Land overwhelmed and people terrified	n/a	New York	
Aberdeen Journal	25th Mar 1903	Another volcanic eruption in St Vincent. Island in darkness	23rd, 24th Mar	Kingstown, New York, Barbados	
Stamford Mercury	27th Mar 1903	St. Vincent	n/a	n/a	
Sussex Agricultural Express	28th Mar 1903	n/a	24th Mar	n/a	
Cheltenham Chronicle	28th Mar 1903	n/a	n/a	n/a	
Lincolnshire Chronicle	5th May 1903	Undoing the volcano's work at St Vincent	n/a	n/a	
Gloucestershire Echo	15th May 1903	La Soufriere active again	22nd Apr	St. Vincent	
Whitby Gazette	15th May 1903	Last year's great eruption in the West Indies. Dr Tempest Anderson's experiences	n/a	n/a	
Nottingham Evening Post	15th May 1903	Volcano photography	n/a	n/a	
Yorkshire Evening Post	8th Oct 1903	Mr Chamberlain and the volcano	n/a	n/a	
Worcestershire Chronicle	24th Oct 1903	Foreign and colonial	n/a	n/a	
Hampshire Advertiser	28th Nov 1903	St Vincent Souffriere	n/a	n/a	
Portsmouth Evening News	14th Mar 1904	The Soufriere	n/a	n/a	
Western Times	22nd Mar 1904	n/a	n/a	n/a	
Leeds Mercury	5th Apr 1904	St Vincent after the eruption of La Soufriere	n/a	n/a	

Leeds Mercury	9th Apr 1904	A volcano tragedy. St. Vincent after the eruption of La Soufriere	n/a	n/a	
Gloucestershire Echo	24th Feb 1906	The West Indies earthquake. Inhabitants terror-stricken	24th Feb	New York	
Sheffield Evening Telegraph	24th Feb 1906	Mont Pelee active. Panic stricken islanders	24th Feb	New York	
Exeter and Plymouth Gazette	26th Feb 1906	Volcanoes and earthquakes	24th Feb	New York	
Western Times	26th Feb 1906	West Indian volcanoes active	24th Feb	New York	
Yorkshire Post and Leeds Intelligencer	26th Feb 1906	Mont Pelee and La Soufriere again active. Town residents taking flight	24th Feb	New York	
Sheffield Independent	9th Mar 1906	Cut off from the world	20th Feb	Barbados	
Aberdeen Journal	9th Mar 1906	Alarming experiences	20th Feb	Barbados	
Aberdeen Journal	14th Mar 1906	The Soufriere eruption	n/a	n/a	
Manchester Courier and Lancashire General Advertiser	27th Apr 1906	An astonishing shot	n/a	n/a	
Nottingham Evening Post	8th Sept 1906	Earthquake shocks	n/a	Kingstown	
Motherwell Times	1st May 1908	Rev. D. Scott on his voyage home	n/a	n/a	
Sunderland Daily Echo and Shipping Gazette	13th Oct 1908	A rain of ashes	n/a	Basse Terre	
Manchester Courier and Lancashire General Advertiser	14th Oct 1908	West Indian volcano active	n/a	Basse Terre	

Aberdeen Journal	14th Oct 1908	Reuter's miscellaneous telegrams	n/a	Basse Terre	
Bath Chronicle and Weekly Gazette	7th Jan 1909	Some memorable earthquakes	n/a	n/a	
The Advocate	17th Apr 1979	Packing clothing for St Vincent	n/a	n/a	
The Advocate	18th Apr 1979	Preacher predicted volcano's eruption	n/a	n/a	
The Advocate	18th Apr 1979	Eighth explosion rocks La Soufriere volcano	n/a	n/a	
The Advocate	19th Apr 1979	The tragedy - and lesson - of St Vincent	n/a	n/a	
The Advocate	19th Apr 1979	Students start fund. Seven explosions shake Soufriere	n/a	n/a	
The Advocate	19th Apr 1979	US $300,000 in aid for St Vincent	n/a	n/a	
The Advocate	21st Apr 1979	Vincentians flee the wrath of Soufriere	n/a	n/a	
The Advocate	21st Apr 1979	Soufriere tremors decreasing	n/a	n/a	
The Advocate	22nd Apr 1979	More aid going to St Vincent	n/a	n/a	
The Advocate	22nd Apr 1979	Cato says recovery will 'tale quite some time'	n/a	n/a	
The Adovcate	22nd Apr 1979	Soufriere blows for 16th time	n/a	n/a	
The SV association in Barbados	23rd Apr 1979	Vincentians to form own group	n/a	n/a	
The Adovcate	23rd Apr 1979	Two blasts shake Soufriere	n/a	n/a	

The Adovcate	24th Apr 1979	Adventists to give St Vincent $10,000	n/a	n/a	
The Adovcate	25th Apr 1979	The agony of St Vincent	n/a	n/a	
The Adovcate	25th Apr 1979	CPA sends message	n/a	n/a	
The Adovcate	25th Apr 1979	$750,000 in expenses	n/a	n/a	
The Nation	25th Apr 1979	No deaths by Soufriere	n/a	n/a	
The Nation	25th Apr 1979	Ash up to 3 feet	n/a	n/a	
The Advocate	26th Apr 1979	The catastrophe of St Vincent	n/a	n/a	
The Advocate	26th Apr 1979	More aid for St Vincent	n/a	n/a	
The Advocate	26th Apr 1979	Sounds of Soufriere?	n/a	n/a	
The Nation	27th Apr 1979	Showers of Soufriere. April dust	n/a	n/a	
The Nation	27th Apr 1979	Eruption no. 20: ash takes over	n/a	n/a	
The Nation	27th Apr 1979	Looting in St Vincent	n/a	n/a	
The Star	28th Apr 1979	Scientific team's report. A midnight explosion - 1.2 million ton of ash dumped on island	n/a	n/a	
The Star	28th Apr 1979	Scientific observations at Soufriere volcano St Vincent 16-19 1979	n/a	n/a	
The Advocate	28th Apr 1979	Evacuee camps	n/a	n/a	
The Star	28th Apr 1979	The Soufriere experience	n/a	n/a	
The Star	28th Apr 1979	List of donations and donors	n/a	n/a	
The Star	28th Apr 1979	Pendant made from Soufriere ash	n/a	n/a	

The Adovcate	28th Apr 1979	Providing help for St Vincent	n/a	n/a	
The Adovcate	29th Apr 1979	Adventists give $15,000 to Soufriere victims	n/a	n/a	
The Advocate	29th Apr 1979	Tremor stops	n/a	n/a	
The Advocate	29th Apr 1979	Volcanic ash helps the soil	n/a	n/a	
The Advocate	29th Apr 1979	Soufriere takes new turn	n/a	n/a	
The Adovcate	30th Apr 1979	Cools down	n/a	n/a	
The Advocate	30th Apr 1979	More B'dos aid for St Vincent	n/a	n/a	
The Advocate	30th Apr 1979	Cooking oil for St Vincent	n/a	n/a	
The Advocate	30th Apr 1979	Heavy ash fall on St Vincent	n/a	n/a	
The Advocate	30th Apr 1979	Vincentians need food and clothing	n/a	n/a	
The Advocate	May-79	Supplies will be shipped to St Vincent	n/a	n/a	
The Nation	May-79	Experts to climb Soufriere. Cato for talks with Dr Williams	n/a	n/a	
The Nation	May-79	Millon dollar grant for St Vincent	n/a	n/a	
The Nation	May-79	St Vincent needs more	n/a	n/a	
The Nation	May-79	Beware the 13th of May	n/a	n/a	
The Advocate	3rd May 1979	Soufriere goes quiet	n/a	n/a	
The Star	5th May 1979	Soufriere relief fund	n/a	n/a	
The Star	5th May 1979	Soufriere relief fund	n/a	n/a	

The Star	5th May 1979	Soufriere pendant sold for $5,000	n/a	n/a	
The Star	5th May 1979	La Soufriere erupted	n/a	n/a	
The Star	5th May 1979	Misconceptions	n/a	n/a	
The Nation	5th May 1979	Drive to aid Vincentians	n/a	n/a	
The Star	5th May 1979	Experts still monitoring situation. Premier Cato addresses nation	n/a	n/a	
The Star	5th May 1979	Address to the nation	n/a	n/a	
Sunday advocate news	6th May 1979	Hams help in St Vincent emergency	n/a	n/a	
Sunday Advocate News	6th May 1979	It's our moral duty to help St Vincent	n/a	n/a	
The Advocate	7th May 1979	Trinidad sending rice, chicken to St Vincent	n/a	n/a	
The Advocate	8th May 1979	Urgent need for food, clothing in St Vincent	n/a	n/a	
The Advocate	9th May 1979	Supreme cookware sent to St Vincent	n/a	n/a	
The Advocate	11th May 1979	Group set up to aid Vincentians	n/a	n/a	
The Advocate	11th May 1979	St Vincent to get $1m from EEC	n/a	n/a	
The Star	12th May 1979	Lava dome growing in crater	n/a	n/a	
The Adovcate	12th May 1979	Grant for St Vincent approved	n/a	n/a	
The Star	12th May 1979	List of donations and donors	n/a	n/a	Photo only
The Advocate	14th May 1979	When B'dos gives aid	n/a	n/a	

The Advocate	14th May 1979	Boredom is big problem for evacuees	n/a	n/a	
The Advocate	14th May 1979	YULIMO calls for conference	n/a	n/a	
The Advocate	16th May 1979	T-T $$ for St Vincent	n/a	n/a	
The Star	19th May 1979	Lava dome increasing in size	n/a	n/a	
The Star	19th May 1979	Trinidad and Tobago send aid	n/a	n/a	
The Star	19th May 1979	Urgent plea for aid	n/a	n/a	
The Star	19th May 1979	La Soufriere	n/a	n/a	
The Advocate	25th May 1979	Supplies for St Vincent	n/a	n/a	
The Star	26th May 1979	Eruption continues quietly	n/a	n/a	
The Star	26th May 1979	Cato wins Batik painting	n/a	n/a	
The Advocate	28th May 1979	Donation for evacuees	n/a	n/a	
The Advocate	29th May 1979	St Vincent gets US $33,000 in aid	n/a	n/a	
The Advocate	29th May 1979	Lava dome pinpointed	n/a	n/a	
Caribbean business news	May-Jun 1979	Soufriere cripples Vincentian trade	n/a	n/a	
The Star	19th May 1979	Trinidad and Tobago send aid	n/a	n/a	
The Star	2nd Jun 1979	Volcano remains quiet	n/a	n/a	
The Advocate	3rd Jun 1979	Cato gives the figures	n/a	n/a	
The Advocate	3rd Jun 1979	Lava dome grows in La Soufriere	n/a	n/a	
The Advocate	7th Jun 1979	Booklet on Soufriere published	n/a	n/a	
The Advocate	10th Jun 1979	To discuss disasters	n/a	n/a	

The Advocate	12th Jun 1979	Likely end to violent Soufriere eruptions	n/a	n/a	
The Advocate	13th Jun 1979	CLICO gives money to St Vincent	n/a	n/a	
Caribbean contact	14th Jun 1979	Rehabilitation with a 'quiet' Soufriere	n/a	n/a	
The Advocate	14th Jun 1979	29 centres will be closed	n/a	n/a	
The Advocate	17th Jun 1979	Cato tours damage area	n/a	n/a	
The Nation	28th Jun 1979	Soufriere lava dome spreading	n/a	n/a	
The Advocate	29th Jun 1979	15 centres closed	n/a	n/a	
The Nation	6th Jul 1979	Have the Vincentians come to stay here?	n/a	n/a	
The Star	10th Jul 1979	Nation newspaper must accept responsibility	n/a	n/a	
The Star	21st Jul 1979	Soufriere relief fund	n/a	n/a	Photo only
The Vincentian	11th Aug 1979	No change in activity	n/a	n/a	
The Star	25th Aug 1979	Thanksgiving services held throughout the state. Premier Cato read lesson at St Paul's church	n/a	n/a	
The Advocate	27th Aug 1979	Youth group aids Vincentians. St Vincent seeking road construction help	n/a	n/a	
Caribbean commercial and industrial report	Sep-79	Learning to live with a volcano. The Soufriere of St Vincent	n/a	n/a	
The Star	8th Sept 1979	Jaycees call on premier	n/a	n/a	

The Star	8th Sept 1979	Soufriere relief fund	n/a	n/a	
The Advocate	14th Oct 1980	Scientist for talks on volcano	n/a	n/a	
The Courier	Jan-Feb 1982	St Vincent: fire and rain	n/a	n/a	
Weekend EC news	Oct 7th 1988	UNDP sets up stations to monitor volcano activity. Electronic eye on Soufriere	n/a	n/a	
The Star	8th Sept 1979	Soufriere relief fund	n/a	n/a	

Appendix B: Museum sources

List B1. Sources obtained from the Yorkshire Museum

Box B1: Tempest Anderson Collection: Volcanology of St. Vincent 1902. Numbers 1-45.

1. St. Vincent. Steam-column rising in southeastern part of crater. 31 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Plate 37 in Bulletin of the American Museum of Natural History XVI
    c. Steam rises from lake in bottom
    d. View shows alteration of the beds of lava with tuff that makes up the island
2. St. Vincent. Mud-covered upper slopes of Soufrière. 31 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Completely flattened, no vegetation
    c. Person for scale (foreground), person in the background
    d. Pyroclastics turned muddy due to rain (see TA's report)
3. St. Vincent. Southwestern part of rim of crater of Soufriere. 31 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey (Plate 37.1)
    b. The narrow path described by John Anderson in 1830s (Magistrate diary, see notes)
    c. No vegetation, flattened.
4. St. Vincent. Soufriere, crest of the half-way Ridge, 450 m above the sea. 31 May 1902.
    a. Negative for the American Museum of Natural History by E.O. Hovey (Plate 42.2)
    b. Extensive erosion of unconsolidated ash on flanks of ridge but not crest
    c. Odd path in the middle, smoothed/created after event?

    d. Person for scale
5. The Windward trail midway St. Vincent. 19 June 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Person for scale
    c. Tree debris, destroyed by nuées ardentes
    d. Ridge with broken trees, mountain in background
    e. SE side
    f. Trail to summit showing effects of volcanic blast. There was a bridle path on this ridge before the eruption
6. St. Vincent. Dust-covered ridge of Bunker's Hill, Richmond Estate. 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Dust ridge with burnt tree stumps protruding
    c. Palm trees have been destroyed by the pyroclastic flows
    d. Gully erosion of ash
    e. Grass in foreground
7. St. Vincent. Secondary eruption. Wallibou, first stage. 30 May 1902
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Columns of steam and ash, part of same sequence as 8 and 9
    c. Background looks covered by pyroclastics/unconsolidated ash
    d. Volcanic material steaming – still hot. Minor blast in an eroded channel.
8. St. Vincent. Secondary eruption. Wallibou, culmination (follows #20). 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey (Plate 40.2)
    b. Ash issuing from side of crater, withered trees in foreground
    c. This eruption is the result of the contact of river water or groundwater with hot ash, which is the deposit of pyroclastic flows.
    d. This superficial eruption threw a temporary dam across the river and caused a mudflow
9. St. Vincent. Secondary eruption. Wallibou, last stage (follows #22). 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Ash and steam rising from side of crater, bare trees and lake in foreground
    c. Separate of ash (dark) and steam (white), gully erosion in foreground
10. St. Vincent. Wallibou River from Bunker Hill. 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Pout formed by steam action
    c. Side of mountain with river in foreground, cutting through hot pyroclastic flow deposits from Soufriere.
    d. Viewpoint similar to 9

e. Gully erosion of ash
f. Damaged tree in foreground

11. St. Vincent. General view of Wallibou River. 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey (no. V.19), Dr. T Anderson compliments of the American Museum of Natural History
    b. Steaming pyroclast deposits
    c. View of river with craters in background
    d. Craters result of interaction of river water or groundwater with hot ash. Hot ash deposit of nuées ardentes.
    e. Destroyed vegetation in foreground
12. St. Vincent. Ash-filled bed of Wallibou River. 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. Steam effusion and small explosions in the hot ash deposits filling the river valley
    c. SW side. Valley of Wallibou River, showing ash-beds 50 to 75 feet thick, and a secondary or superficial outburst of steam
13. St. Vincent. Wallibou Valley from 130 m on Bunker Hill. E.O.H. Neg. No. V.143. III 1903.
    a. E.O.H. neg. V. 143., Dr. T Anderson compliments of the American Museum of Natural History
    b. View of valley with rocky slope above. Deep erosion of volcanic ash deposits by river.
14. St. Vincent. Area of secondary eruption from Bunker Hill. E.O.H. Neg. No. V.144. 7 March 1903.
    a. Same shot as other III 1903. Dr. T Anderson compliments of the American Museum of Natural History
    b. Gorge of Wallibou from Bunker's Hill
    c. Eroded ash deposits in the valley of the Wallibou River. Viewpoint very close of 5; photograph taken nearly 1 year later.
    d. Note large amount of erosion which has taken place in this time
15. St. Vincent. Site of Richmond Village. 30 May 1902.
    a. Negative made for the American Museum of Natural History by E.O. Hovey
    b. People for scale
    c. Bare trees
    d. Remains of buildings (Brick? Masonry?)
    e. Ash deposits and a few ruins left after destruction of the village by nuées ardentes
16. St. Vincent. VI 1902. E.O.H. Neg. No. Y66. Rabacca Dry River. 1902.
    a. Compliments of Dr. T Anderson of the American Museum of Natural History
    b. Person for scale
    c. SE side. The Rabacca Dry River Valley where it issues from the hills, showing bed of ashes where a gorge of 200 feet deep existed before the eruption. From a distance looks like a glacier.
17. St. Vincent. Cone of secondary eruption. Rabaka. 7 June 1902.

    a. Negative made for the American Museum of Natural History by E.O. Hovey (Plate 10.2)
    b. Hot ash deposits, including small steaming cone. Behind cone are steep valley sides with devastated trees.
    c. Ash filled Rabaka valley. Cone formed during secondary eruption. The scale is given by the man standing on the side of the small cone
18. St. Vincent. Southwestern crest of Soufriere from beside Rozeau River. 7 March 1903.
    a. Negative for the American Museum of Natural History by E.O. Hovey
    b. Eroded ash deposits at coast
    c. Person for scale
19. Volcanic dust. St. Vincent 1902.
    a. Thin section under polarised light
    b. Irregular, some twinning
    c. Given to TA by F. Martin Duncan on 15/01/103
    d. Flett: fine grains of sand were crystalline, meaning temperature was high, yet not enormously high as it had been lower down, because they began to crystallise before the lava was blown to pieces. Some crystals partly surrounded by very thin film of molten glass
20. Volcanic dust. Mt Soufriere. 1902.
    a. Thin section under non-polarised light
    b. Given to TA by F. Martin Duncan at the Camera club on 15/01/1903
    c. See J. Camera Club, pg. 39, on pg. 11 of TA's news cuttings vol. 3
21. Near Morne Ronde, St. Vincent 1902.
    a. View of coast, showing dead trees which were possibly killed by nuées ardentes
    b. At the coast was photographed on a boat
22. Lee Coast, 1902 (Leeward)
    a. Coastal section through volcanic ash deposits, seen from boat
    b. Stratified layers in cliff
23. N.W. coast of St. Vincent June 1902
    a. View of coast, showing volcanic rocks
24. Basalt Petit Bordel. 1902.
    a. Columnar jointed basalt lava seen in coastal section
    b. Small cave
25. Soufriere Windward ascent above Lot 14. 30 June 1902.
    a. Expedition party
26. Soufriere Windward ascent. 1902.
    a. See pg. 442 in Anderson and Flett (1902)

26A. St. Vincent, Soufriere 1902.

a. Eroded ash slopes, with man and grass in foreground. View of extensive area covered with thick ash, which has been guilled and furrowed by tropical rains. The unconsolidated ash has been washed out with great ease, to form a miniature “Badlands” topography very quickly (within months of the deposition of the ash in this case). A man stands in the right foreground. In the extreme left foreground some very wiry grass.
b. Published as plat XVIII in Volcanic Studies, entitled: St. Vincent. Denudation on Soufriere, Windward slopes.
c. TA and JF arrived on 10th June to investigate and record the effects of the 1902 eruptions, which had occurred between May 6th and 18th
d. Pg. 29. “The heavy tropical rains which had occurred between the May eruption and the visit of Drs. Anderson and Flett had cut deep channels in the mud which had filled the Rabaka and Wallibu valleys. The steeply sloping sides of these channels were furrowed in the usual way, as if they had been scored with a giant’s rake. Beneath the surface the mud is still extremely hot, often discharging steam as if from fumaroles, and sometimes ejecting it with explosive violence, so as to form small bowl shaped craters.”

27. Windward coast, St. Vincent. 1902
    a. Rocks exposed in coastal outcrop. These could be volcanic breccias, or possibly pillow lavas or spheroidally weathered basalt lavas
28. Windward road, St. Vincent. 1902
    a. Shows erosion surface in bedded tuffs of probable air-fall origin
29. Rain sculpture, Windward road. 1902.
    a. Gullying of soil
30. Wallibu, site of subsidence. 1902.
    a. Plate 25 in Anderson & Flett (1902), pg. 454 for explanation
    b. A strip of land along the coast has subsided beneath the sea
    c. Shows cliffs eroded in hot ash deposits. In foreground is one beached rowing boat, and another in the process of landing
    d. “The low cliffs in the middle distance consist of old tuffs with a capping of several feet of fresh sand, the product of this eruption. On the top are seen the ruins of the Wallibu factory, and at the foot was formerly a foreshore perhaps 200 yards wide, on which were the high road and a number of negro huts standing among luxuriant vegetation. The whole subsided on the day of the eruption. The new beach in the foreground has been formed since that time (about a month) of material washed from the cliffs and brought down by the rivers. The Soufriere is seen in the extreme distance to the left.”
    e. “Wallibu. Site of subsidence. A foreshore above a mile in length and averaging 200 yards wide subsided into deep water. A bed of new ash on top of bluff. Ruins of Wallibu plantation to the right. The Soufriere in the distance.”
31. Hot sand, near Wallibu mouth.
    a. Steaming cliffs of volcanic ash, seen from sea. Boulder beach in front.
32. St. Vincent 1902
    a. Plate 24 in Anderson & Flett (1902)
    b. Shore section in ashes near Wallibu River
33. Mouth of Wallibu River. 1902.

    a. RGS on negative
    b. Small secondary eruption due to contact of river water or groundwater with hot ash deposits filling valley. In foreground is small delta build-up of ash eroded from further up the valley

34. Mouth of Wallibu River. Boiling mud. 1902.
    a. Plate 23 in Anderson & Flett (1902)
    b. Boiling mud in the ash delta built up at the mouth of the Wallibu River
35. St. Vincent. 1902.
    a. Mouth of Wallibu River. View from sea, showing valley filled with hot ash deposits.
36. Wallibu. 16 June 1902
    a. RGS on negative
    b. View from sea of cliffs eroded in ash deposits. This is the site of subsidence.
37. Wallibu Works. 1902.
    a. Plate 25 in Anderson and Flett 1902
    b. Factory wrecked by nuées ardentes. This was a sugar factory
    c. Ferry wheels buried but appear to remain intact
    d. Brick/masonry foundations buried but remain
38. Wallibu. 1902.
    a. Plate 26 in Anderson & Flett (1902)
    b. Shows the fields of the Wallibu plantation grounds covered with ash to a depth of several feet. Trees are stripped of branches on up valley side, by nuées ardentes. Gullying of ash.
    c. Adult male native as scale
39. Wallibu. 1902.
    a. Erosion of ash deposits which have destroyed trees. Steam activity in the background, in the hot ash deposits filling the valley bottom
40. Wallibu plantation. Erosion of hot ash.
    a. Plate 28 in Anderson & Flett (1902)
    b. Plate XIV in Volcanic Studies II, Denundation of ash. Wallibu plantation estate.
    c. Rain furrows in fresh hot sand. Gulling of ash by rain. Trees blasted by nuées ardentes, blast from right to left.
    d. Person for scale; tree near person interesting
41. Wallibu and Morne Garu. 1902.
    a. Plate 27 in Anderson & Flett (1902)
    b. Fields of Wallibu plantation, and ash-filled valley in background. Vegetation has been buried and destroyed by nuées ardentes.
42. Wallibu
    a. Plate 27 in Anderson & Flett (1902)

    b. Burnt out house of Wallibu, surrounded by ash and overturned trees, as a result of nuées ardentes.
    c. Person for scale
43. Earth sculpture. Wallibu district.
    a. Plate 30 in Anderson & Flett (1902)
    b. Deep erosion of gorges into unconsolidated volcanic ash
    c. Person for scale
44. Soufriere from Wallibu Valley. June 1902.
    a. Shows erosion of ash deposits on the side of the volcano and in the Wallibu valley
45. Wallibu 1902.
    a. River eroding into hot ash deposits. This is almost identical to 46, but from a slightly different viewpoint (or using different lens?)

Box B2: Tempest Anderson Collection: Volcanology of St. Vincent, 1902. Numbers 46-95.

46. Wallibu 1902.
    a. River of boiling mud?
    b. The river is eroding into hot pyroclastic flow deposits
47. Wallibu hot ash falling into eroding bed. June 1902.
    a. Plate 29 in Anderson & Flett (1902)
    b. Could be evidence of lahar
48. Similar to 47
49. Wallibu 1902
    a. RGS on negative
    b. Terraces eroded into hot ash by Wallibu River. Trees killed by eruption in background, on slopes of Morne Garu. Steam from ash.
50. Wallibu 1902
    a. Upper part of Wallibu valley, showing erosion of hot ashes by river. Small mud crater in right foreground
51. Wallibu June 1902
    a. Erosion of river into hot ash, and small steam explosions in the hot ash deposit filling the Wallibu valley
52. Identical to 51
53. Very similar to 50
54. Wallibu 1902
    a. River erosion of hot ash deposits
55. Wallibu valley 1902
    a. River erosion of hot ash deposits, with steam emission similar viewpoint to 54
56. Wallibu valley 1902
    a. Same viewpoint as 55 (panorama)

57. Wallibu 1902
    a. Plate 29 in Anderson & Flett (1902)
    b. River eroding hot ash deposits
58. Wallibu “funnels”
    a. River erosion and steam explosion crates in hot ash deposits of the Wallibu valley
    b. Accompanying text on the back of catalogue sheet – get a copy
59. Wallibu steam craterbowels
    a. Plate 30 in Anderson & Flett (1902)
    b. Three small craters produced by steam explosions in hot ash. Also shows erosion of ash by a small stream.
    c. Person for scale
60. Wallibou 1902
    a. From [Carroll] Curtis [from Boston] and Hovey
    b. Ash rising from crater. Secondary explosion caused by contact of river water and groundwater with hot ash
61. Wallibu 1902
    a. From Curtis and Hovey
    b. Ash column from secondary explosion in hot ash deposits of the Wallibu valley, refer to 60 for another viewpoint
62. Wallibu 1902
    a. From Curtis and Hovey
    b. Low ash column arising from secondary eruption at the coast. Explosion appears to be the result of either of the contact of seawater with the cliffs of hot ash, or possibly of the collapse of these cliffs into the sea
63. Wallibu steam explosions 1902
    a. Columns of steam rising from secondary explosion, due to contact of river water or groundwater with hot ash
64. From Petit Bordel. June 1902
    a. Ash and steam arising from secondary explosion in the Wallibu valley. Tree in foreground
65. From Petit Bordel. June 1902
    a. Ash and steam rising from secondary eruption in the Wallibu valley. Very similar to 64
    b. A substantial explosion
66. Similar to 64 & 65
67. Similar to 65, 65 & 66
68. Similar to 64, 65, 66 & 67
69. Similar to 64, 65, 66, 67 & 68
70. Explosion seen from Petit Bordel. June 1902.
    a. Secondary explosion with columns of ash and steam

71. Explosion. Petit Bordel. 1902
    a. Secondary explosion with eruption of ash and steam. Taken from same viewpoint as 70
72. From C.belair (Chateaubelair). 1902.
    a. Secondary explosions in Wallibu valley. Taken from a similar viewpoint to 73
73. Wallibu explosions from Chateaubelair. 1902.
    a. Seen from Chateaubelair 2 miles distant.
    b. Columns of ash rising from secondary explosions, caused by contact of groundwater or river water with hot ash. The hot ash represents deposits of pyroclastic flows
74. Wallibu 1902
    a. This is a closer view of the secondary eruption shown in 75
75. Wallibu 1902
    a. Secondary eruption due to contact of river water or groundwater with hot ash. Viewed from the sea.
76. Wallibu from sea 1902
    a. Ash clouds from secondary eruption in the Wallibu valley. Eruption caused by contact of river or groundwater with hot pyroclastic flow deposits. Same viewpoint as 75
    b. Adult male in foreground
77. Rabaka near mouth 1902
    a. Eroded ash deposits in the almost dry bed of the Rabaka valley
    b. Vegetation in background covered in ash
    c. Appears to be 2 channels with island in middle
78. Rabaka area 1902
    a. Plate 31, fig. 2 in Anderson & Flett (1902)
    b. Upper part of Carib country, above Lot 14. Gullying of ash, which is 4-5 feet thick here. Trees have been stripped of branches by nuées ardentes
79. Rabaka 1902
    a. Erosion of ash in the Rabaka valley, showing the development of arcuate landslip scars, and slipping of ash into the river
80. Rabaka valley 1902
    a. Closer view of ash erosion and landslip scars seen in 79
81. Rabaka June 1902
    a. Ridge of tuff on lower slopes of Soufriere. Rabaka Dry River behind. Only a few charred remnants remain of the formerly luxuriant vegetation
    b. 2 adult male natives, carrying boxes which may contain T.A.'s photographic equipment
82. Rabaka area 1902

a. Ridges of tuff on lower slopes of Soufriere. Same view as 81, from slightly different viewpoint

83. Rabaka 1902
    a. Destroyed and buried vegetation/tree branches.
    b. 2 adults for scale
    c. Eroded ash deposits and devastated trees
84. Rabaka Dry River, upper valley 1902
    a. Plate
    b. Steam craters in hot ash deposits filling valley
85. Rabaka Dry River 1902
    a. Plate 32 in Anderson and Flett (1902)
    b. Upper part of Rabaka valley, "obstructed by the avalanche of sand."
    c. Before the eruption, valley was over 200 feet deep, but is now almost filled. River is eroding into the ash
    d. Water is flowing and steaming in places
86. Rabaka valley 1902
    a. Ash deposits filling river valley
    b. Hill just right of centre is that seen in 85
87. Rabaka Upper part 1902
    a. Plate 34 fig. 2 in Anderson & Flett (1902)
    b. Water flowing through pyroclastic deposits
    c. Tree debris that look charred on either side of valley
    d. Very deep gorge
    e. Could be lahar remnants
    f. Lake of mud in a side valley. Dammed by the avalanche deposit in the main valley. Forest covering valley side has been destroyed
88. Rabaka Dry River 1902
    a. Plate 34 fig. 1 in Anderson & Flett (1902)
    b. Lake in side valley
    c. Man in helmet on right hand side for scale
    d. Canefields covered with ash
89. Ash funnel or cauldron 1902
    a. Plate 33 fig. 2 in Anderson & Flett (1902)
    b. View of crater with make figure in foreground
    c. Crater formed by steam explosions due to contact of groundwater or river water with hot ash
90. Rabaka 1902

    a. Taken from same viewpoint as Plate 31 fig. 1 in Anderson & Flett (1902)
    b. Ash covered canefields of the Carib country. In distance is Rabaka Dry River, in flood, sending up clouds of steam as water comes in contact with hot ash. Hut in foreground.
    c. Hut appears intact but may have lost the roof
91. Rabaka 1902
    a. Same viewpoint as 90
    b. Steam rising from Rabaka River, in flood, comes in contact with hot ash
    c. Hut – items damaged nearby, roof has collapsed
92. Steam eruption, Rozeau Dry River 1902
    a. Steam eruption due to contact of river water with hot ash
93. Rozeau Dry River 1902
    a. Steam explosion due to contact of river water with hot ash
    b. Same viewpoint as 92
94. View of valley entering sea (probably 1907)
    a. Mouth of Wallibu River
    b. Terraces in ash deposits
95. Eroded ash deposits in river valley (1902?)

Box B3: Tempest Anderson Collection: St. Vincent volcanology and general 1902. Numbers 96-136.

96. West lip of crater of Soufriere. 1907
    a. Plate 18 in Anderson (1908)
    b. Steeply sloping, indured bedded ash deposits on left side of photo
97. Probably Wallibu valley 1902
    a. Eroded ash deposits, with destroyed trees in background
    b. Male figure for scale
98. Rozeau Dry River 1902
    a. Man crossing bridge of tree trunks across river of boiling mud (lahar)
    b. River has eroded a gorge in ash deposits
    c. 7 men: 4 Europeans and 3 natives. Equipped for wet weather.
99. Rozeau Dry River 1902
    a. Improvised bridge across river of boiling mud. Same viewpoint as 98
100. Rozeau Dry River 1902
    a. Improvised bridge across river of boiling mud. River has eroded gorge in ash deposits
    b. Man in foreground

101. Cleaning hotel yard

   a. Georgetown 1902
   b. Negro shovelling volcanic ash, which has accumulated to a depth of 40-50 cm in a hotel yard
   c. 2 men, 1 woman, 1 small child natives

102. Lot 14, devastated plantation 1902

   a. Charred and stripped, factory unroofed and machinery wrecked by the blast of the nuée adrente
   b. Group of natives with mule
   c. Accompanying text on the back of catalogue sheet – get a copy

103. Lot 14, 1902

   a. Rabaka area
   b. 2 natives standing in doorway
   c. House wreaked by nuée ardente
   d. Wood/timber, tile of roof of back house appears intact, roof for house on right some sheet (steel?) loose
   e. Window glass missing
   f. Vegetation in foreground and tree in background stripped of leaves but still standing
   g. Ground covered with ash

104. Lot 14 1902

   a. Rabaka area
   b. House ruined by blast of nuée ardente
   c. Foreground is farm cart, partly buried in ash
   d. 2 natives
   e. Trees in similar state to 103
   f. House – window glass missing, still standing and front is intact

105. Group of figures in valley eroded in volcanic ash

   a. 9 men: 5 Europeans and 4 Negros. Tempest seated on right; man standing on left is Flett (moustache)

106. Same as 105

107. Same as 105 & 106

108. The Lesser Antilles (1907?)

   a. E.O.H. negative compliments of the American Museum of Natural History to T.A.
   b. Plate 14 in Anderson (1908)
   c. View of mouth of Wallibu River
   d. Small boat in foreground

109. Leeward coast 1902

a. Plate 22 fig. 1 in Anderson (1908)
b. Coastal section in volcanic rocks, apparently showing breccia – filled channel eroded into tuffs. From the sea
c. Near Cumberland

110. Leeward Coast 1902
a. Two large rowing boats, with cliffs behind
b. Approximately 12 men, mostly Negros, crewing the boats

111. Leeward Coast 1902
a. Sea cliffs in columnar jointed lava, overlying less resistant material (volcanic ash?). vegetated view from sea

112. Windward Coast 1902
a. View of beach into low cliffs and small village behind

113. Windward Coast 1902
a. Wave breaking over large offshore rocks

114. Windward Coast 1902
a. Wave breaking over large offshore rocks

115. Windward Coast 1902
a. Similar to 113 & 114

116. Black Point 1902
a. Cliff and beach. Cliffs are possibly composed of columnar jointed lava
b. Ship wreak on beach

117. Chateaubelair from north. 1902
a. Plate 21 fig. 2 in Anderson (1908)
b. Although covered with ash during the eruptions of 1902, the area has rapidly become revegetated by June 1902

118. Chateaubelair June 1902
a. Plate 24 fig. 2 in Anderson (1908)
b. Beach outside devastated area
c. Native village with a number of residents including 2 children

119. Chateaubelair June 1902
a. Tropical vegetation outside devastated area
b. Luxuriant tropical vegetation, including banana tree
c. Hut “of the usual type occupied by negroes, the descendants of liberated slaves”
d. Native woman with small child in arms and child in hut on left

120. Identical to 119

121. Identical view to 119 & 120. 2 women & 2 small children

122. Chateaubelair June 1902
   a. Native village with children

123. Orange Hill 1902
   a. House with balconies, broken trees in foreground
   b. House remains intact, no damage
   c. Ash on ground

124. Orange Hill 1902
   a. Large house with veranda
   b. Possibly the 2 Europeans are inspecting the house, following the eruption when many people’s lives were saved by sheltering in the cellar
   c. 2 European men, 1 at back Flett. 2 Negros, man and woman, well dressed

125. Cellar, Orange Hill 1902
   a. Anderson & Flett (1902) pg. 396-397
   b. Interior of a stone built cellar, with workbench and cartwheel
   c. Many sheltered here from the May 7th nuée ardente
   d. 70 crowded, 40 in cellar were saved. 30 in passage were killed
   e. Manager Mr. Fraser and wife dead on veranda. Fraser was in cellar but complained that the densely packed crowd of negroes made the atmosphere unbearable, and went to get fresh air

126. Rose Bank. Carib Settlement 1902
   a. Native thatched hut in clearing among trees
   b. 3 women and 2 children

127. Caribs. Rosebank. 1902
   a. Group of negro women and children in front of wooden house

128. Road at Petit Bordel. June 1902
   a. Group of people on road. Telegraph post & large tree behind
   b. 2 men, 1 woman, 1 boy Negros. Boy and 1 man carry loads on heads

129. Sea view cottage. Petit Bordel. June 1902
   a. No damage appears to have occurred
   b. Group of people (9 adults) in front of wooden bungalow
   c. Dense vegetation on valley sides

130. Same as 129

131. Moving a house. Carib country 1902
   a. Large of negroes (20 mostly men) in process of dismantling (or rebuilding?) a wooden house

132. On Windward road 1902

a. 4 wheeled coach drawn by 2 mules. Behind, in the distance, is a cart drawn by 2 mules. The road is cut in gently dipping, bedded volcanic ashes and breccias

133. On Windward road 1902
   a. 4 wheeled coach drawn by 2 mules, driving along a road which appears to be cut in spheroidally weathered basalt. Farm or hamlet in distance

134. Beach outside devastated area. Lee Coast (Barruali?) [Barrouallie] 1902
   a. RGS on negative
   b. Plate VIII in Geographical Journal March 1903
   c. Included for comparison with the mouth of Wallibu, to show how the latter appeared before the eruption
   d. Many negroes

135. Barruali [Barrouallie] 1902
   a. Group of tents and huts, with hill behind. This is probably a camp for refugees made homeless by or evacuated during the eruption

136. Barruali [Barrouallie] 1902 MISSING
   a. Similar to 135
   b. Several negro men and women

Box B4: Tempest Anderson Collection: St. Vincent general. Martinique: volcanology and general. Also other parts of West Indies. 1902. Numbers 137-190.

137. Plain of Georgetown. 1902.
   a. Pl. 21 fig 1. In Anderson & Flett (1902)
   b. View of coast, looking north spur of Soufriere in background

138. Georgetown. Catholic chapel. Tornado. 1902.
   a. Ruins of church, presumably destroyed by tornado
   b. 1 man for scale

139. Refugees, Georgetown 1902.
   a. Campsite with cooking pots, buckets etc.
   b. Approximately 12 negro women and children. Presumably refugees from eruption

140. At Georgetown
   a. 50 negro children, refugees
   b. Stone and wooden building behind

141. Carib refugees, Kingstown 1902
   a. Group of people in front of wall
   b. 3 women with 2 small girls. Some Indian (Kalinago) and some negro (Garifuna)

142. Carib refugees, Kingstown 1902

a. Similar to 141

143. Refugee children, Kingstown 1902

a. Group of some 30 negro children with 5 adults

144. Georgetown, 1902

a. Street scene – several negro men, women and children
b. 3 men in foreground appear to be going to market, with a small flock of goats and 1 carrying basket on head

145. Street scene 1902 MISSING

a. Similar to 144

146. Horse drawn coast 1902

a. Similar to 133

147. Campsite 1902

a. Similar to 139
b. Approximately 12 negro women with children refugees from eruption

148. Georgetown 1902

a. Catholic chapel destroyed by tornado similar to 138

185. Flint. Carib implements 1902

a. Martinique or St. Vincent (Royal Society)

Box B5: Tempest Anderson Collection: St. Vincent volcanology and general 1907. Numbers 191-250.

191. North wall from east lip. Descent to Rabaka.

a. At or near crater of Soufriere. Mule track with hairpin bends cut into vertical wall of rock

192. South lip. Crater Soufriere 1907

a. The steep crater walls are on righthand side. The tuff deposits dip outwards from the crater, and drape over its rim. They have been guilled by running water
b. Two men for scale

193. South lip crater, Soufriere 1907

a. similar to 192 – looking more towards crater wall

194. South lip crater – towards east corner 1907

a. Plate 16 in Anderson 1908
b. Shows steep crater wall on left, with lava flows standing out
c. Gullying of ash on right
d. Party of 7 men in foreground on ridge

195. St. Vincent 1907

a. Plate 18 in Anderson (1908)

b. Man for scale
c. West lip of crater of Soufriere. Shows thinly bedded ashes dipping steeply away from the crater, and these ashes are being eroded. Lava flows stand out on the face in background.

196. Northwall of Soufriere crater 1907
a. Plate 17 in Anderson (1908)
b. Eastern end. The lower part of the wall exposes thick, lenticular lava flows, while the upper part is mainly composed of thinly bedded ashes. Crater walls almost vertical.
c. Man for scale

197. St. Vincent 1907
a. Probably crater of Soufriere. Shows slopes with erosion of thinly bedded volcanic ashes.

198. Crater lake Soufriere 1907
a. Plate 15 in Anderson (1908)
b. View of crater lake from crater rim. Ash deposits and lenticular lava flows are exposed in crater walls.

199. Crater lake Soufriere 1907
a. same as 198

200. Crater lake 1907
a. same as 198 & 199

201. Crater lake 1907
a. Crater lake of Soufriere volcano. Shows steep sides of crater with lake in bottom

202. Crater lake 1907
a. Panorama of 201

203. Ridge on Soufriere 1907
a. Plate 22 fig. 2 in Anderson (1908) (pg. 287)
b. A ridge of volcanic soil from which the 1902 ash has been eroded, showing returning vegetation. Dead tree in background covered by creepers.
c. Man for scale

204. At Wallibou 1907
a. Flett as scale
b. Shows ruined building covered by vegetation, including tree ferns

205. 2 servants and 3 Europeans 1907
a. Same as plate 206

206. Wallibou, MacDonald, Sands and servants
a. House, with slate roof and slate cladding on the upper storey. Shutters on windows.

207. Chateaubelair 1907

a. Several men and children
b. Jetty with steps from down to platform at which is a rowing boat. Sandy foreshore in foreground.

208. Chateaubelair 1907
    a. Similar to 207
209. Richmond works 1907
    a. Ruins of works, including chimney and waterhwheel, which were destroyed during the 1902 eruption
    b. Ruins are overgrown by vegetation
    c. 2 people for scale
210. Richmond works 1907
    a. Plate 19 in Anderson (1908) and Plate XX in Volcanic Studies 2
    b. 2 people for scale
    c. Ruins of works, including chimney overgrown factory was destroyed in 1902 eruptions
211. Rozeau grass, Richmond works 1907
    a. Plate 20 fig. 2 in Anderson (1908)
    b. Rozeau grass *Gynerium saccharoides*, approximately 10-12 feet high
    c. Man for scale
212. Castor oil *Ricinus communis*, Richmond works 1907
    a. Man for scale
    b. Castor oil tree and other vegetation
213. Pluchea odorata. Richmond works 1907
    a. Plate 20 fig. 1 in Anderson (1908)
    b. Shrubs of 'Cattle Tongue'
    c. Man for scale
214. Pluchea odorata 1907
    a. Same as 213
215. Mouth Richmond (rest of label missing)
    a. Flett for scale
    b. Mouth of Richmond River, showing meandering channel and sand bars. Vegetated cliffs behind.
216. Mouth of Richmond River 1907
    a. Similar to 215
217. Avalanche near Richmond works 1907
    a. Plate 21 in Anderson (1908)
    b. Shows the deposit of the hot avalanche of 1902, which have been gullied by streams, and partly colonised by vegetated

218. Lower Wallibou 1907
    a. Plate 9 in Anderson (1908)
    b. Lower Wallibou district from Richmond bridge, near Bunker's Hill. Steep-sided river valley eroded into ash of the 1902 eruption and older rocks

219. Lower Wallibou south bank 1907
    a. in Anderson (1908) pg. 10
    b. River in foreground and terraces cut in ash of 1902 eruptions

220. New ash, north wall Wallibu 1907
    a. Plate 10 in Anderson (1908)
    b. Ash terrace, Wallibu
    c. Terrace in "new ash" of 1902 eruptions, showing the height to which the valley was originally filled
    d. 3 men and 2 mules for scale

221. Lower Wallibu looking toward sea 1907
    a. Plate 11 in Anderson (1908)
    b. Terraces in ash deposits of 1902
    c. New channel about 30 feet deep excavated by Wallibu river early in 1907

221A. Wallibu valley 1907
    a. Plate 12.1 in Anderson (1908)
    b. View of guilled slopes, probably in volcanic ash
    c. Steep slopes, much guilled, probably in soft, unconsolidated volcanic ashes. To the right is a similar slope but with a cover of vegetation, including trees – perhaps it is an older slope?

222. Mouth of Wallibu 1907
    a. Plate 14 in Anderson (1908)
    b. Mouth of Wallibu from plateau below Richmond bridge. Bed of Wallibu in foreground, with cliff in 1902 ash. Crater and somma of Soufriere in background

223. Wallibu works 1907
    a. Zoom in of 22
    b. View of area near mouth of Wallibu river, with Soufriere behind. Heavily vegetated ridges and valleys

224. Wallibu plantation 1907
    a. Area near mouth of Wallibu River, with slopes of Soufriere in background. Similar to 223

225. At Wallibu plantation 1907
    a. Ruined buildings overgrown by vegetation. The buildings were destroyed by the 1902 eruptions

226. Wallibu plantation 1907
    a. Similar to 225

b. Man for scale (W.N. Sands of the Botanical Gardens)
227. St. Vincent 1907
a. Ruined buildings overgrown by vegetation. Probably Wallibu plantation (225 & 226)
228. Avalanche with lateral ravines, Trespé 1907
a. Plate 13 in Anderson (1908)
b. Remains of the hot avalanche deposits of the 1902 eruption, showing gullying of the ash. Tree in foreground was killed by eruption.
229. First rise from Trespé 1907
a. Vegetated ridge with dead trees
b. 2 men for scale
229A. West Indies. South slopes of Soufriere 1907
a. Plate 23.1 in Anderson (1908)
b. 2 men on steep, vegetated hillside, dead tree to right
230. In Trespe ravine 1907
a. Plate 22 fig. 1 in Anderson (1908)
b. Anderson for scale
c. North wall of Trespé valley. Sides of gorge becoming vegetated
231. In Trespe ravine 1907
a. Similar to 230
232. St. Vincent 1907
a. Vegetated valley walls. Possibly Trespe valley (230, 231)
b. Man for scale
233. In Trespé valley 1907
a. Terraces cut in the ash of the 1902 eruptions. Possibly each terrace represents an individual ash flow deposit. Screes have formed at base of cliffs
b. Thin-bedded airfall tuffs are also present in the succession exposed in the walls of the ravine
c. Man for scale
234. St. Vincent 1907
a. Plate 12 fig. 2 in Anderson (1908)
b. Trespe ravine, gorge cut in ash deposits. Light-coloured bank left of centre in remnant of 1902 ash. Bank on right is of 1812 ash
235. St. Vincent 1907
a. Vertical sided ravine carved in volcanic ash, with water deposited gravel in the bottom. May be Trespe ravine (234)
236. Upper Rozeau 1907
a. Shows deep gorge and gullies in the flanks of Soufriere, whose higher parts are seen in background. Vegetation is growing in the gullies.
237. Upper Rozeau from near Maroon Tree. 1907

a. View of ravines on Soufriere volcano. Similar to 236.

238. Near Maroon Tree, 800 ft 1907
    a. Plate 23 fig. 2 in Anderson (1908)
    b. In foreground are tree ferns, Cyathea arborea, and behind is upper Wallibu region, with spur of Morne Garu on right
239. "When shall we three meet again." 1907
    a. Left from right: (possibly) Lacroix, Anderson and Flett.
240. Site of Morne Ronde subsidence 1907
    a. Cliffs in volcanic ash, with Soufriere volcano behind from the sea
241. St. Vincent coast 1907
    a. View from sea of cliffs and screes of volcanic ash, with spurs of volcano behind. Similar position to 240.
242. North of Larkai Point 1907
    a. View of cliffs from sea, with smoke rising from one valley (probably fire, not volcanic activity), and Soufriere volcano behind.
243. NW coast St. Vincent 1907
    a. View of sea cliffs with steep-sided ravines, and spurs of Soufriere behind
244. St. Vincent 1907
    a. Similar to 243
245. Lee Coast St. Vincent 1907
    a. Wooded hills behind. Along shore are several thatched huts and a jetty with a wooden hut built on its seaward end. Rowing boat in foreground.
246. Catamarans. Lee Coast, St. Vincent
    a. 2 catamarans (small rafts). Wooded cliffs behind
247. St. Vincent or Martinque 1907
    a. View of volcano with cloud covered summit and vegetated ridges in front
248. St. Vincent 1907
    a. View from sea
    b. Same are as 241
    c. Cliffs cut in volcanic ash, which is well-bedded. Screes have developed. Wooded ridge behind
249. St. Vincent 1907
    a. NW coast, to left of 243
    b. View from sea of cliffs cut in bedded volcanic ash, through which a gorge has been eroded

Box B6: Tempest Anderson Collection: St. Vincent, Martinique, Jamaica, Barbados 1907. Numbers 251-350

251. West Indies 1907(?)
    a. Slopes of vegetated mountain, probably Soufriere
254. West Indies 1907(?)

a. Bushes by side of a path, which appears to run along a ridge. Probably Soufriere

255. Melanostoma(?) 1907 [Mesopotamia]

a. Probably St. Vincent. Bush with long leaves, growing over a dead tree

259. St. Vincent 1907

a. Upper reaches of an ash-filled valley, in which the river has cut terraces. Vegetation is returning to the valley sides.

List B2: Sources obtained from the American Museum of Natural History

The following images are from the notebooks of Assistant Curator of the American Museum of Natural History, geologist Edmund Hovey. In 1902, he was sent to investigate the eruptions of La Soufrière and Mont Pelée in Martinique, similar to Tempest Anderson. As Tempest Anderson's notebooks have been considered lost, Edmund Hovey's notebooks were the alternative. Included in the notebooks are descriptions of the environment, geological interpretations, interviews with eyewitnesses and field sketches.

Box B7: Edmund Hovey Collection: Box 2, Item 17, St. Vincent 1902

Strongest of these streams was
2 ft. wide and 3 in. deep.
Specimens from heavy talus
Many bombs along bottom of
Valley - In next gorge to
west saw very perfect one
32-36 inches long. black.
Went up this gorge, which
seems to be the one along the
water shed to alt. of 430 m.
without reaching end of accessable
portion. - Then turned back.
Agglomerate - no rock. Apparently
went around the lava bed
and stopped preceding gorge
& could have gotten above it.
2:57 - P.m. - N. 30 W. 7 miles

Estimate 1/3 as much water as in
Wallibou at 270 m.

Turned back. Collected bombs
from the bed of Rabaka riv. just
below the new gorge, & returned to
Georgetown, arr. there at 4:40 P.M.

Left at 5:40 by carriage and
arrived at Kingstown at a little
before 11 - p.m (Club).

Mr. Patrick Foster - Huggins,
planter, pensioner of ~~Govt.~~ service
(not an engineer.)

Larakai Valley - uniform or
used to be a street slope
nearly uniform from the south
into the valley
where now there is a rock
precipice of 60-100 ft.
Slope was of soft material
(talus &c). Very steep. No
material change in way
of extending rim westward.
Does not think that the
bottom of the notch is es-
sentially lower than in old
days. (previous to eruption)
September eruption seems
to have removed soft stuff
talus &c, along the present cliff

All action seems to have ceased
here though one finds circular
pits in sides of main gorge
like the one in Wallibou gorge which
is still active. Perhaps there
is too little water soaking thro
the ash here to have any effect.
(Noticed only very small effect
on Mt. yesterday - nothing like
Wallibou).

Found a shallow bowl-shaped
depression 8 ft. diam - 2-3 ft. deep
in middle of top of ash plateau
at 300 m. which still is quite
hot. Not steaming today. Surface
coated with alum or copperas and
iron oxides.

Farther along one comes out on
north side of ash bed and sees
that there is a new cutting
through the old material and
that this is the main branch
of Rabaka, part of which has
injured the Rabaka works.

W. 2 16/02 Table rock from bed
of Rabaka at 310 m. Just at
foot of watershed ridge. We
lunched at about 2:50 m.(?)
in main bed of Rabaka and
then went on up stream.
Bed 150-200 ft. broad, even
slope, not too rapid. At
about 270 m. came to water.
Less new sand as one
goes up. Could ride horse
back easily to 310 m.
Just above here river turns
nearly right angles, as it
comes out of gorge.

2:15 P.M. At 400 m. alt. and
6 mi. from Georgetown, reached
base of rock fall at least 100
feet high. On west was a
cirque in the agglomerate
of perh. 250 ft.

From beneath the talus
of great blocks below precipice
the river issued in five streams
which joined just below. (25-30 ft)

new cane planted in holes dug
through the new ash.

F. 1. 16/02 Up the Rabaka. Shows
the condition of region looking
like a glacier last May.
F. 2. 16/02 - The new gorge of the
Rabaka. This gorge is the
widening and deepening of the
gulley visited by Curtis and myself
on 7 June - which was formed by
the overflow of hot water on
surface of ash bed. See photo of
27 May outburst in Rabaka.
This new gorge has been cut
entirely through the old yellow
agglomerate of the ridge. Twice
as deep as it is high, vertical
& over hanging walls. This gives
reason for the Rabaka's not
having cut away the "glacier"
deposit of ash at the turn. 50
ft. wide & 100 ft. deep.
Bombs extremely numerous in
this valley. Largest one seen
was 2 ft. long but 1 ft. to 15 in.
seems to be measure of most of
large ones.
Just above the new gorge the
deposit of ash is higher than old
bluff and therefore is (measured
it by aneroid 35 m.)
Drainage on north side of
valley has carved out and then
gully with more sloping sides
along edge of old valley and
then across ash bed. Where it
issues from the hills.
Stream bed in southern gorge
even is not down to old level.

M. 1. 16/02 Place where the cone
of secondary eruption stood, which
I photo'd 7 June, with Curtis
on it. Gorge 50 ft. deep has
been cut in side of the ash
bed by side stream from the
mountains, from spot which
was a temporary pond when
we were here in June.

The usual measure. Heavy gravel deposit. It is loose, forming a strong contrast to the compact hard surface on leeward slope.
Here and there, below the place where trail crosses the river, one can see deep (10-20 ft.) beds of the recent ash in protected places in the bottoms of the great ravines. The trail is altogether in gravel, but beside have sprung up in places from the old soil clumps of bamboo—noted new shoots 8 or 10 ft. high.
The Lot 14-estate presents a scene of desolation. The coating of heavy gravel rests uniformly over the gently sloping plateau in a bed scarcely a foot thick, but it is so heavy that almost nothing has pushed its way through. Some parts are being badly cut up by gullies. The rainy season has done little apparently, toward removing

the bed and probably returning fertility must wait on the action of decomposing agents of the atmosphere.
Several graves of eruption victims are in the field just below the house. They have been partly washed open.
(D. K. Porter, the late owner of these fine estates, died in February of consumption)
At Rabaka works one arm of the river has washed so far out of its course as to destroy part of the water wheel.
Material brought down by the Rabaka and other rivers has been distributed along coast. The shore line at Georgetown has been pushed out 200 ft. The mouth of the Georgetown river now is under the jetty.

11 March. Start at 9:45 - Mt. Bentinck(?) est. Old canes flourishing

of Lake in 1812 crater is probably
correct. There is not so much
drop from crater rim at 1010 to
Lake as was indicated by 3 III
reading.

From this point the "saddle"
ran out more to left than present
wall (Hockerday) + slipping and
blowing has widened crater 50
ft. there.

The old "saddle" was a narrow
ridge of agglomerate, which one
straddled in traversing it.

The solid rock of great crater forms
a nearly circular pit, but the
loosely compacted agglomerate
above, recedes at varying slopes
and rises to varying altitudes, so
that a tracing of the watershed
divide or actual crest, would be
quite irregular.

L. 2. 8/04 Over Cast. 4:15 P.M.
From 950 m. notch east rim
looking N. 60° W. at the Larakai
notch. For record of rim sky-line.

L. 1. 8/04 Sun hidden. Alt. 695 m.
looking N. 10 W. Shows old surface
with new ash half removed - ravined -
Bluff at top is one at base of
which we all lunched 5 June.

F. 2. 8/04 Where trail crosses Rab.
river - boulders &c -

Arr. Lot 14 Est. 6:20 (Rev. Leslie)
Arr. Mission house
Georgetown at 7:15 -
7 miles fr. crater to house.
Whole tramp today 16½ mi. 4 mi
fr. Walliboo to crater, leaving 5½
mi. used up around the
crater rim.

On the windward side the ash
has in general been removed
entirely from the slopes of the gorges
ravines and gullies, but not from
the crests of the ridges. On the
crests however there is not much
at present, from 6" to 1' being

I. 1 – 8/04 – The water shed m
looking N. Many stones
on plateau.
Highest point of Somma ring
must be 300–400 ft. higher than
highest of rim. 8 lava beds
in sight. Highest point of
northern rim (rock) of 1812 crater
is 1040 m. (leveled across)
There are at least 4 feeble
fumaroles in this rock wall.
Several heavy beds of agglom.
in the Somma ring are very red
from decomposition. Along
highest ridge as elsewhere noted
many scoriaceous bombs as well
as the more numerous angular
fragments of ancient lava.

Diam. of 1812 crater in direction
S. 60° W. from lowest point of rim
near rock wall, is 465 paces
Alt. of point over great crater
1010 m. (full)

Ejected block of andesite which
evidently was highly heated.

Lake seems to have shrunk some-
what in past week. Tho' there has
been rain enough to wash away
my footprints across the mud flat.
Alt. of lake 1000 m. App. very
shallow. Fumaroles pretty high temp.
Scalded my hand at the
mouth of one. Products sulphur
(yel. green &c) white
and reddish brown iron deposits.
Collected some. Whole rock wall is
quite warm. Altitude of point
at South of new crater is 1070 m.
(N.B. did not actually stand here on
3 M.) hence this value is more
likely to be the correct one.
Todays reading for the surface

From point 880 m. on west rim
the lake subtends angle of 46°
S. 2. 8/02 Eastern 1/2 of crater
Point just above Larakai Gorge 860
m. - Immense amount of fresh ash
in head of Larakai valley. Small
jets of steam issuing from a few
points in gullies in the ash. One
point of base of rock shows steam.
Descended into Lar. Valley lowest
point of rim 810 m.
Fumaroles in rock on South
side at head 300-400 ft. from rim.
Old Lava bed intersected.
3 spots of boiling S-S.E. and
near center. Latter just getting to
work again at about 12:30.
Shaler may stand on exact
rim of crater "in safety" if he
wishes to - I have today seen
not less than 50 stones from 4
to 75 lbs. in weight, which have

landed exactly on the rim of
the crater. Several fumaroles
at different places in two lava
beds show that there is not
a single fissure down the
Larakai - network to depths -
Stones have fallen in several places
on the trail made by Huckerby,
Capper (& Collie) on n.w. side of
crater about 13 Feb. when
they circled the crater. One
splash 3 ft. across. Many small
outbursts irregular intervals.
A foot of mud is here which
has been deposited and not
washed off since October.

Heavy ash on n.w. side of highest
point of rim. Coarse, soft gravel.
Some steaming from beds. Soft
mud on top 6 in. in places.
Alt. of highest pt. of rim 1080 m.
Echo repeated call 4 times - fine -
#1 & 2 - 8/04 - (Cloudy) Pan. of
new crater from west.

P. 1 Portrait of Mr. Frederick
P. 2 & S. 1 & 2 of Lonfriere -
Spent day writing article for Herald 3/2/02
10 - Started at 7:20 from Chateau belair
Outburst from crater at 7:34. One of the
strongest since I came. Almost
entirely steam. Little dust. Possibly
equal to those of 3 March.
Start from beach at 8 o'clock.
A. 1 - 8/02 The old fig tree at
310 m. 9:30 o'clock.
A. 2. 8/02 - Down Rozeau valley fr.
390 m. Note that not all the
deposits in this valley which look like
new ash, are such. Vegetation roots appear
well up near the top of the beds in
middle of valley.
Half way tree 490 m. at 10 o'clk.
B. 1. 8/02 The half way ridge (Comp.
photo. of 31 May)
Summit at 10:53 - 865 m.
This morning the activity is in
southeast corner. Possibly a little
less water in lake today. Water very

thick with mud. Western dike less
prominent.

than in May - Curved columns
at east side either cut away or
else covered with the great talus
& dust slope there, prob. latter.

B. 2 - S. 1. Ten views 8/02
forming panorama of the crater
taken at noon

S. 1. 8/04 - Site of Richmond Village under 20-30 ft. of ash.
S. 2. 8/04. Up valley of Richmond river.

The Richmond place, that is the terrace near the house, looks very much as it did in May. There still is 4 ft or so of the new ash over it. Rains removed some of the May ash, but that of Sept. covered the place again with a coarse deposit which forms a more solid bed. The general snow drift surface is still noticeable. The new drainage has been determined by the hollows of that surface. The water has cut into the old ground along many at least of these rills (?) - Noticed cutting of from 1 ft to 1 1/2 ft. into the old below - 2 to 3 feet of new ash. Richmond village. looks about the same -

The Wallibou river has brought down an enormous quantity of sediment, to be measured not only by what has been removed from its own bed since the eruption but also by what has been swept into and out of from the drainage area. This deposit has extended the delta (between the cañon walls) apparently at least 100 yards to sea. The promontory of Wallibou (North side of river) has been cut back by sea, it seems to me.

Certainly as viewed from above the little plateau, seems not more than 1/2 or 2/3 as big as it was in May. The division line between old and new surface is not pronounced now, as in May -

8. March. O. 1 + 2. Test Camera
9 " P. 1 & 2 - 16/02 - 6 1/2 m
Sonfrière

olivine rock included in the andesite
Sharp boundary to the mass
and prob. not a segregation. Could
not collect it.

D. 2 4/04. 1:05 p.m. The gorge at
this point.

G. 1 - 16/04 - 1:20 p.m. - Crater rim
in background. Hoodoo pinnacles
in foreground - 260 m.

G. 2 8/04 Soufriere from
Wallibou river at 240 m.

F. 1. 6/04 - 6 1/2 in. Hoodoo at 120 m.
from East.

F. 2. 10/02 - 11 1/2 Ditto -

H. 1 - 32/02 - Steam cloud from
Soufriere.

D. 1 & 2. & R1. Cooke 32/1 - Ideal
Panorama of Wallibou and
Soufriere - D1. out of focus.

P. 2. 64/2. Zeiss - Soufriere from
same point on Richmond Estate.
Compare with Taylor's, from here.

H. 2. 8/04 Wallibou val. from 130 m.
on Bunker Hill near by where
took general view 30 May.

Crest of Bunker Hill - ridge
looks very much as in May.
The heavy material from September
eruption packed down solid
and has remained. Grass is
springing up in little ravines
~~Grass~~ palms are putting out
new leaves.

L. 1. & L. 2. Area of secondary
eruption 30 May. from same
spot on hill, 6 1/2 & 11 1/2 Lens.

L. 1. 8/04. Souf. fr. 20 ft. dist.
L. 2. 8/04. The Bunker Hill ridge.

M. 1 10/04. 11 1/2. The dentritic
drainage on slopes of Richmond
estate.

M. 2. 8/04 The Richmond House.

hot water. Issues from three
main and several smaller
openings and along branch to
East toward Richmond
Peak. Water is clear and
impregnated (to some extent
with sulphur. Coating of dark
indigo blue on ash bed (above
and near the hot springs.
There is known to have been a
series of warm sulphur springs
in Petit Wallibou (this region)
before the eruption. The springs
now existing further along the
bank are not as warm as
the strong springs first met with.
Springs at intervals for 50 yds.
Strongest and hottest are in middle.
Specimens showing the blue incrustation.
Pyrite also - For 50-60 paces
along same terrace on Wallibou
river side, warm water issues
at intervals and less copiously.
From this point on the volume
of water in the river increases

rapidly until it gains its full
original (ante eruption) amount at
about 220 m. Here one sees the river
flowing in numerous channels
at slightly varying elevations
occupying a larger proportion of
the breadth of the flood plain.
These channels evidently shift from
time to time and carry on erosion
and transportation across the whole
bottom of the gorge. Transportation
rapid. Small stones up to 2 in. in
diam. being moved along with
great ease, and larger ones more
slowly of course.
At 270 m. the river comes around
a sharp angle from the north and
strikes against a heavy bed of solid
lava, torrent - We could go no farther.
Here we seem to be within 1/8 mi.
of the narrow ridge between Wallibou
and Rabacca drainage.
In the solid lava at this point
there is a 2 in. mass of the very
coarsely xlized hypersthene-feldspar

the bottom of the Wallibou. That is
The material certainly looks as if
it had been dry when it flowed
down into the river bottom (like
those of Riv. Blanche). Material
seems to be sufficiently permeated
with hot air or steam (or both)
to make it act like a fluid
Much stuff has been blown
out of this hole and has
fallen as dust all about.
A. 25. 8/04 - Ditto.
This is the spot mentioned in notes
of 2 March. to N.W. of site of little
pond opp. the spot shown to left
of photo. of Wall. val. 30 May. General
view. (See note on p.)
Much material has been blown
out here very recently (yesterday?) &
a somewhat cup-shaped depression
formed. Ejected masses 1-2 ft
diam of dried loosely cemented
ash lie on outside (E) of the lip
of this curious "crater". Red
calcined appearance pronounced

in the sections of recent ash, which
however are black on top. of ash
B.1-8/04 The ejected masses of ash
B.2-16/04 The pit of activity-
C.1 & C.2 16/04 - Ditto- dif- meas.
of the faces 79° 82° 83° slope.
Rocks and dust Constantly
falling. This gravel dust &c
is so fluid when dry. That one
sinks into it nearly to the knees.
Water Consolidates it somewhat.
D.1-8/04 Hoodoo topography
in new ash at 110 m. The
wavy line near top of view &
just above the pinnacles is
the surface of the May ash.

Another area which has been
very hot (burnt color) but now is
cold is at 160 m.

At 180 m. down stream, end
of a terrace of the recent ash
on branch of Wallibou. There
is a strong spring of scalding

Vesicular gray and solid red
There was solid gray also but
Could not start a Hand Specimen
there.
Ascended perhaps 50 m. more
beside this precipice but could
not see around the corner of the
Canon. Slight drizzle of mud from
outburst while I was collecting
specimens here.
Descended valley making distance
by pedom. about 3/4 mi.

T. 1. - W 7/04. Cascade fluting in
agglomerate reminding one of
? Dome &c in Mammoth
Cave.
T. 2. 16/04 Fr Larakai Point.

Old trees on bluff side 200+
yds. from present coast line
indicating position of old surface.
Bluff 150-200 ft. high. Below
the ash has covered the old
cricket flat to a depth of 50-75

feet. The collection of ash which is so
striking along the coast does not
extend back very far inland.
The material driven by the blast
came down the valley, which is
fairly straight (i.e. radial) and
then drifted underneath the
bluff, just as at other places
where the bluffs are at right
angles or large angle with
the radius from the volcano,
(Trespé, Wallibou, Rabacca &c).
Action of these bluffs is just
like that of a snow fence.

Wallibou River - 9 a. m. 7 March 1903

A. 1. 5/04 Spot at 70 m. which is
still very hot and from which there
was a secondary eruption yesterday.
(I noted the dust column from
Roseau valley.) This sent a dry?
sand and gravel flow out into

F. 2. 4/04 Cross section of one of these
dry sand fans mouth of Larakai val.

The Larakai val. before the eruption
was a broad, level plain, stretching
back from sea level, 1/4 m. wide.
Now filled with new ash, still
rising 100-120 feet in pinnacles.
The proportion removed by
erosion has not been as great
as in Wallibou, Trespé and
Roseau valleys.

Toward northern side found
Charcoal tree stump imbedded in old
ash near sea level. Charcoal is soft
(rotted as the men say) showing its age.
Perhaps of 1812 eruption -

Following along the ravine along
northern side of valley 1/4 m. & less
from sea there is a thin (8-10 ft.
thick) bed of lava on the old river
deposits. Would correspond in
position to a flow of 1812. as described
in the description of that eruption but
the bed is covered with old ash

or river deposits to a depth of 100 ft
at least. Argues against the real
lava being of 1812 eruption. The
waterfall was known before the
present eruption -
Slopes of evidently fresh ash are
along sides of gorge.

G. 1. 4/04. up northern ravine of
Larakai valley Fr 60 m - (above
first little waterfall -
This lava bed continues up
stream and seems to emerge
into the sides of the gorge,
showing that it is much more
ancient than 1812.
The rock has been beautifully
worn into channel grooves and
pots, by the sand-bearing, in-
termittent stream.

G. 2. 16/04. Rock gorge of Larakai.
Do—

H. 1 - W. A. - 128 / of & on
H. 2 - 4/04 Rock precipice at 160, m.

Specimens of lava bed at 160, m.

of the spring (river). water is-
suing from the sand. 2 ft above
sea level at mouth of Roseau
river.

D.1. 10/02. 11/2 m. Roseau val-
from its mouth. High point in
middle of picture is on edge of crater.
Small outburst at 12- o'clock, gave
us a sprinkle of mud.

D. 2 - 8/02. In Roseau valley from
60 m. Looking up. Two to partly
on an old lava flow.

Dust here red & burned looking.
Altogether too hot for comfort. Hot
air issuing from cracks. This
spot contains still a heavy accumu-
lation of new ash. (60-70 ft deep)
which has been protected from
complete excavation by the pocket
shape of the old Cañon. Water has
cut down to old rock bed in
places. Steam issues when
water strikes it. Not a true
fumarole, however.

Specimens of the solid lava
here (60 m.) Two
G. 1. 4/04. Little precipice (water
fall) in north fork of Roseau
to show the oblique scoring
caused by the sand laden
water during torrents.

Water runs out on shelf
during floods and causes
more oblique scoring 25 ft.
further down stream.

G. 2 - 16/04 Typical dry sand
fan or delta at side of Roseau
gorge. Coarser pebbles at
bottom.

F. 1. 8/04. Up Roseau gorge
Fr turn. at 20 m. above sea.

Nearly opposite our point of arrival and a little to the west of the new crater the streams of water noted 31 May. These are issuing from the north wall of the crater. These have cut quite a broad valley in the ash slopes just mentioned forming a "flat" just as noted 3 May—

Avalanches in crater very frequent especially on N. E. & E. sides

6 March - Start from beach at 10:15 - Bar 0

[C.1. Seaview cottage, with plate which may have been fogged through the slide].

C. 2. 8/04. Mouth of Wallibou and site of Richmond Village from Trespi terrace 45 m.

Tried going up ridge recommended by McDonald. Too hard and came down after climbing 125± ft. Gave up mountain on account of my weakness and being sick yesterday, and returned to shore.

A. 1. 4/04. Group of 3 boulders with cracked surfaces, prob. bombs from this eruption. Look new and are not decomposed on surface. Largest one is 6 ft. above sand and may be 2 ft in sand.

A. 2. 4/04. Surface of largest mass. Specimens from it.

B. 1. - 16/04. Mouth of Roseau valley from south. Shows the bluff as it was before the eruption, except for vegetation. There is a thin coat of new ash on top of the bluff, not distinguishable in photo. This gorge was filled or nearly so with ash when I saw it in May, but now all has been washed out and river bed is nearly down to its former level. Cocoa plantation here before.

B. 2. 64/.7 Dendritic erosion caused by the undermining action in bottom of ravine. Originated in rain-soaked ash-covering near crater rim.

Arrived at the rim at the same spot as on 31. V at 11:05 o'clock. Altitude obtained on arrival 860 m. (On return at 4. o'clock barometer read 890 m. Average would be 875 m. On reaching sea coast again at 5:50 reading was 110(?) m)

Lake seems somewhat larger than 31 May, water thick like mush. Streams of water flowing in from north as before.

No great changes strike me as having occurred since our visit. General shape of lower portion of the crater is the same. Inquiry of Mr Huckerby as to the western side elicited the opinion that the crater had lengthened somewhat (20-30 ft) toward Larakai Valley since 7 May - (or else during the eruption of that date)

The old route of descent into the crater was by a slope descending from this point. All other parts of the crater were too precipitous for descent.)

The mud lake does not occupy the entire rounding bottom of the crater. On the south & west the water comes to the vertical walls, but on the north and east there are steep slopes of ash reaching from the water's edge to the vertical cliffs. These slopes are deeply cut with ravines.

way through the coating of ash.

The crest of the ridge along which we pass does not seem to be any narrower than on 31. V

Ridge at 480 m. (see photo of 31 V) looks as it did then, except that now it is covered with the coating of gravel. But above this point the mud covered slope, which made travel so laborious in May, has received such a coating of the cindery gravel that the change is more striking than on the lower levels. Now progress is sufficiently easy over the hard surface.

The proportion of larger and larger pebbles increases as we go up. Many, if not most, of the pebbles have a bomblike surface, i.e. - they show that they have been heated to a condition of viscosity. - Cracked in every direction. Surface of these Soufrière bombs, evidently is not so glassy as that of Pelée bombs.

Frequently we encounter the dents or splashes made in the surface of the ridge, by the projectiles from the crater.

As far as observed these recent projectiles are masses or fragments of ancient solid lava. Most of them have bounded out of the holes they made on striking, and have rolled on down the slope of the ridge. Some have broken into many pieces on or immediately after striking, and their fragments lie in the hole.

One mass was noted on the lower edge of one of these depressions, but it seemed likely that it had happened to lodge there after rolling from a striking place farther up.

Several heavy showers of rain as we were ascending. Mudflow in valley (Rozeau? or Frazers) to our left going up. Cataract over precipice. Molasses-like flow

"Sect. written 4 Mch. at Sea View Cottage"
3 March at 8:25 A.M. we
(Prof. & Mme. Lacroix, Lieut. Devilley
Mr. Hueckerby and I, with five porters
left the beach just north of Trespé
valley for ascent of Soufrière.
The Trespé valley has become so deeply cut by precipitous ravines since our party crossed it 31 May that it is impassable and now one is obliged to traverse the smaller ravines on the north side of the main valley in order to get onto the spur leading to the ridge to be followed to the top.

Same route as on 31 V. Ash now covering the slopes is much coarser than that observed then, more cindery in aspect. Said to be the October ash. Like gravel. Most of particles are 1/4 to 1/2 m diam. Occasional particles of clear feldspar 1/3 m. across cleavage face were observed.

The crests of the ridges which were covered in May with the fine mud forming a rough coating like cement, now are coated with this gravel. [The old coat seems to have been covered up, not washed away - but this may not be the case].

The coating of ash has been almost completely washed away from many of the slopes, and there has been some cutting into the old soil, now unprotected by vegetation; quite a good bit, in fact, in some places.

The cirque which we noticed in May near the first steep ascent of the ridge (150 m) looks just as it did then.

Where the roots of the old vegetation have not been destroyed, and are now uncovered, the plants are springing up again and many of the banana and other plants have pushed their

where the greatest widening of
the Crater has taken place
in one direction. Today the
Knoll is 850 m. & lowest
pt. of rim there is about
14-15 m lower. (Huckerdy)

4 March - From Seaview
Cottage -
θ. 1 - 11½, 32/5 Ideal morning
Soufriere -
θ. 2 - 11½, 128/.2 Ditto -
Temp. 1:30 in dining room 83°
" sun 102°
At 2:40 in room 86°
P. 1 - 6½ - 64/0.2 and
P. 2 - Cooke 45/0.2 2:25 p.m. These 2
show the top of Soufriere almost
absolutely free fr. Cloud. The
near and the remote parts of
the Crater rim and the
Somma ridge beyond. (thro'
the notch opening into the
new crater) All are clearly
visible. Table rock distinct. -

Best view of Mt. I have had
yet (this time).

Here the river has cut down
quite to its old level. The
depth of the deposit was not
less than 65 feet deep, estimated
from Collis standing beside the
bluff.

G. 2. 4/04. Site of temporary
Lake of 30 May 1902.

The place where the little
Lake formed has been cut away
Over to the left (N.W.) where
there was a steam outburst on
30 May. There is still much
hot sand. (See beyond 7 Mch.)

Slopes of Bunkers Hill show
green, especially on southern side.
Many of the garou-garou palms
have put out their leaves.

3 April.

A. 1. N. 8/01. Outburst of mud
from the crater 7:55 A.M. View
taken from near Richmond village.
A. 2. 4/01. Ditto.
Left Beach at 8:20. 1/2 way

Here 480 m. arrived at rim at
11:05. Same spot as 31 V.
860 on arrival. 890 m. (9. a.m.)
Outbursts from crater, mud &
stones far above our heads.
Fell again into crater, being
little South of centre, but
almost central.

Two fine outbursts before
12:30. (One at about 12:10)
Lake is thick mud.
2 P.M. Grand outburst which
Hackerby & I witnessed from
the edge of the new crater.

Highest point 1060 (above
little crater)

Bed of Lake 980 m. (See 10 Mch.)
Middle of wall between two
craters, now, 1010 m.
300 + paces across N 10 E.
Table Rock, N.W. edge is now
105 paces from edge of crater.
Highest point 985 m. (perhaps
3 ft. of cinders).
Head of Larakai (?) Valley is

St. Vincent 1903.

2 March - Wallibou Valley -
D.1 & B.2 - 4/04 Looking up the
valley. There has been much
change since June. Immense
quantity of the ash has been
washed out. Down now
in places nearly to its old
level before the eruption
began.
C.1 & C.2 - 4/04. In the Wallibou
about a quarter of a mile up,
near where we saw the fine
outburst 30 May - Dust shower
still hot today. Stones too hot to
rising. hold in the hand.
D.1 - 4/04 - Group - N.G.
D.2 - View up river at place
of secondary eruption. Photo.
30 May - (Light struck.)
E.1 - 4/04 - Do -
Went on to the exact spot

or ashes rose from new
Crater up to 2 P.M. 7 May
& none has risen since.

7.— The stream of water re-
issuing from the Old Crater (wh. we noticed
31 May) came from between
the old and the new
Crater & probably had its
origin in the new crater
(lake.)

8 — Curtis thinks there
was a greenish hue to
the mist due to the
presence of the crater
(lake) in the bottom. I
am not so positive about
this color.

10 June

Heavy rain at 5-6 o'clk.
this morning. At 7:30
saw great columns of
steam rising from the
ashes in the bed of the
Dry River.

— 8th July —

A. 1 & A 2. 8/02 Nevis from
N.W. (?)

B. 1. 8/02 (St. Kitts) Mountain North
(W.?) of town of Basse Terre to
show the slope (ash?) coming
down between peaks & to
show ravines in the
slope.

B. 2. Lost by failure of catch

eastward along rim of new
Crater at intervals the clouds
broke away sufficiently so
that we had a dim view
of parts of it and thought
we saw the bottom.
Ridge runs down from
saddle into Crater.

Some dust heaps at
bottom of the slope of ridge
those we saw were not

strikingly large. Dust on rim
of new Crater diminishes in
quantity as far as away
from the old crater [We
saw the saddle from the
lee side 31 May, and Mr
Macdonald said then that
its sky line was essentially
as before.]

It seems to me probable
that the "new" crater has
taken no part in the
eruption, reasons:—

1 – Ridge sloping into
Crater seems intact.
2 – Saddle is about as before
3 – Small heaps of gray
dust at base of slope,
as if from old Crater.
4 – No sound
5 – Condition of its rim.
6 – Brown stated positively
that no column of steam

The great Flow which first Slopes
down from 1100± ft A.T. to
the ocean is deeply eroded
at upper part but only
partly channeled in lower-

We got clear up to the
rim of the old crater but
did not dare to go quite to
the edge because it was
so sharp (over hanging?)
and had open cracks.
to its edge, one of which was
1 1/2 to 3 in. wide. Too
Inffective of sand slides into
the crater, so went along
then N. & N.W. Very rough
traveling on account of rain
channels. After 200 or 300
yards the edge of the crater
was not so dangerous
and we went to it.
Then could see the steam
issuing from even the very
rim where first reached

the summit.

The clouds did not permit
us to see into the old
crater at all. We walked
along the summit of this
soft ridge until Brown
said that the "new" crater
was on our right and the
saddle should be directly
in front of us. - Heavy
cloud of mist - sudden
drop here to the saddle.
even before the eruption
aneroid where we stood
= 3550 feet. Roaring in
old crater very plain and
distinct from the howling
of the wind. - No sound
from new crater. Too
much fog to attempt to
reach the saddle. Turned

Mr. John C. Brown, wife and three children took refuge in the cellar of the house. This cellar has a small iron barred window by it, which was open during the eruption, and it and the door are both on the side toward the crater but there is a slight rise of ground directly in front of them. Thus:

The family crouched down together in the N. W. Corner of the cellar and all seem

When I asked Ingley how high he meant that the wall of water was he pointed to the mountain high factory chimney, which is 60 ± ft high. Ingley did not feel hot air at first, later it was hot and hard to breathe on account of dust rush back ~~wash~~ from the sea because he was in that house. He said the down rush of boiling water through the Dry River valley took place about an hour before the big outburst, as nearly as he could judge. He said there was no rain during the eruption. [It seems as if this flood of boiling water must have been the lake thrown out bodily.]

Frederick Friday - Sugar boiler & overseer on Lot 14 Estate was saved by running to Rabaka Estate and getting into the Manor house there.

I saw no rain attended the eruption except a little drizzle in the morning.

Dry River came down "mountain high" with boiling water filled with sand, great stuff from mountain & forest (see beyond).

The openings of the curing house cellar (in which Brown took refuge) are not directly opposite the Crater as at Orange Hill.

The curing house and cellar are about at right angles to that of Orange Hill i.e. it faces the South. Here again there were no openings on the side toward the Crater and the others

were protected by heavy wooden shutters.

the black cloud rolled down the Mt. with a great blast of wind and leveling the trees. Each and stores wrecked the buildings.

The air was so hot he could scarcely breathe. Lasted but a few minutes. "Stopped to flow to breathe". "When you stand up the heat so you could not breathe, it no strike you down, but you must drop to ground to breathe."

"We see the gutter (the dry valleys) lead the fire down".

Smelled sulphur strong. [These people do not seem able to distinguish between rotten egg smell & the smell of matches.]

S. Brown stood outside watching the eruption till the great explosion at 2 o'clock.

Ridge first as narrow before the eruption as now. Lava some. Rapid blast action on one of the old slopes

Photo, 4/02 - of large "tantamier" tree, 1250' A.T. S. 60° E. blown down by blast from crater.

It seems to me that when the great volume of confined steam rose to the top of the crater, it expanded suddenly in all directions causing this great tornado down the sides of the mountain, could not expand all its force upward.

Brown says a small pond was formed in the south fork of Dry River where it joins the main valley.

Formed by dam of ashes in the big valley.

Show the effect of this great tornado.—

Samuel Brown (blk) [illegible]

Man & Carfer at Lot 14. [illegible]

was at the estate during the whole eruption. Saved his life by going into a cellar underneath the curing house and closing the doors (2) tight.

James C. Brown (White) the manager of the estate, his wife and three children saved themselves by going into the cellar under the manor house.—

11 blk & 29 coolies were killed in buildings in which there were openings, but some were saved out of a number in a cellar (with open door.)

Samuel Brown describes the cloud from the eruption as coming down on both sides of the building and rushing to the sea where it made a "line of fire" when it struck the sea, the cloud did not come back from the sea.

Samuel Brown went into the cellar at first 2 P.M. May, 5 and remained till 5 A.M. next day.

Big stones dropped, hot, when they struck the ground "the fire opened"—

No rain at all.

Thunder at 10. A.M. Wednesday. A little rain—Mud—"plenty" fell there from above about 1 in. deep. Ran off as fast as it dropped. Warm but not scalding.—

Afternoon small stones (1 cm) then larger ones then the big stones with great explosion at 2 P.M. When the [illegible]

Trenching of ashes to point
below level of divide –
Last flood sent some ash-
down Crater into Langley
Park River – but then to
trenched too deeply
repeat the process. —

8th June —

Did not go out. —

9th June

Started 7. A.M.
The debouchment of the Dry
River – ash bed from the
mile looks like a glacier
issuing from a valley –
The stratified "Coastal plain"
deposit runs up a pretty
uniform slope to 1100 ft.
a.t. where it butts a famish

the ridge. But we saw no
sign of elevation at this
height. Would be inclined
to place one old shore line
at 200 – 225 ft.
Valley to right contains
ash beds and terraces 50-60
ft. deep in bottom.
Trees on this ridge blown
down by blast, from
direction of crater, along the
trend of the main valley
Tremendous blast. Dry
New deposits in
River seems to exceed in
quantity those of Wallibou. –
Photo, 8/02 looking southward
across the Dry River, valley
to show the leveling of the
trees in a direction down
the main valley by the
great explosive blast from
the Crater. The trees on
the near slopes of the
Morne Garou Mts, (Est, Brisbane)

On the south side of the
natural outlet of the river
the ashes formed so much
of a dam, that the waters
flowing down that side
have cut a new gorge
through the spur and dis-
charged through the ravine
to south of main channel.
Gorge somewhat tortuous. –
Pot-hole erosion by sand
laden water undercut banks
&c. &c. – Splendid [illegible]
of torrent carving. The
sides in their minute carving
show the varying direction of
the water currents, by the
lines of cutting and striation
by pebbles. – "Glacier Mills (?)
in the old tuff body.

History: – Old gorge filled
with ashes, part of drainage
turned over lip of old gorge
into Langley Park River. –
Waters dammed back behind
spur by ashes & flood turned
over the spur cutting gorge
20 ± ft deep. – through old tuff.

Photo of the little Cone taken
at [illegible] to East view.
Another blow hole to the
South East of the one just
mentioned, has built up
for itself a little Cone and
Regular Crater. Crater
on one side & Right beside
drainage Channel. The great
amount of dust on surface
about shows the vigor with
which it has exploded. –
Steam has but little odor
of Sulphur. The Crater
has been crowded back
in the Craters along the
drainage line. –

ash bed near some steam holes
This steam does not smell
particularly of sulphur, but the
pounding odor is pronounced.
Went on up the now hard
ash bed to where the steam
out bursts were so strong ten
days ago - some steam still
issues.
Photo 8/02 of one of the largest
of these secondary ash cones.
In the back ground there is
a pounding of two streams shown
one much larger than the
other. Much hissing from
the water percolating thro'
these porous beds. Evidently
much heat still in the depths
of the bed. These ash beds
contain a large proportion
of bombs and blocks and
are mostly now composed
of particles the size of gravel.
The configuration of the
old surface here was such

as to form a strong eddy to drop
causing the ashes to be borne farm[?]
on the gorge. Partly
cut Brisbane range, as the
responsible for this. was
Richmond Peak range. In the
for the accumulation —
Gallibon[?] River valley —
Noticed bombs (i.e. blocks where
surfaces had been melted) up
to 2 ft across. - Occasionally
a rounded boulder of old
lava was seen.
The courses of the present
surface torrents are particularly
the lines of steam now.
some crevices produced by
sinking are now regular
fumeroles, and are making
deposits on cavity xls.
Odor of Cl rather strong
from the steam holes. Strong
enough to keep small pebbles
(1 cm. diam) in suspension in a
small hole.

the Langley Park river by
the ashes filling the bed
of the Dry river.

The back or west side
of Harpy Hill is a kind
of infacing escarpment
formed by the river coming
out of the hill there.

The divide of the old plateau
was at the very edge of the
Dry River gorge before Eruption

The top of a big yarn Falu
Creek orig. Lerbock 40 feet
high shows about 5 feet
above the ashes. 15 feet fr
the edge of the old gorge.
This diversion of the drainage
of the Dry River has ceased
or is about to cease because
the torrents are cutting down
the old channels. The old
gorge at this point is
variously estimated as
having been from 75-
100 feet deep. A little
steam is still issuing from the
ashes and the ground is
warm to the touch.

Overloaded stream phenomena
with built up bed. Illustrated
here also, Photo. 402 Gear
views of ash filled Dry River
issuing from hill showing
fine curve.

Collected (5) some "bombs"
from the surface of the

which have carried away
great quantities of ashes, when
at their most vigorous stage
and have deposited some
during their last stages of
diminution. -

The main plateau is about
200 feet above the sea where
it reaches the base of the
mountains. Made up of
waterworn boulders, gravel
and sand, black & yellowish brown.
The detritus of the hills
& volcanic ash, brought
down by the streams and
rearranged by the ocean,
then elevated to present
position.

Photo. of Happy Hill showing
a few hills beyond which
the plateau is shown
against the bar(?) of the old
shore line. - Numerous delta
fans in the recent river
valley, where the little
rivulets from the ash
covered hills debouche into
it.

Photo. showing diversion of
water from Dry River across
head of Coastal plain into

high cumulus clouds stood over the mountain but this seemed to be of no significance because cumulus clouds were to be seen at the same time continuing to the N.E. over the ocean.

There were heavy rains last night and early this morning.

Counted about thirty perforations of the galvanized iron roof of the porch on sea ward side of Spencer's hut. One of these was an irregular hole about 8 in. in longest diam. 2 or 3 others were smaller, but by far the most were only sufficient to let the day light through. The long axis of the largest hole was nearly at right angles to the sheet line.

— 7 June —

Dry River – Photo. 9:50 a.m. 8/02 showing the stream of ashes coming out of the hills. Old terraces in the lower portion of river recognized by the line of roots and other vegetation below the coating of ashes. Much erosion done since the eruption. The overloaded side streams have deposited load from the slacker water along their sides. Apparently the streams were so thick with ashes that they rolled along somewhat above the general immediate level. The new benches in the old terraces have vertical or nearly vertical walls.

On the comparatively gentle slope of the plateau the recent heavy rains have produced sheet [?] floods

heard the report one heavy then
after a few minutes a lighter one,
then a double report. I
thought they came from Fr.
Fr. man of war at target
practice from seaward.
I could see no ship
and concluded they came from
the Soufrière on St. Lucia.
People on the North Shore of
St. Vincent were frightened by
the reports and fled down
the coast. In Georgetown
the people generally thought
that the Soufrière of St.
Lucia must have been in
an eruption. It seems to
me however, that we cannot
judge about it, because the
whole mountain on this island
and the northern horizon
are covered with heavy mist -
very dark - Cumulus clouds
have stood above the Soufrière,
but similar ones are all about.
Have observed no dust falling.

7 June - These phenomena seem to
have been due to another outbreak ~~or~~
of Pelée. Lieut. Marshall in
~~command~~ of H. S. Collier
Leonidas arrived at Kingstown
today. He tells me over the
phone that yesterday at 3. P.M.
when 102 miles west of
Martinique dust began to
fall on the deck of his ship.
The shower continued for
nearly three hours, and
fully 1/4 inch fell on the
Leonidas in that time.)

The reports were heard at
Kingstown and Chateaubelair
according to phone from former
place. Enquiring as to cause
of noises. No ship entered
harbor. - The upper part
of the mountain has been
covered with clouds all day -
sometimes very thick and
dark. After ...

— 6 June —

Staid in Georgetown writing
watching Con Fenere and looking
at the People Crowds of refugees
receiving their dole of
provisions & last Week
Monday Clothing given out
today. Recipients proud as
Peacocks. Never before
have these People had as good
Clothing as that which was
sent by the — U. S. Those
who are not refugees look
on with envy at this easy
method of getting a living.
Photos of Transportation —
Tandem team of donkeys
with load of vol. ashes from
the streets. Two donkeys
with crates for carrying
loads on back.
Two of view down the main
street (Looking S. W.) showing
refugees receiving clothing

and food. Two of Hindoo
Coolies with new Clothing
under their arms.
Between 10 & 10:30 (about 10:15)
felt slight shock to building
as I was sitting in hotel. &
like a distant blast. —
People in the street heard (or felt)
the same and we heard them
saying "By Gonfree go boom
- boom." The People say
they heard four, (some say 5
others 7) reports, like those of
Cannon. Saw one man
from north at Rabaka, who
said he and others heard
the reports, that the sound
came from the direction
of the Crater, that he and
the other north People were
scared and came at once
to town.
(Note = A man who was in-
specting the Crown Lands
on the mountains above Twi

or store was about 15-18 ft.
Every living thing destroyed
Building up of sea beach
especially along coast
of Robin Rock by Curtiss, showing
the new beach beyond the
rocky point.
All region up to Overland
terribly devastated.
Overland wrecked. Village of
wind during eruption partly by
Worst devastation extends to
just beyond Ram (?) Point.
Some crimpined (?) trees show back
of Ram Pt. -
Espagnol Pt. saved.
We turned back at point south
of Yaro.
Straight beach south of Yaro
Pt. Mud built out. Fine
delta fan to dry stream
which flows into sea here.
Agerika river much cut
back. The stream south of
Overland has cut into its

banks deeply but has filled
up its flood plain.)
At the mouth of Agerika
river ashes have made far
out into the sea and
have been cut into a fan
by the waves and the
material distributed along
the coast. New beach may
be 100 yards wide.
Delta fans superb &
well marked by the
lighter colored shore
material contrasted with
the black beach sand.
Overland village picturesquely
situated on high bluff
overlooking ocean. Houses
blown down, not burned.
Bluff 150± ft. above sea.
Police Station burned.

valley and the great erosion has been done by the torrents which rush down these slopes during the rainy season and after heavy rains at any time. In the present condition of absence of vegetation and presence of vast quantities of loose dust ready to be carried along by the water the erosion will progress rapidly.-

Large proportion of erupted material was gravel, size of dried split peas (3 mm.) up to size of small marbles (10 mm.) Commingling of country rock and scoriae in this stuff. Ejected blocks of considerable size (cu. ft. & more) numerous, also found a good many "bombs" of the volcanic type with "bread crust" surface showing that they had been fused. One such

mass was 3 1/2 feet long but showed the peculiar surface less satisfactorily than the others did.-

5th June

Eureka Dist. Prop. J. D. K. Porter - like Lot 14 Grays Hill and 19 others). Four people saved over 300 killed on the estate. A man and his wife saved themselves by going into his shop and locking the door. Fine dust got in however. Manager killed - House wrecked. Roof of boiling house also & the chimney, which was comparatively new, was thrown down. Some "trash" houses were burned. Several Tamarind Almond and other trees were blown down, and now lie pointing away from the Crater. The little shop

debris during the 7th of May.
The roof over the other part
of the building is intact.
Roof had a [illegible]
the roof of the boiler house
is of shingles - rather steep angle
and it was not injured. The
roof of the shed south of the
steam factory, where the
squeezed canes were stored
was burned, but not by
the eruption

5th June - Photo. of Hotel Spence(?)
" S.S. Garrett
Mayor of Georgetown.

Journey up windward side
of La Soufrière, 4 June.
The great ash bed of the
Dry River, which was steaming
so vigorously at the time of
my visit to Georgetown
27 May, has quieted down,
so that only a few mild steam

columns are to be seen. Other
smaller such areas were noted
but these do not seem to be
as extensive as the deposits
in the corresponding valleys
on the leeward side. —
Ridges on this side are not as
continuous as those of the lee side,
(trenching greater?) of our road
traversed several beds of lava
after we descended into
the bed of the north fork of
the Dry River.
Deep scouring in the basaltic(?)
lava. Photo. of one portion where the
river course channel
of the [illegible] rocks, channel
about six feet deep - narrow
V shaped. This was taken
looking down stream. Looking
in the up stream direction
the narrow, deep trench or
channel in the rock was
very evident. There is no
permanent stream in this

one would die from suffocation
and cries for water were heard
on all sides. Then the air
cleared a bit, though the rain
of dust and stones continued.
Taylor's statement is, that
132 persons were saved in
this rum cellar. Not one
was injured except a little
child that was somewhat
burned before it got in.
Several persons died in the
cellar who had been outside
and had received part of the
fury of the storm of dust
ashes &c. before they could get
or be gotten into the cellar.
Between the two parts of the
lower portion of this building
there is an arched passage-
way to the furnaces of the
sugar boilers, and of this
passage opened out on either
side of the boiling house.
Several persons took refuge

in this passage way, and
lost their lives because
the dust-laden hot air, &
steam, swept through it
and suffocated them.
The buildings in which this
cellar and the storage room
are, has a second story on a
level with the boiling
house. The portion of the
galvanized iron roof of which
is above the rum cellar
was broken down by the

Leader of slope 5-1/2 feet in
90 ft.

Roof of wheel house was broken
in 7 May.

———

Mrs Fraser's body found on
face head toward sea 150
feet from house in the
public road S.E. of house.
(Jacob Taylor (blk) 48 years
old, cellar-saved) informant

Mr Fraser was found on west
side of house, near door, head
toward house, arm over face.
Taylor thinks the nephew and
Megant were found in cellar
with many black people.-

10 long paces wide } Outside of
46 " " long } whole cellar

———

Wave of dust &c. came down
the Rench (?) Hill dry river
on South side of Mill -

a deep ravine, 100-150 ft. deep.
also down the slight ravine
on north side of house. A
cook told me that the wash
in front of cellar and some
of the houses were set on fire
by the hot stones.-
Taylor (who is a very intelligent
black man) and the others
said that the "Cloud" rolled
down from the Soufriere struck
along the ravines
the sea, burst into flames,
'God, God, God,' and at
once turned back toward
the sugar factory striking the
building with great force and
forcing shut the heavy
doors and the heavy
wooden shutters of the window
openings. Heat was very
oppressive, air suffocating -
smelled of sulphur (rotten eggs,
one said) for four or five
minutes it seemed as if every

saw there. From 2 P.M.
7 May till next morn'g they
stayed there. Cellar was
on ground level on side
away from mountain. No
opening towards Souffriere,
one wide door and two
windows with wooden shutters
on sea side. — Hard to breathe
on account of heat, — smell of
rotten eggs. (Hard to make
these negroes understand one.)

Fraser's home 235 feet from
mill. No evidence whatever of
fire. One unprotected window
on west side was stripped
of its glass. The windows on
sea side were protected by a
porch roof. Some impalpable
dust we found on window
cases. Some out buildings
have been crushed by
weight of sand &c.

Cellar again. The floor over
the cellar has been broken
through since the eruption.

— 4 June —

Started 6:40
Left horses 1000 ft. — 8:20 —
Very deep ravines — followed up the course of the Rabaka Dry River, in bed or on ridge. — High up on the slope found goodly number of bread crust bombs besides the ejected blocks, some of the latter show the effects of having been red hot (specimen). Passed over general lava beds — One of our men said Jaggar & Ross "properly occurred" surface has only a little of the fine dust. Tops of ridges harder and firmer than those to leeward —
Halted for lunch at 2700 ft. — at base of cliff of fresh fracture surfaces

and enormous blocks. —
North Fork of Dry River —
Photos at 1700 feet — group — down up 1530 — windward sea.
Photos at 1500 ft. up gorge with group in foreground — erosion channel in the lava.

Party — Jaggar — Curtis — Storey — J. C. Wilson — Photog — Kingstown. —
J. G. Taylor Jr.

Osmond Chills (blk.) Vet. surgeon, Kingstown.

James Beach (wh.) Manager Lans Fonci Estate.

Orange Hill — Cellar, 20 paces long outside — 8 1/2 paces wide inside 10-12 ft. high.
Whole building 46 long paces long and 10 wide outside. —
Saw four black people who were saved there, afterwards

Hopewell Mariagna Valley-
House and Family-
Jungle -

Montreal Spa - at foot of
Petit Bon-Homme - Head of
Mariagna Valley, Considerable
iron, rather sweet taste, and
CO_2 very slight H_2S - Cool -
Just beside the stream
(Lambu river) Bank of
Ferns: Bamboo, gommier
tree (or gum tree) Many air plants
with Bamboo, wild palms
(palmit) &c -

1400 ft. a.t. (aneroid - Curtis agrees)
Mesopotamia ville - 430 ft.
Gorge of the Lambu river -
Columnar basalt flow
showing on west side -
Weathered tuff or breccia on
the easty side. -
Photo - looking North near side
" " " Southern end.
" of village.

Road East of ruined Factory
at Lambu, boulders of
breccia within a breccia,
breccia boulders or rounded
Three are quite large, two
masses and three feet in diam.
Mostly whitish or greenish
white, a few black, in a red
brecciated matrix - Sea beach?
Photo of Balabu(?) Point showing
Low sea benches at elevation of
60 ± ft and 100 ± ft.
Pink breccia at sea level
overlain by beach deposit at
Adelphi - This is a volcanic
breccia. -

was due to lamps and domestic fires and not to eruption directly. — Not
He found dead woman and children in one of the houses. Clothing all on and no indications of fire. — Partition blown in. — Unburned letters in card-board box. — Inexploded percussion caps on a window sill — Tested them afterwards and found them in perfect condition.

In St Lucia ask for Samuel Renshaw at Bernard Sons & Co. – (on Wharf) He was at St. Pierre very soon after the eruption of 8 May and will be able to give excellent account. — (J.H.D)

3 June

Road to Mariagna valley much decomposed basalt (?) breccia — Apparently some or one flow — badly decomposed, colors deep red, black, greenish-yellow — gray. — Boulders of decomposition as well as those of the breccia (or agglomerate)

Photos of Mariagna valley general from Pleasant Hill — S.E. corner — 2 at 4/02 Dark green back ground, some clouds. —

Spheroidal weathering in basalt, S. side Mariagna valley — 4/04.

Mesopotamia Police Station near outlet of the valley — Valley formerly closed by old lava (basalt) flow, now cut through by gorge — Stable with donkey —

Cross bedded yellow tuff on
eroded surface of old [illegible]
breccia. Cliff 200 feet high
sea level - facing [illegible]
Old Woman Point - [illegible]
Military Hospital - below
dark colored breccia. Coarse

Pull and be damned Point
forms first point beyond
western side of Kingstown
harbor.

To memory of 46th & 69th
regt. and of island militia
and rangers who fell in
defending colony in 1795 & 96
Stone erected on boundary
of Duley Hall Est. & Garrison
of fort. Fort built in 1805-6

Wednesday, 28 May - 6 p.m.
Fontabelle 50 miles at sea
had ashes fall on her deck
and saw Pelée in
eruption - Reported by
sloop bringing despatches
from St. Lucia to
Kingstown - Friday, 30 May.

Chas. G. Taylor - St. Thomas
Photographer - Photos. of Pelée &c.
and ~~St. Croix~~

Was in St. Pierre 17, 18 & 19
of May - Some houses intact
seven preserving roofs and
windows -
Altar and painting in
Cathedral uninjured -
Other houses had lost roofs
but retained upper stories -
others preserved only the
lower stories. -
Many houses were burned
but he thinks that the fire

at Sir Robert Maloney's house

Talked with Mary Ann Robinson who said Tuesday lake was high on crater discolored and bubbling and spitting.

Black man who passed on Monday found top too hot for his feet.

Darrell says he and his wife felt very frequent earthquake shocks (2 or 3 a day) for three weeks before the eruption. The "intensely stifling oven-like" heat felt by him and "everybody" on Monday before eruption and Tuesday.

Darrell's thermometer registered 94° in shade at 5 P.M. Monday.

Brondfoot stood at 120° in the sun on Tuesday.—

Darrell says lightning was extremely vivid and in

every direction during eruption

Section 30-40 ft. high at sea. Joint below Leper Hospital Fine cross bedding on large scale

MacDonald was Stephenson Clement at Mt. Bentinck Estate near Georgetown. Latter saw nothing of the outbursts. which alarmed the former.

Brown Colored Manager of Lot 14 Estate was saved by going into cellar. There nearest estate to Crater on windward side.

February 1902, Wm Edwards working roads on mountain, says he felt earthquake shocks at summit and saw the water of lake disturbed and thrown up. (To be verified) Macdonald

Average slope of La Soufrière as seen from Mr Richards Cottage is 18°

2 June - Left Chateau-belair 6. a.m. - Dog (Dark) Head basaltic columns not just above water's edge, covered with horizontal beds of yellowish tuff agglomerate, Point Diable, also basalt (?) running out into sea - Next point ditto - "Hacketts breeches" Photo. of Natural arch 4/02 & 16/02 agglomerate. Polly Dyer's Head - 8/01 horizontally bedded coarse and fine agglomerate, Indian Gallows. Keartop's Point underneath. The Jaggar got off and collected some specimens. I made some photos 4/02 one 11/2 of Bottle and Glass 16/02

Darrell: 2:42 p.m. - great explosion
4:20 " dust in Barbados
5 " " " Trinidad

of steam that Mr. MacDonald saw was on the 20th Tuesday 6 a.m. but he would not be positive that that was the very first because there had been rain. These steam eruptions began after the showers. Thursday, the 15th MacD. saw small quantity of water coming from Wallibou river. An old fig tree (not edible fig) on path at 1160 ft. elevation shows burning and subsequent sand-blasting of sides toward crater. — Etched surfaces & points, many other trees showed same. — Deep cirque with water fall of 100 feet at its head. Trees and tree roots still on vertical and almost vertical walls. Surface soil gone for most part. —

Graf. store keeper in Georgetown, keeps store.

MacDonald came here in 1886 — remembers earthquake about 1890 — Wallibou. When a year ago, when he was in England his brother wrote him of earthquakes, which frightened people, and Windsor Forest wanted to leave the place. Not felt in Kingstown

Line of devastation goes contin[ues]
of the high Mts. South Each
of Morne Garu, - but not
heavily dust covered - not
the heaviest of the dust-mud
with its much-slipped surface
comes down to altitude of
about 1500. — Very hard
traveling - almost all the way
to the top from the
soft mud, made this point
of testimony, mixing
the fine ashes — with
The deposits of ashes are
far deeper in the great
of valleys, - Wallibou, Trespé
(the next one north), the next
north (to left of upper portion
of our route) of Fraser's valley
and the other large ones
as far north as Windsor
Forest. Currents of air. -
Thoughts of crevasse beneath
Wallibou River - prob. not
correct on account of similar

deposits in all the great
valleys.

F. M. MacDonald was dig
Wednesday of May eruption - on Friday there
was an eruption at 6:50 A.M.
of less degree - May have
been from Wallibou! White
discharge fast Richmond
Hill - could not see summit
of Soufriere on acct. of clouds.

Erosion enormous, apparently
removed surface soil from
many slopes - but the
surfaces more protected.
Coating of dust has been
removed - almost entirely
in spots - Ridges with paths
Ridges are narrower in
some places than before
eruption
First violent eruption

Photos, of details of mud surface and divides of covered of fine dust but eroded on both sides, — those that look so much like traveled paths and are so prominent in all views —
16/02 & 8/02 one 4/02

Photo of Half Way Tree

There was a hot spring in the side of Wallibou river valley near Petit Wallibou

The portion of the shore near Fraser's was called "Hot Water" on account of heated water to be found by scraping away surface (not deeply) —

Heavy dust deposits reached only to the very lowest slopes and spurs of Richmond Park (Morne Garu) — Upper levels more thinly covered

is to be seen, roots &c. on the protected sides. The fine dust may be the latest fall, but on the other hand the first effect of the rains on the practically level edge of the ridge &c to make it slimy and sticky and prevent its being washed away. — On the slopes, however, even where very gentle, the rain would carry away the fine stuff first, leaving the pebbles

East side of crater Lava fills old break or scoop on rim. Curved columnar structure radial, central columns dip away from us but are nearly vertical.

Avalanches of rock down east precipice, numerous and pronounced while we were on top —

1000 feet below summit we noticed H_2S. odor strongly but perceived none when on summit, though the steam was not blown over me.

Went along southern rim to point above most active area - but not farther on acct of softness of ground and lateness of hour. —

Photos — Odor of H_2S. strong in the steam. (Jaggar sticks to $S.O_2$, but I think H_2S.)

Small stream on bottom of crater issuing from wall, splendid delta where it flows into lake. Streams issuing from lower part of north rim show strong colors, red brown, yellow-iron? Sulphur for the yellow, - Jaggar.) Left Summit at 12.50. Stopped often on the road so that we did not reach boat till about 4-o'clock.

Further or northern rim
800 feet higher. Surface of
Lake fully 1600 feet lower
than we - judging from
opposite rim & hand level
across. Present surface
of lake is about 1150 feet
above sea, or 800 feet lower
than before. Fine sections
of columnar lava exposed
within the crater. Columns
curved at eastern side.—

(Waters of lake seem to be in
actual ebullition, at least at
eastern end where the column
of steam is rising, at time
of our visit and where we
observed ash laden steam
bursting up, just as at
Wallibou - (Curtiss &) I
estimated the depth of crater
at 2800 to 3000 feet below
the highest point on north-
east side of crater, which

is given on map at 3600
feet A. T. leaving present
surface of water 1600 - 800
feet, A. T.-)

Fine dike 40-60 ft. cuts
north sides from bottom to
Lava bed at 3000 foot
level - Horizontal columns
Another dike to west of this
one cuts from bottom to
2000 foot level.

from it.
dust after the column of dry
there had ceased during
the place was quiet, then
few minutes, after which for a
came steam and the
black wet dust in geyser
fashion like the one we
the river which we
watched this morning
Great volumes of ash
laden, boiling water came
pouring down the valley
in great pulsations with
much noise. The great
activity of the Wallibou valley
began this afternoon after
the rain set in. - evident
connection. -
The mouth of the Wallibou
is the southern limit of
the Coast Land slides. Can
it be the line of faulting
and consequent weakening of

Note
volcanic energy? east side
continuation on valley of dry
into the valley of active
river, similarly filled
and similarly lasted an hour+
eruption. Jeffries
Boatman, frightened
and brother, our boat
as we say to the mouth of
close to the mouth of
the river.

31 May

Start from Chateau Bel air 6:45
" " Wallibou 7:20
Curtis at rim 9:49
Jaggar " 9:58
Hovey + Macdonald " 10 - o'clock.
Crater - rim where we
reached it was 2750+ feet,
above sea.
(Aneroid - Jaggar - 2760.)
(Second reading of aneroid gave 2850.)

Ponde Point is old lava and has not been affected by slips.

Larikai Bay, la Trois Loups (or Jocelyn) Bay, Tucker Bay and Grier Bay, also were affected by similar slides.

Hanging Valleys numerous all along the coast. Some of which are due to valleys terminating on lava flows but most of them are due to these recent submarine landslides.

The tropical rain storm which poured down during a part of our trip, produced many temporary water-falls and gave indication of the rapidity with which erosion now acts on the denuded slopes.

Topography marvelously rugged.

Counted seven lava flows one above another near Larikai Bay. Fine sections exposed by the sea show the filling of old valleys by the lava.

Witnessed a wonderfully fine outburst of the lowest of the dry hot areas in which bed of Wallibou River we noticed this morning. Column of steam and dust rose to great height (considering the character of the spot), probably a mile into the air, tho' we were not in a position to judge accurately. All the characters of a crater eruption, cauliflower masses &c as described by eye observers. We were too near for one to be sure of mushroom or pine trees shape but we got a heavy shower of fine dust

When we first reached
the river the most active center
was 200 yards or so farther
up stream at the base of a
similar bluff of ashes.
The change to the one
above described took place
while we were watching it.
Not many large pebbles
many of size of marbles. Pea
grain and others of dust. Four
and five feet of ashes on
Richmond estate. Up to
20 ft. or more on Richmond
village. - Some large boulders
on village site which seem
to have come down in the
eruption. Some heat remains
in the debris covering the
village.
The works on the hill
were destroyed by the hurricane
of 1898 and part was never
rebuilt.
The rebuilt portion was

destroyed by the eruption. was
Factory on river of ashes
ruined by weight
on the flat roof.
Took boat along coast
as far as Petit Belleine and
back. From Wallibou river
to Morne Ronde village the
sea has encroached
considerably on the land.
Sharp vertical cliffs
with deep water (more than
12 feet) directly up to them,
numerous hanging valleys
and absence of erosion
phenomena indicate that
the land has slipped into
the water, forming fault
scarps. New land has
made out into a point
just north of the site of
Morne Ronde village.
Slipped again between
this new point and Morne
Ronde Point. The Morne

From a point 525 feet above sea.

The point of origin was at the back of a heavy bed of ashes where much heat was stored.

Column thrown up 200 feet. River dammed back by the ashes thrown out here.

Some times ashes were driven out at angle of 45°. — Little bluff was on our left as we looked at it. Matter thrown out toward right. — Fine imitation of a geyser. — Some variation in strength, winding up with grand outburst. — Lasting some seconds after which all was quiet.

Two photos of spot where eruption took place! 6/2 . 16 . 02 &
should show pond 11/2 . 16 . 02

Pond formed above the new dam until finally the water reached its lip and ran over. Then ensued rapidly the formation of a gorge through the dam with rapids and fall cutting back to the pond. (History of Niagara w. steeper grade.) The freshly thrown out cinders formed a loose aggregated barrier.

Little waterfall releasing pond must have been 6 or 8 feet high 10 (?)

New little Cañon at first had vertical walls. — Nearly straight —

Two photos. W. O. 01.
Dark Head - Lava, Columnar
The Pitons of St. Lucia
plainly visible as we rounded
Dark Head.

No deep gash on lee side
as at Pelee.

- 30 May -
Richmond estate Photo of
upper mill &c. destroyed
by eruption 16/02.

Wallibu river - Much
changed from 25 May.
Point north of river cut
back considerably since
Sunday. Very hot. -
Much steam this morning.
River cutting now on smooth
side of valley. instead of

north side as on Sunday
- flowing in same spasmodic
fashion. Has cut down very
much more deeply than on
Sunday. The heated parts
are dry. - Ashes now knee
deep and more on slopes,
Whirlwinds brought the
vast quantities of ashes
into the river bed. Much
has been brought down
by the recent rains. -
Slope on S. side to 45°
(meas.) in concavity. -
Two photos. of river
bed - 8.02 & 4.02.
One of drainage looking
toward summit 16/02.
Several of a great blow of
column in the bed of the
river 8/02
This column of ash laden
steam played for about
1/2 hour we watched the
latter part of the little eruption

South of Bucament.—
Layon Point— numerous
buttes, mostly agglomerate
Good "Hoodoo" topography.
1/4 Wynn bay - Photo. 4. 01-
South of Barrualli Bay- Sea
Cave 4.02 - Section of Shore 4.02
Barrualli - General views of
children. Cliffs on each side
of Wallilabu Bay, 8.02. Bright sun
South side of Wallilabu
Bay, great cliff 100-150 ft.
high - fine section of
agglomerate. Blocks 10+
feet across. North side of
same bay sea cave, and a little
beyond is a fine natural arch
standing out a very few yards from
shore.

Peaks south of Cumberland
Bay, (little village on shore
in bay South of this, at foot
of these peaks) of Cumberland
North side of Cumberland
Bay, agglomerate, dips slightly
northward.—
South side of Brumaka (?) bay
sea (?) grotto of 25+ ft. above sea.
North side shows 3 lava
flows one above another.

Viewed from S.W. 5:50 P.M.
active crater at right.
Somma ring very
distinct, but perhaps the
eruption has destroyed the
dividing ridge.— Later glimpse
seemed part of the northern
rim of old crater.

Incidents — Landing in
Crate and Crane. Heavy
Surf — Loading injured
Persons into boat. Same way
Complaints of recipients of
rations. — Visit with Hospital
Ship as Siege Post — from
Table and other furniture of Mahogany
Hard ships of tradesmen. —
Mayor of Town — Pajamas on
Sunday. — Conv. with
Terrible burns — Skin hanging
of Dr Lar. Burns on negroes
show color as white or
nearly White Patches. —

28 May — On board Dixie
Packing and writing — and
getting luggage ashore
and into Club.

29 May — Morning Raining —
at 2:35 left pier in Smelt
up dug-out Canoe for
Chateau Belair. Five oarsmen
— Creathe with rising sound
(like argument) — Good natured —
Much talking — Still raining
hard at intervals. — Fine
view of sections along shore:
Mostly tuff. — Marked
Cross-bedding. — The tuff and
Sea Caves in the tuff and
agglomerate, numerous and
typical. —
Doubtful indications of an
elevation of 60-70 feet. — Cliff
Encampment Point — Cliff
under-cut at sea level
forming pronounced sea
bench. — Face of Cliff
vertical, water very deep
directly up to it. — Little
islets — Vale with palms —
N.B. At least 2 lava beds
at different levels in point

(which were not Infected) on
East side were broken by
About 18 in. of dust and
ashes, on average, covered
this estate. Rapidly being
washed away. Met negroes
carrying charcoal. Made
by eruption.
Thomas Diment, Supt of
this estate, was at Mt. Bentinck
estate and felt three shocks
of earthquake 6 May - 7.20
second 9.45 - third 10 - p.m.
Water came down the Dry
River at noon of 7 May - to
fetlock of horse, & hot mud
and water.
& Rebecca wharf being buried
by sand (washing out.)

Major J. Hill, Royal
Army Medical Corps, was
in the Military Station at
the Morne St. Lucia, when
the eruptions of both took place

Felt no earthquake. - Received
a fraction of inch of dust from &c
Pelée - Columns of steam
from Pelee rose to great
height and spread out
like a mushroom. Column
from Soufrière seemed
considerably larger than
that from Pelée. -
Considers hot air and
air laden with dust sufficient
to account for deaths,
(answer to my query.)
Griffith - Advertising, 413
Pearl St. Recd. Photos, from
Dr. Hutson Dr. J. Hutson, Harmony Hall
Barbados. - Photos - Promised
me a set.

"Send a few Cots as sharp
as possible" remark of negro
Georgetown

Below Peruvian Vale (?) the Coast is red stratified tuff.
One of the low bluffs looks as if it had dikes of Lava intersecting the tuff.

Ashes fell thickly as far as St. Vincent, scorching to a point about midway between Black Pt. and Colonarie River. —
Black Point is an old Lava flow.

Dr. J. Anton, of Barbados, was sent on.
1st days work out of 30 men 121 burns were cared for.

Connell (negro, caretaker on Porter estate.) Cloud 1/2 acre in extent swirled around the house (where he was — total darkness. Gush of "fire" came right down into room. Smelled bad,

(From Dr. Antons notes:) House, Dr. 7 May in Mansion house (Porter.)
7 A.M. very fine stones then large body of smoke with whirling motion went in side house, which had been closed all around. Quite dark. Shower grand, followed by stones. Hole burst wooden roof — Hole burst in roof of dining room and filled with smoke. Something burst on larder (?) and seemed to throw out gas which suffocated him. — Hands, face and feet burned. Stifling sensation passed off and he regained power of sight.
Five were killed in out house. — In house (Langley Park) in which 21 people were killed. House faced sea. Windows

— 27 May —

Heavy rain between 6 & 7 a.m.
Boarded the Wear at 9 a.m.
for trip to Georgetown. Photo-
landing supplies. Got
away at 10:15 —
Cam garden Point, Columnar
Lava at water's edge, overlain
in places by tuff agglomerate,
and also alternating with
the agglomerate toward
extreme point. — agglomerate
also to windward. Black
Rock is Lava. Great head
valley is occupied by fine
plantations. +

Lamba Head - Sinks Sea Cavern - agglom-
Photo - 4-01 -
Argyle estate looks prosperous.

on account of inhabitants thinking there was "too much electricity" in the air already.

Note that new moon in Martinique was 7:48 a.m. 8 May and the great eruption which destroyed St. Pierre occurred at 7:50 a.m.

Six lighter loads, each of 20 tons, were removed.

In the northwest slope of Mt.
St. Andrew there is a hot
spring said to be hot enough
to cook an egg. Dr. Frazer
doubts the high temp. Other hot springs exist
in Mesopotamia or Mariaqua
Valley.

Capt. Freeman, of Steamer
Roddam. rody at anchor
St. Pierre 8 May. between 7
& 8-o'clock,- saw dark cloud
sweeping down over town,
struck this vessel and cast
her over towards sea, so
that lee scuppers were
under water! -
Hot. cinders began to fall
and his men began to fall,
looked toward city, saw it
burst into flame! People
running about. Noticed
a slight tidal rush out
and back. Slipped chain.
Saw some small vessels
keel over and sink. Steered
his vessel with his own hands,
badly burned about hands
and face, deck was burned.
Mostly dust and fine
material. He did not
notice suffocating gases,
but thinks hot air and
mingled dust did the work.
Smelled sulphurous odor.
Several (120) tons of
dust and ashes were
collected from deck of the
vessel when she reached
Castries, St. Lucia (Above
is from Curtis interview
with the man)
The weight of dust removed was
given me by the Castries
agent, of the Roddam,
who had it removed.
Electric light in Forte
de France occurred stopped

Mr Alex. M. Frazer at
Grange Hill estate (windward side)
18 persons took refuge in
the half-basement of one
building and were saved
unhurt. 20 sheep also
saved here. They seemed to
experience no inconvenience
from the eruption, though
everything about them was
devastated.

The building was somewhat
protected by the topography
of the immediate vicinity
but upper part received
injury from the falling
stones. —

P. F. Nairn, engineer of estates
could give information.

The night watchman was
in the stable and would
be intelligent witness. Also
a Coolie boy. —

7

Mr Frazer's father (Alex.
Supt of the estates) and
mother and a cousin
were killed.

Frazer's cousin (Wellington
Frazer) Percy Grant and a
boy, started up the mountain,
met a woman who had been
at the crater that morning
at 10 o'clock, and who
reported that the crater
in the crater lake was
boiling up and likely
to run over the rim.

The three turned back
and went down to Grange
Hill and were killed there.

The old crater lake
smelled strongly of sulphur.
The water varied in
color from green to yellow
and blue.

[On 29th of April the water in
Crater Lake of Pelée was at
temp. of 37° C. — = 97° F.

Kingstown Hospital
C. W. W. Grant Chief Dispenser 26.V.02
Showed us the Wards. –
Burns from hot cinders
not from mud, – Hands,
feet, arms, legs – some
on face – Negroes, mulattos,
Windows, Caribs. One negro
man whose face and ears
had been burned told me
of his difficulty from breathing
on account of the hot dust
in the air.
Fifty one burned cases
in the hospital today. – 5 or 6
deaths in hospital. – One
little black Carib girl was
suffering from fracture of
skull. Head had been
protected by tray. –
Clothing was not burned
from these people. – Clothing
usually protected parts
beneath.

John Medford lightkeeper at
Fort Charlotte. Said that
he saw "a sight of glory of
fire in the clouds" of steam
that rose from La Soufrière
Sunday 4 May – 6:30 P.M.
This looked just like the
reflection of fire under an
over hanging cloud. No dust –
Roaring – Note that this
was before the great eruption.

On 7 May – Great roaring
at 1:50 – then the great
eruption with a great amount
of lightning. About 2:30
small fragments like
gravel fell at the fort
followed by dust. –
The shower of dust fell
all afternoon and night.
Angle of at least 30 – 35°. –
On 18 May – another great
outburst with much lightning
about 7 o'clock. —

Above Barrgualli the hills rise at a rather steep slope to Lava bed 2/3 up.

La Soufrière has Somma-like ring around northern side. Deep ravine. Summit higher than that of crater.

Chateau belair island and the near mainland show excellent basaltic columns.

Richmond estate - House was ruined in hurricane of 1898 and only partly rebuilt. Now injured and partly burned by eruption.

Undulatory surface of dust now. Rather light gray when dry - two to four feet deep - some scorching. - Coffee, Cocoa, Sugar &c. Small stones up to head size

mingled with the dust.

Wallibou river - Bed filled from 40-60 and even 100 feet with the debris - River now forcing its way through so heavily laden with debris that it goes by pulsations - Waves come down at intervals of from 15-40 seconds. Apparently water needs to accumulate strength to force its way along with its load of ashes.

Small amounts of steam rising in countless jets. Occasional outbursts of greater magnitude. Some times carrying dust. Roar from descending crater may have been in part what was heard yesterday.

Charlotte is 627 feet above sea on Promontory to west of harbor 1/2 mile fr. town. The lower part of this point at sea level is composed of tuff and agglomerate. Two thirds of the way to top the red bed of Columnar lava is evident. Another bed of lava occurs at the water's edge. Small extent. Point between Fort and town.

Fort Point west front, bluffs at water's edge. Fine grained tuff. occasional small boulders. various dif. Light buff, salmon pink, red, & brown

Neat little bluff has a lava belt in it, and large blocks lie at its base. Camdom Park, has rather gentle slopes which head up into the steep sides of Mt St Andrew. Promontory north side of York Bay is a low bluff of rudely Columnar lava.

Instances of local slipping along shore. — especially good in Promontory South of Lyman Bay. +

Falling on hot ashes. - Enormous volumes of steam, —

Morne Rondo (T. M. McD.)
there is an extension of new land into sea - steam jets rising from small openings (like crab holes) at edge of sea removing a few inches showed hot water as hot as hand could bear it. Man jumped from boat into water and as he sank into the sand he pulled himself out again saying his feet got into hot water. This was on Friday 16th. —

Lake formerly in old crater was sounded and no bottom found at 70 fathoms - 20-30 yards from shore.

Eruption of 1812 - Kingsley's "At Last" pp. 53-58 -
Humboldt. "Personal Narrative" Book V. Chap. 14

Kingstown harbor lies open to southerly and westerly winds. On the eastern side an ancient Lava flow showing columnar structure forms the eastern shore of the bay. —
The Lava bed rises toward the north and seems to disappear in the top of the hill just east of the town. Most of hills seem to be composed of volcanic tuff and agglomerate. - The town has been built on a small alluvial plain.
Handsome villas occupy high ground. Old Fort

back of Barrouallie village (Photo)
Bottle and glass works
(Photo) roughly stratified, coarse agglomerate
North Cape of Wallibou
Bay - fine material - well stratified - dipping northward.
Shortly after passing this Cape we noticed from the "Wear" 12:40 P.M. a column of vapor suddenly rise - from valley of Wallibou river.
Chateaubelair Point and Island basaltic columns
Burnt area on South west slopes of Richmond Peak south of Kukungare (?)
Came down to sea shore about 1 1/2 miles North of Chateaubelair -
Drops of mud fell as far as Barrouallie (?) - Drops of sand in abundance at Chateau Belair. -
Heavy reports Tuesday 6 May - when individual

explosions took place. - The continuous roar of the great eruption began between 10 & 10:30 on Wednesday. Clear sky during the outbursts of Tuesday (6) and also on Wednesday (7) ———

Richmond Point - Pile of ashes 50-60 feet deep covered site of Richmond village. - Top of bluff also covered with ashes. - Manager's house in ruins.

Eruptions seem to show marked sympathy with those of Pelee.

Roar today, as on lay of the coast, sounded like that of Niagara. Very continuous - Probably caused by the rain

probably had not risen, at
any rate, it could not rise
to the Rest House, because
there are many points of the
rim lower than that.]

Mary Anne Robinson (negress)
goes from Wallibou to Georgetown
to sell fish; on her return to
Chateaubelair Wednesday morning
got to Rest House about 9 a.m.
on edge of old crater, found
that the lake which was
usually 500 feet down, was
level with rim of crater
and boiling. She rushed
back to Georgetown to warn
the people but her story
was discredited.

Dr. Christian W. Branch
Colonial Surgeon, went down
that night from Kingstown
with Capt. Caldwell, Chief
of Police, to Chateaubelair.
Just as they got to Chat.-

the crater burst forth in
great flames.

Chief zone of destruction was
from Robin Rock to East side, while
of Waterloo on
West side from Richmond
on to Windsor Forest (Petit Belair)

This zone was fire swept.
Devastation extended in less
degree to Fancy estate.
Devastation was worse on
west side, but people had
taken warning and fled.

Fifty feet of ashes where
Wallibou was located. At
Richmond estate a new
head land has been formed.

Fragmental material
forms bluff all along sea
- west coast - One lava bed
noticed north of Clare valley

Basaltic columns in bed
of lava in middle of bluffs

Site of Wallibou Factory and mouth of river. Now show deep water where there was a sloping beach before the eruption. —

Mr MacDonald saw light playing around the column of steam &c. Did not experience suffocating gases himself.

Could not tell whether both craters were in action.

Thinks new openings were formed on flanks of mountain.

Before he left he observed the flat spreading of the top of the column. More to east than to west. Noted height of column before great eruption at about 7 times the height of the mountain, or 28 000 feet.

about 2:45 or 2:50 the (Griffiths) P.M. 7 May. Fall of ashes began. Before that Barbadoes telegraph operator there had been asking the cause of the roaring and noises heard from direction of St Vincent.

Dust began to fall in Grenada about 4 o'clock. Began in Kingston about 2:15 or 2:20 –

At 4. P.M. Barbados telegraphed that they were lighting lamps there on account of darkness from dust cloud. ———

Some of the fish women who passed the crater on the 6th & 7th stated that the lake had risen in the crater, but others said not.

MacDonald thinks that it

Wm. F. Durrant. Bet 2 & 2:10 P.M. of 7- May one of the huge brown cloud of dust, referred to previously was just leaving the dense column, when a flash of pinkish purple light resembling lightning seemed to disconnect (split) the cloud, as it passed to townward, which opened and closed again instantly. Half of this cloud passed on to townward & the remainder came back on the island.

F. Matthes, Jr. Bolivar, Venezuela, who came here for his health will publish in German periodical.

— 24 May — staid at Mr. MacDonald, staid at his house until 2. P.M. on Wednesday 7 May. 4 men on lee side of island saved themselves from the gases by constantly diving and coming up to their boat. One of them became too weary to dive any more and he had the tops of his ears singed.

Saw large blocks (flour barrel) issue from column at height of 4000± ft. above top of mountain.

Such blocks as could be seen very distinctly from his estate (which is four or five miles as the crow flies.)

These blocks seemed to him to issue from the eastern side of old crater.

rose to above trades and
passed eastward; when
got 5 miles east, dust
Cloud broke in two.
half kept on and balance
Came on land on windward
side of Cone of mountain in
rain. Saw no flames
but saw reflection of molten
lava in steam Cloud

Height of Column estimated
at 28 miles because it
passed through the trades
Gases recognized by Mr.
Mathies: H_2S, C.O, N.O,
(Nitrous oxide)
Mr. Edw. Beach manager
of the Fancy estate on North
end of island, observed large
blocks (size of flour barrel)
thrown up into the air out
of the Crater.
When these fell on the
ground, they broke into

small fragments.
Dust choked him (Durrant)
as he was driving along -
irritated eyes.

Brother of his - at Kingstown
- fine sand like drops of
rain - Coarser sand
small pebbles larger pebbles
up to size of fist. within
an interval of about 10 min.
One piece he collected was
about the size of the fist
which had in it a large
nail (20 penny) - such a
nail as is often used
for hitching ponies when
travelling.

Bullet was thrown up
from Soufrière which struck
a boy in the left fore-arm,
who was in the lower
part of Kingstown.

Sir Robert Llewellyn K.C.M.G.
Governor of Grenada
G. S. St. Lucia & St. Vincent
G. Cameron, Administrator
of the Island of St. Vincent
Henry Powell Botanical Station,
Rev. J. H. Darrell, Kingston
Dr. W. N. Newsam.
Mr. P. F. Huggins Engineer
and surveyor, sounded crater
lake, and found 87½
fathoms in centre (1896)
but did not reach bottom in
N. W. quarter.
Mr. McGregor MacDonald

Ship Coya - from Brazil
when 250 miles E. of St.
Vincent 10 p.m. 7th of May
was covered with dust.
The dust was very fine
but still a little gritty. Note
from Governor.

7 May
Small boat - Father Pütz
(native of Aix-la-Chapelle)
Rumbling noise, & lightning,
Thinks people to windward
were killed by lightning,
falling stones, & ignited gases.
Went up in small boat
along the leeward side.
of Richmond on this island
has sunk below sea.
Block from volcano
falling on shed in Georgetown,
pierced galvanized iron roof.

Wm. J. Durrant, Chemist and
Druggist Kingstown. Was at
Georgetown on 7 May, when
great eruption! Odor H. S.
very strong and absolutely
recognized.
Trade wind died out just
before eruption broke out.
Column of dust and steam

St. Vincent. – Kingstown

F. C. King – villa 16 miles (see map) – in straight line from La Soufrière –
7 May, very fine dust. Fragments of pumice. – Samples given us which were gathered from his grounds during and immediately after the fall.

James G. Richards, brother of American Consul, states are Petit Bordell, Sharpes & Mt Alexander are on Leeward side of volcano – not injured.

Mr. J. Macgregor MacDonald
" D. A. MacDonald
" W. Griffith Govt Clerk
" J. G. Richards (cottage)
E. A. Richards – Consular Agent.

Old descent into Crater was straight for 1/4 to 1/3 vertical dist. then zigzagged down water courses over and around the edges of the old lava beds. Talus at base formed a kind of promontory in the lake and there was sufficient space to pitch a tent.

Grandfather determined by barometer dif. of alt. between rest house & surface was 1122 feet.

Huggins thinks that rim of Crater at Rest ~~House~~ has receded 60-80 ft. toward Table Rock.

The "Saddle" between the two Craters was a very narrow ridge extending about W.S.W. from a little way below the high point at S.E. side of new Crater.

It was composed of rather loosely compacted agglomerate forming upper portion of this side of the great crater. The ridge was so narrow that one had to stride it in traversing it. It was quite precipitous on the side toward the new Crater - more so than on the side toward the great crater.

note top.

St. Vincent – Kingstown

F. S. King – villa 16 miles in straight line from La Soufrière. – see map
7 May very fine dust – fragments of pumice – Samples given us which were gathered from his grounds during and immediately after the fall –

James E. Richards, brother of American consul, Estates the Peter Bardell, Sharps + Mt Alexander are on Leeward side of volcano – not injured –

Mr. T. Macgregor MacDonald
D. A. MacDonald
F. W. Griffith Govt clerk.
J. E. Richards (cottage)
E. A. Richards – Consular agent,

~~Next Monday~~ 3 June ? ~~Str to St. Lucia~~.

R Sir Robert Llewelyn K.C.M.G.
Governor of Grenada
St. Lucia & St. Vincent.

E. J. Cameron, Administrator of the Island of St Vincent.

Henry Powell, Botanical Station

Rev. J. H. Darrell Kingstown

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Mr. C. F. Huggins, ~~Engineer + surveyor~~, sounded crater lake + found 87½ fathoms in centre (1896) but did not reach bottom in N.W. quarter

Mr McGregor MacDonald -

Ship ~~A~~ - Corga from Brazil when 250 miles S.E. of St. Vincent. 10 P.M. 7 May was covered with dust. Note. The dust was very fine but still a little gritty.

Note from ~~Administrator~~ govern—

7 - May - small boat - Father Pütz (native of aix la chapelle)

Rumbling noise - lightning.

Thinks people to windward were killed by lightning, falling stones, ignited gases. Went up in small boat along the leeward side.

Richmond on this island has sunk below sea -

Block from volcano falling on shed in Georgetown pierced galvanized iron roof -

Wm J. Durrant - chemist & Druggist, Kingstown. Was at Georgetown on 7 May - when great eruption.

Odor H_2S very strong and absolutely recognized.

Trade wind died out just before eruption broke out.

Column of dust and steam rose to above trades & passed eastward when got 5 miles ~~east~~ ~~close~~ dust-cloud broke in two, half kept on & balance came on land on windward side of cone of mountain in rain. Saw no flames but saw reflection of molten (?) lava in steam cloud.

Height of column estimated at 28 miles, because it passed through the trades

by Mr Mathies:
Gases recognized H_2S, CO, NO
+ ~~Mr Mathies~~ (nitrous oxide)

Mr Beach Esq. manager of the Fancy estate on north end of island observed large blocks (size of a flour barrel) thrown up into the air out of the crater. When these fell on the ground they broke into small fragments –

Dust choked him (Darrant) as he was driving along. irritated eyes

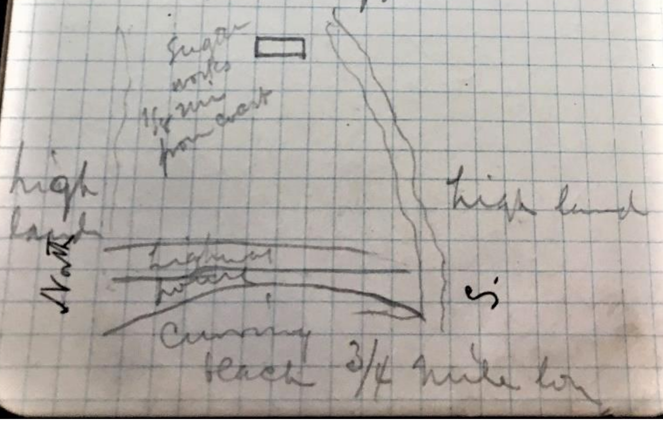
Brother of his – at Kingstown fine sand like drops of rain – coarser sand, small pebbles larger pebbles up to size of fist within an interval of about 10 minutes –

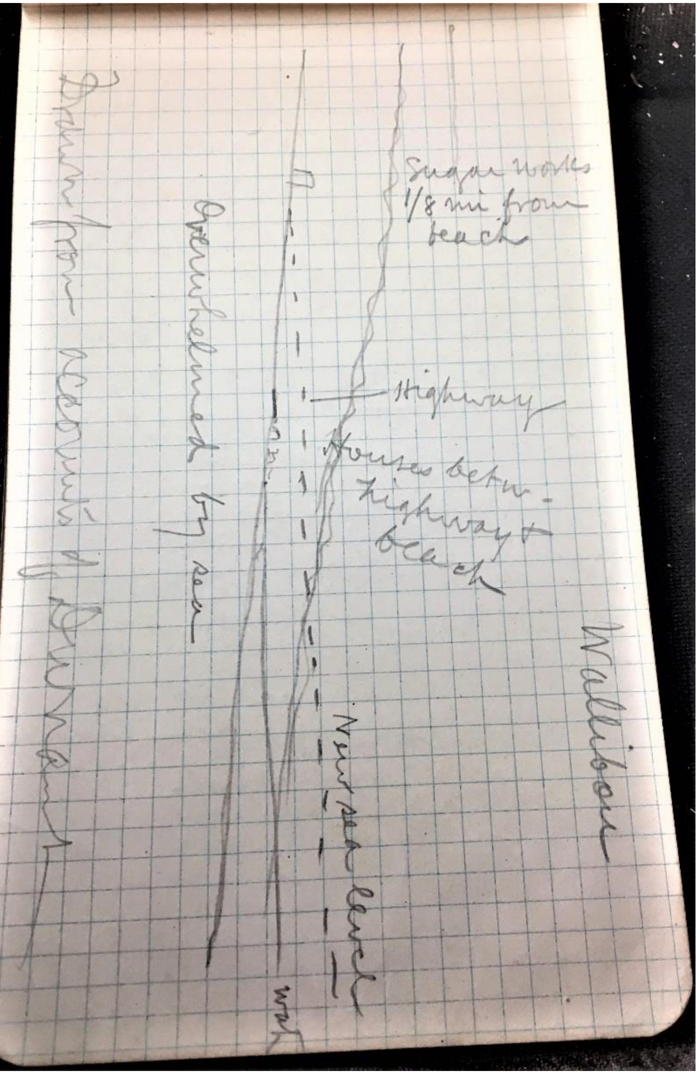
One piece he collected was about the size of the fist which had in it a large nail (20 penny), such a nail as is often used for hitching ponies when travelling.

Bullet was thrown up from Soufrière which struck a boy in the ~~left~~ left fore arm who was in the lower part of Kingstown. ~~F~~ Arthur Holder of the Kingstown "Times" told me he saw the boy + the bullet + the wound – Custom of visitors to the crater was to fire rifles + revolvers into the lake –

* Mud flows on mountain

Mr. Mathies said to Mr. Durant that he visited Wallibou estate at northern base of mountain and found that a portion of what had been the shore of that bay had been blown out to sea & had disappeared & ~~deep~~ water three feet deep is to be found where there had been a sloping beach of 120 feet, lined inshore by low cliff.



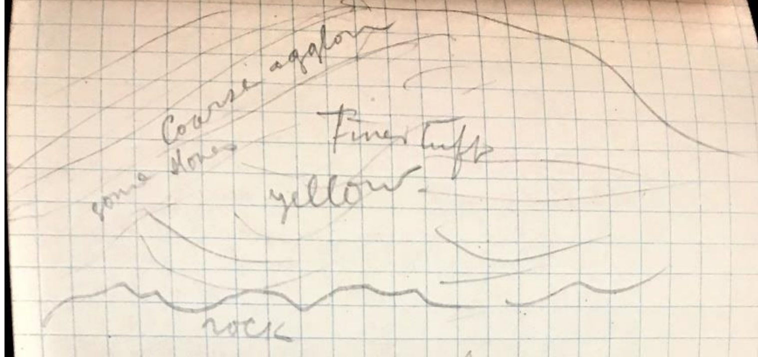


ing all on and no indications
of fire – Partition blown in
Unburned letters in card-
board box – Unexploded
percussion caps on a win-
dow sill – Tested them af-
terwards and found them
in perfect condition.

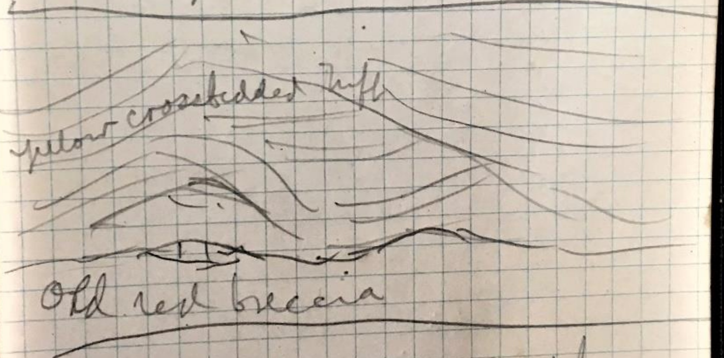
In St Lucia ask for Samuel
Renshaw at Bernard
Sons & Co – (on wharf) He was
at St. Pierre very soon after the
eruption of 8 May & will be
able to give excellent account
(G.H.D.)

Old Woman Point below
military hospital. coarse
dark colored breccia –

Pull & be Damned Point forms
first point beyond
western side of Kingston
harbor



Section 30-40 ft high at sea. Point below the leper hospital - Fine cross bedding on large scale.



Cross bedded yellow tuff on eroded surface of old red breccia cliff 30± feet high - sea level - facing south

high in crater, discolored & bubbling & "spitting".
Black man who passed on Monday found top too hot for his feet.

Darrell says he and his wife felt very frequent earthquake shocks ~~for~~ (2 or 3 per day) for three weeks before the eruption. This in Kingstown.
Oven-like heat felt by him and ~~others~~ "everybody" on Monday before eruption & Tuesday.
Darrell's thermometer registered 94° in shade at 5 P.M. Monday. Proudfoots stood at 120° in the sun for Tuesday (?)
Darrell says lightning was extremely vivid and in every direction during eruption.
94° in shade 120° in sun

point Diable also basalt (?) running out into sea – Next point ditto.

Photo. of "Hackett's breeches" 4/.02 + 16/02 Nat. arch. agglom.

Jolly Dyer's Head – 8/01. horizontally bedded coarse + fine agglomerate Indian Gallows –

Keaton's Point underneath this – Jaggar got off + collected some specimens – I made some photos 4/02

One 11/2 of Bottle + Glass 16/02

Darnell: 2:42 P.M. great explosion
4:25 o'clock dust in Barbados
5 " dust in Trinidad
at Sir Robert Maloney's house.

Talked with Mary Ann Robinson who said Tuesday lake was

~~them~~ by going into a cellar ~~there~~ – nearest estate to crater on windward side ✓

February 1902, Wm Edwards working ~~on~~ roads on mountain, says he felt earthquake shocks at ~~the~~ summit and saw the water of lake disturbed + thrown up. (To be verified) MacD.

Average slope of La Soufrière as seen from Mr. Richards' cottage is 18°

2 June – Left Chateaubelair 6 a.

Dog (Dark) Head – Basaltic columns just above water's edge covered with horizontal beds of yellowish tuff agglomerate.

Gray, storekeeper in George-
town keeps store—

Mac D. came here in
1886 — remembers earthquake
about 1890 — then a year
ago when he was in England
his brother wrote him of
earthquakes (~~April~~ ±) which
frightened Windsor Forest
people and wanted to
leave the place — Not felt in Kingstown

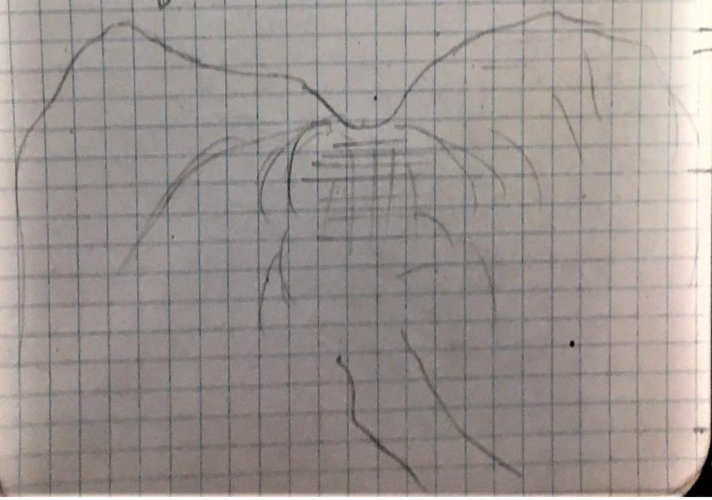
Mac D. was telephoning
Overseer at Mt. Bentinck
estate near Georgetown. Latter
saw nothing of the outbursts
which alarmed the former —

—

Brown, colored manager
of Lot 14 estate was saved

(Spaced fig tree (not decaying))
on path at 1100 ft elevation shows
burning + subsequent sand-
blasting of sides toward crater
Etched surfaces + points.
Many other trees showed same.

Deep crevice with water
fall of 100 ± feet at its
head — trees + tree roots
still on vertical + almost
vertical walls. Surface soil
gone for most part



Erosion enormous - apparently removed surface soil from many slopes but lee surfaces more protected - Coating of dust has been removed - almost entirely in spots - Ridges with paths. Ridges are narrower in some peaces than before eruption.

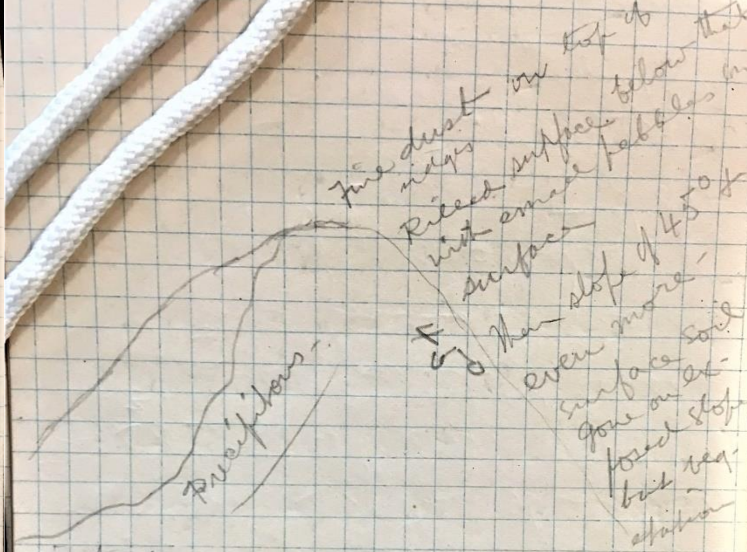
Steaming of Wallibou valley did not begin until after the second eruption. First violent eruption of steam that Mr. MacD. saw was on the Tuesday 6 a.m. 20th but he would not be positive that that was the very first, because there had been rain - These steam eruptions began after the showers Thursday the 15th MacD. saw small quantity of water coming from Wallibou the

T. M. MacDonald -

Wednesday 7 May was big eruption. On Friday there was an eruption at 6.50 A. M. of less degree. May have been from Wallibou, white discharge past Richmond Hill - Could not see summit of Soufrière on acct. of clouds

Line of devastation goes south
of the high mts south east of
Morne Garu - but not heavily
dust covered

The heaviest of the dust-mud
with its muck-slipped surface
comes down to altitude of about
1500 - Very hard travelling
almost all the way to the top
from this point. Soft mud
made by rain of yesterday.
mixing with the fine ashes.
The deposits of ashes are far deeper
in the great valleys - Wallibou,
Trespé (the next one north), the next
north (to left of upper portion of
our route), Fraser's valley, and
the other large ones as far north
as Windsor Forest. Currents of
air - Thought of crevice beneath
Wallibou air - — but not correct
on acct of similar deposits in all the great valleys



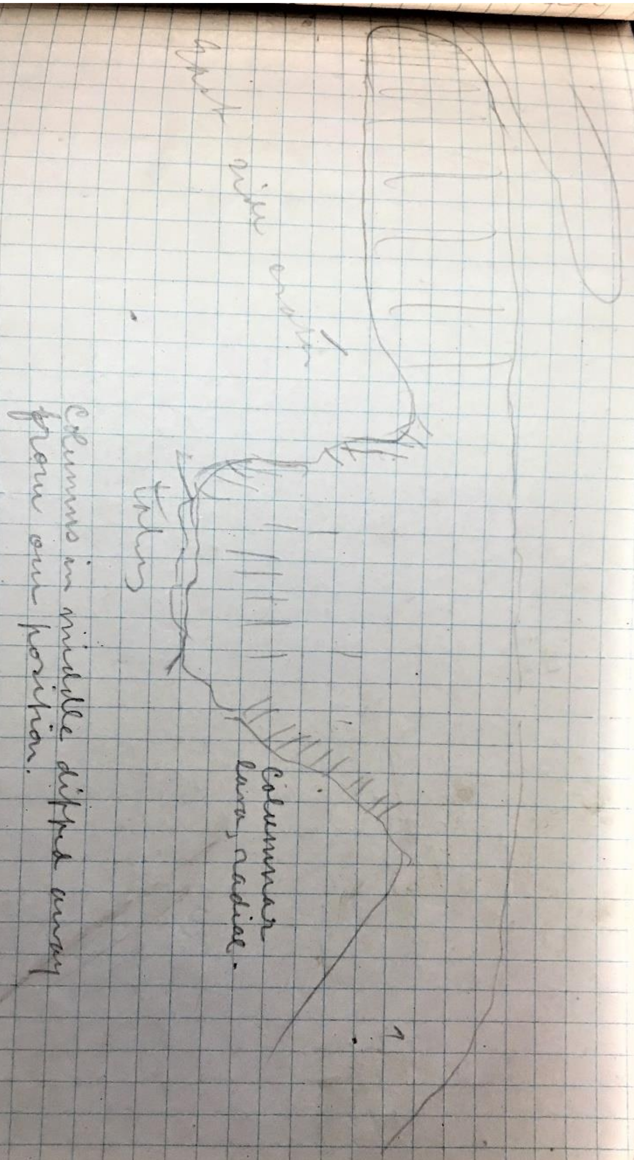
is to be seen, roots &c, on the protected
sides. The fine dust may be the
latest fall, but on the other hand
the first effect of the rains on the
practically level edge of the ridge
is to make it slimy & sticky &
prevent its being washed
away - On the slopes, however,
even where very gentle, the rain wld
carry away the fine stuff first
leaving the pebbles -

Photos of details of mud surfaces
~~+ rains of~~ divides covered with
dust but eroded on both sides
– those that look so much like
traveled paths and are so
prominent in all views –
16/02 + 8/02 one 4/01
Photo of Half way tree.

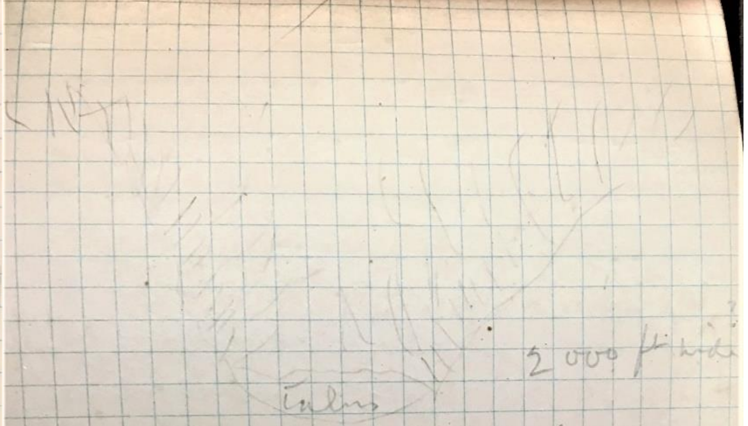
There was a hot spring in
the side of Wallibou riv valley
near Petit Wallibou

The portion of the shore near
Frazer's was called "Hot Wa-
ter" on account of heated
water to be found by scraping
away surface (not deeply).

__Heavy__ dust deposits reached
only to the very lowest slopes
+ spurs of Richmond Pk (Morne
Garu). Upper levels ~~more~~ thinly cov-



Went ~~to~~ along southern rim
to point above most active area -
but not farther on account
of softness of mud + lateness
of hour - Photos - Odor of
H_2S strong in the steam
(Jaggar sticks to SO_2, but I think
H_2S)
Small stream in bottom
of crater issuing from wall
splendid delta where it flows
into lake - Streams issuing
from lower part of north rim
show strong colors - red, brown
yellow - iron? (sulphur for
the yellow, Jaggar)
Left summit at 12:50
stopped often on the road, so
that we did not reach boat till
about ...



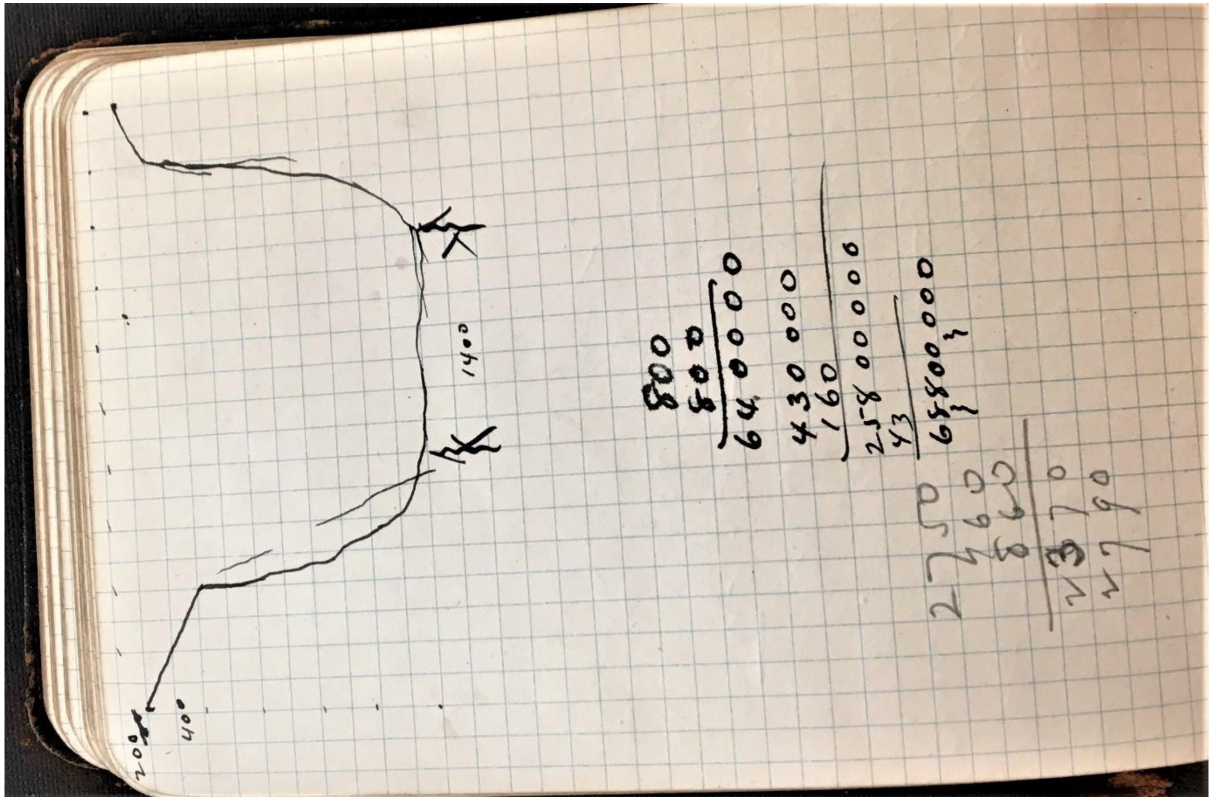
East side of crater lava
fills old break or scoop in rim -
curved columnar structure
+ radial - central columns dip away
from us ~~but~~ but are nearly vertical
Avalanches of rock down east
precipice numerous + pronounced
while we were on top.
1000 feet below summit we
noticed H_2S odor strongly but
perceived none when on summit, though the steam was
not blown over us

Waters of lake seem to be in ebullition at least at eastern end, where the column of steam is rising at time of our visit & when we observed ash laden steam bursting up just as at Wallibon. (Curtiss &) I estimated the depth of crater at 2800 feet to 3000 ~~2800 feet~~ below the highest point on northeast side of crater which is given on map at 3600 feet a.t. leaving present surface of water 600-800 feet a.t

Fine dike, 40-60 ft. cuts north side from bottom to lava bed at 3000 ~~foot~~ level _ Horizontal columns. Another dike to west of this one cuts from bottom to 2000 ft level.

31 May –
Start from Chateaubelair 6.45
from Wallibou 7.20
Curtiss at rim 9.44
Jaggar 9.58
Hovey & MacD 10 o'clock

Crater – rim where we reached it was 2750± feet above sea (aneroid – Jaggar 2760) [Second reading of aneroid gave 2850]. Further or northern rim 800 feet higher surface of lake fully 1600 feet lower than we – judging from opposite rim & hand level across. Present surface of lake is about 1150 feet above sea. Or 800 feet lower than before. Fine sections of columnar lava exposed within the crater. Columns curved at eastern side –


400
1400
800
800
640000
430000
160

of the coast land slides,
can it be the line of fault-
ing + consequent freeing of vol-
canic energy? Note con-
tinuation on east side
into the valley of Dry Riv.
similarly active + similarly
filled. Eruption lasted an hour ±
Boatman Jeffries + brother - frightened as we lay
in our boat close to the
mouth of the river.

shower of fine dust from it. After the column of dry dust had ceased rising there was some steam then the place was quiet for a few minutes after which came steam and the black wet dust in geyser fashion like the one up the river wh. we watched this morning - great volumes of ash laden boiling water came pouring down the valley in great pulsations, with much noise - The great activity of the Wallibou valley ~~at~~ began this afternoon after the rain set in, evident connection.

The mouth of the Wallibou is the southern limit

Larikai Bay. Fine sections exposed by the sea show the filling of old valleys by the lava.

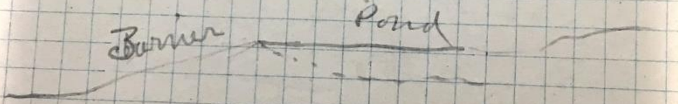
Witnessed a wonderfully fine outburst of the lowest of the dry, hot areas in bed of Wallibou riv: wh. we noticed this morning. Column of steam and dust rose to great height (considering the character of the spot), probably a mile ½ into the air - tho we were not in a position to judge accurately. All the characters of a crater eruption. Cauliflower masses &c as described often by observers. We were too near for me to be sure of mushroom or pine tree shape, but we got a heavy

Larikai Bay, Bois Loups (or Jocelyn) Bay, Tucker Bay and Azier Bay also were affected by similar slides. Hanging valleys numerous all along the coast some of which ~~were~~ are due to valleys terminating on lava flows but most of them are due to these new submarine landslides. The tropical rain storm wh. poured down during a part of our trip produced many temporary waterfalls and gave indication of the rapidity with wh. erosion now acts on the denuded slopes. Topography ~~is~~ marvelously ungaged. Counted seven lava flows one above another near

Took boat along coast ~~to~~ as far as Petit Beleine & back. From Wallibou riv. to Morne Ronde village the sea has encroached considerably on the land. Sharp vertical cliffs with deep water (more than 12 feet) directly up to them, numerous hanging valleys, & absence of erosion phenomena indicate that the land has slipped into the water, forming fault scarps. New land has made out into a point just north of the site of Morne Ronde village. Slipped again between this new point and Morne Ronde Pt. The M. R. point is old lava and has not been affected by slips.

were watching it –
Not many large pebbles – many of size of marbles – Vast quantities of dust – Four & five feet of ashes on Richmond estate. Up to 20 ft or more on Richmond village – Some large boulders on village site wh. seem to have come down in the eruption. ~~Much~~ Some leaf remains in the debris covering the village. ~~Part of~~ The works on the hill were destroyed by the hurricane of 1898 and part was never rebuilt. The rebuilt portion was destroyed by the eruption. Factory on river was ruined by weight of ashes on the flat roof.

Then ensued rapidly the formation of a gorge through the dam with rapids & fall cutting back to the pond (Hist. of Niagara w. steeper grade). The freshly thrown out cinders formed a loosely aggregated barrier. Little water fall releasing pond must have been 6 or 8 feet high 10'? New little cañon at first had vertical walls. Nearly straight.



When we first reached the river the most active center was 200 yds or so farther up stream at the base of a similar bluff of ashes. The change to the one above described took place while we

much heat was stored -
Column thrown up 200± feet
River dammed back by the
ashes thrown out here.
Sometimes ashes were driven out at angle
of 45±°. Little bluff was on our
left as we looked at it, matter
thrown out toward right. Fine
imitation of a geyser. Some
variation in strength winding
up with grand outburst ~~of~~
lasting some seconds after
which all was quiet.
Two photos of spot where erup-
tion took place 6½ : 16 . 02 +
11½ : 16 . 02
Should show pond.

Pond formed above the new
dam until finally the water
reached its lip and ran over

whirlwinds brought the
vast quantities of ashes into
the river bed? Much has
been brought down by the
recent rains. Slope on
S. side is 45° (meas.) in
concavity.
Two photos of river bed - 8 . 02
+ 4 . 02
One of drainage, looking toward
summit 16 . 02
Several of a great blow column
in the bed of the river 8/02

This column of ~~mud~~ ash-laden
steam played for about ½
hour. We watched the latter
part of the little eruption from
a point 525 ft. above sea.
The point of origin was at the base
of a heavy bed of ashes where

30 May –

Richmond estate. Photo of upper mill &c destroyed by eruption 16/02

–

Wallibou river. Much changed from 25 May. Point north of river cut back considerably since Sunday. ~~Lower part of valley contains more ashes.~~ Very hot. Much steam this morning. River cutting now on south side of valley instead of north side as on Sunday. Flowing in same spasmodic fashion. Has cut down very much more deeply than on Sunday. The heated parts are dry – ashes now knee deep + more on slopes

Viewed from S.W. 5.50 P.M. -
active crater at right.
Somma ring very distinct, but
perhaps the eruption has destroyed, or the dividing
ridge - Later glimpse seemed to show
part of the northern rim of old crater -
Two photos W.O. 01

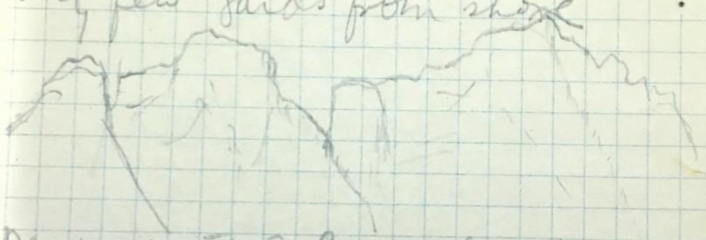
Dark Head - lava, columnar -

The Pitons of St. Lucia plainly
visible as we rounded Dark Head

No deep gash on lee side as
at Pelée.

South side of Wallilabu Bay
great cliff 100-150 ft high – fine
section of agglomerate. Blocks
10+ ft across. –

North side same bay sea cave + a little beyond is a fine
natural arch standing out a
very few yards from shore.



Peaks south of Cumberland bay –
(Little village on shore in bay south of this
or foot of these peaks)

North of Cumberland Bay still agglom-
erate dips slightly northward

South side of Brumaka bay
sea(?) grotto 125± ft above sea –
North side shows three lava
flows one above another

Sea caves in the tuff and ag-
glomerate numerous and typical
Doubtful indications of an elevation
of 60-70 feet. ~~Point south of~~
Bucament point – cliff under-
cut at sea level forming pro-
nounced sea bench. Face of cliff
vertical water very deep directly up
to it – Little islets – vale with palms.

N.B. at least two lava beds at
different levels in point south
of Bucament.

Layou point. numerous
buttes, mostly agglomerate, good
"Hoodoo" topography

Mt. Wynn bay – photo. 4.01 –
South of Barouallie bay – sea cave 4.02
section of shore 4.02
Barrouallie – several views of children
Cliffs on each side of Wallilabu
Bay 8.02 Bright sun

Cow with terrible burns-
Skin hanging from ear-
Burns on negros show
now as white or nearly white
patches-

28 May - On board Dixie
packing + writing = + getting
luggage ashore + into Club.

29 May - Morning rainy-
~~At~~ 2:35 left pier in "bucket
up dug-out" canoe for Chateau
belair - Five oarsmen - breathe
with hissing sound (like axe-
men) - Good natured - Much
talking - Still raining - hard
at intervals - Fine view of
sections along shore - Mostly
tuff - Marked cross-beddin[g]

Griffith - Phot Advertising Co
413 Pearl St - Rec'd Photos
from Dr. Hutson
Dr. J. Hutson, Harmony
Hall, Barbados - Photos -
Promised me a set -

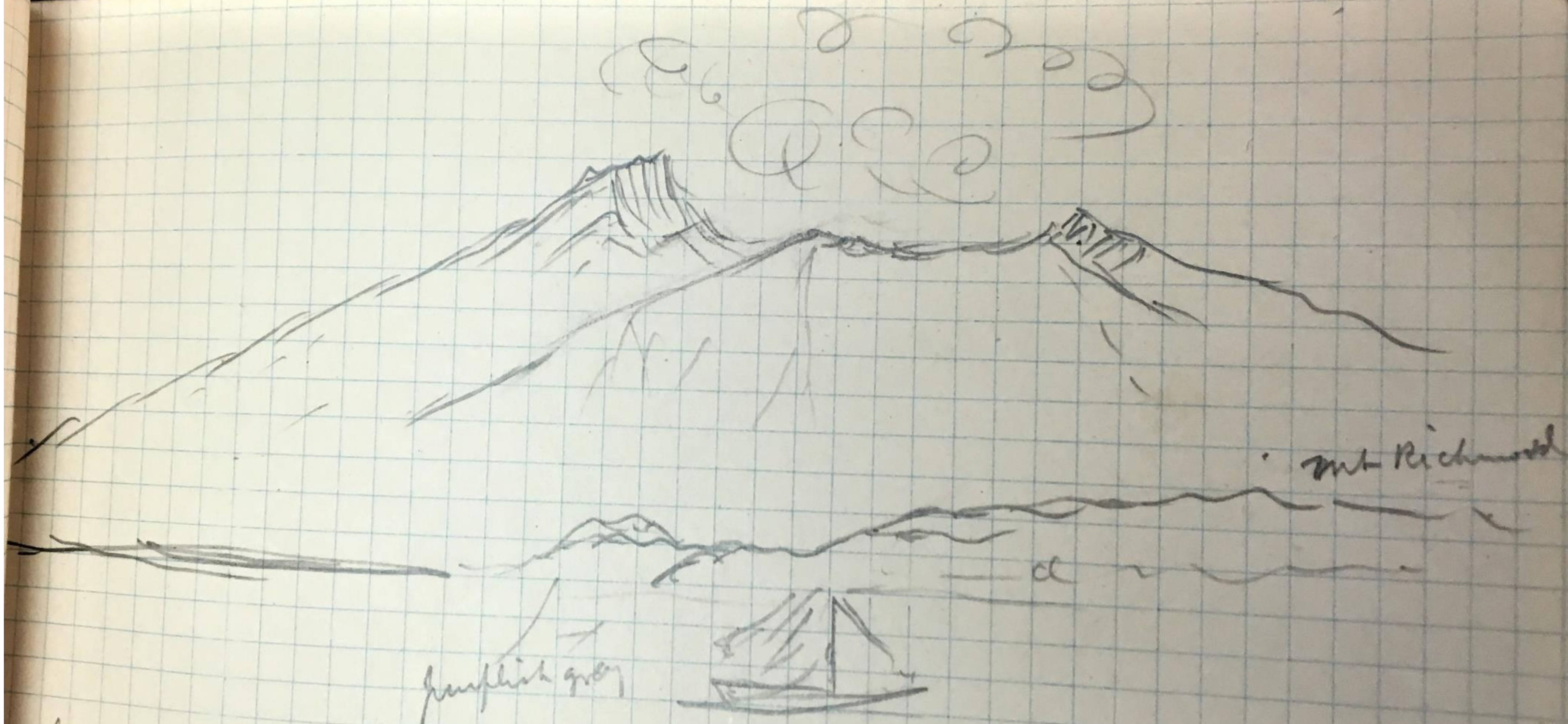
"Send a few cots as sharp as
possible" remark of negro
Georgetown -

Incidents - Landing by crate
and crane - Heavy surf
Loading injured persons
into boats same way. Com-
plaints of recipients of rations
Hospital in church Hotel
with figurehead from ship
as sign post mahogany
table + other furniture Hard
ships of tradesmen. Mayor
of town - pajamas on Sunday

Major J. Will Royal army Medical Corps - was in the military station at the Morne St. Lucia when the eruptions of both took place
Felt no earthquake. Received a fraction of inch of dust, from Pelée. Column of steam &c from Pelée rose to great height + spread out like a mushroom. Column from Soufrière seemed considerably longer than that from Pelée!
Considers hot air + air laden with dust sufficient to account for deaths (answer to my query)

Houses were killed -
House (in Langley Park) in which 21 people were killed House faced sea - Windows (which were not protected) on east side were broken in -
About 18 inches of dust + ashes on av. covered this estate Rapidly being worked away -
Met negroes carrying charcoal made by eruption -
Thomas Osment supt of this estate was at Mt Bentinck estate + felt three shocks earthquake 6 May 7:20 sec 9:45 3d 10 P.m.
Water came down the Dry River at noon of 7 May - to fetlock of horse - hot mud + water -
(Rabacca wharf being buried by sand washing out)

into room - smelled bad
(From Dr. Hutson notes:)
On 7 May in mansion house
Torumma (Porter)
7 a.m. fine stones
then large body of smoke
with whirling motion
Went inside house which
had been closed all ...
Quite dark. Showers gravel
followed by stones.
wooden roof
Hole burst in roof of din
ing room + filled with
smoke. Something burst
on ladder and seemed to
throw out gas wh. suffo-
cated him. Hands face
+ feet burned. Stifling
sensation passed off
+ he remained over night
Five were killed in out-



La Soufrière from S.W. from sketch by G. C. Curtis made 26 May.

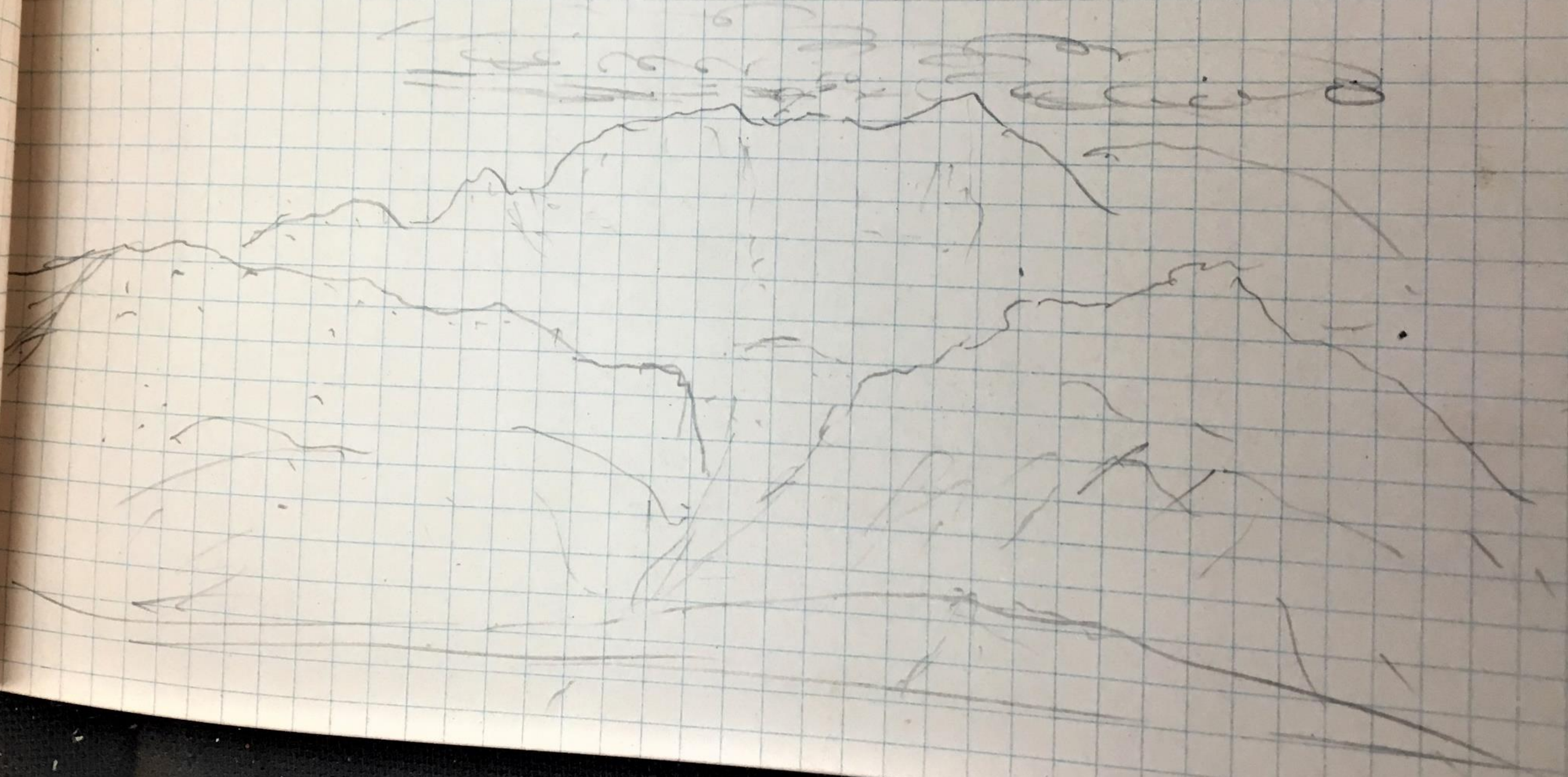
Below Peruvian Vale (?) The
coast is red stratified tuff.
One of the low bluffs looks as if it
had dikes of lava intersecting
the tuff.

Ashes fell thickly as far as N.
Union.
Scorching to a point about
midway between Black Pt.
and Colonarie Riv.

Black Point is an old lava flow
Dr J. Hutson of Barbados was [illegible]
1st days work out of 30 men
12 1 burns were cared for

Connell (negro ~~[illegible]~~ caretaker on Porter
estate) Cloud 1/2 acre in
extent swirled around the
house where he was -
total darkness. Gush of
"fire" came right down

Looking into Mariaqua valley –

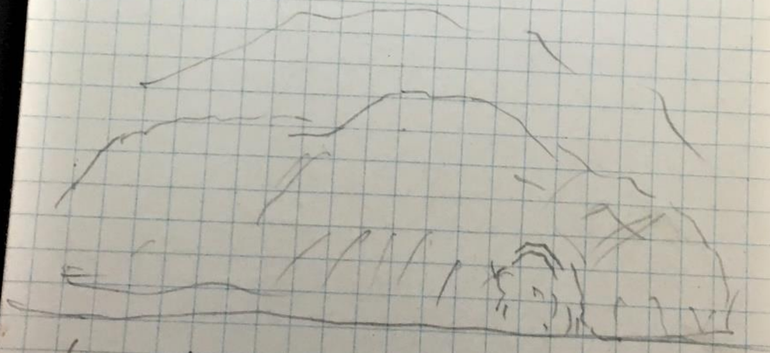


27 May.

Heavy rain betw. 6 + 7 A.M.

Boarded the Wear at 9 A.M. for trip to Photo-[illegible] supplies. Georgetown. Got away at 10:15.

Cane Garden point - columnar lava at water's edge, overlain in places by Tuff agglomerate - + also alternating with the agglomerate toward extreme point - agglom. also to windward. Black Rock is lava. Greathead valley is occupied by fine plantations.



Gambon Head - with sea cave

Agglomerate - Photo 4. .01

Argyle estate looks prosperous

and a cousin were killed.

(Wellington Frazer) Percy, Grant + a ~~Frazer~~ boy

Frazer's cousin ~~+ another man~~

~~started up the mountain~~

met a woman who had been at the crater that morning at 10 o'cl. and who reported that the water in the crater lake was boiling up and likely to run over the rim. The three ~~cousin~~ turned back and went down to Orange Hill and were ~~was~~ killed there.

The old crater lake smelled strongly of sulphur. The water varied in color from green to yellow and blue.

On the northwest slope of Mt. St. Andrew there is a hot spring said to be hot enough to cook an egg. - Mr. Frazer doubts the high temperature. Other hot springs exist in Mesopotamia or Marriaqua Val.

Mr. Alex Frazer M.
at Orange Hill estate (windward side)
7 Eighteen persons took refuge in the half-basement of one building & were saved unhurt, 20 sheep also saved here. They seemed to experience no inconvenience from the eruption, though everything about them was devastated. The building was somewhat protected by the topography of the immediate vicinity, but upper part received injury from the falling stones.

P. F. Nairn, engineer of estates & could give information
The night watchman was in the stable, wld be intelligent witness — also a coolie boy.

Alexander F.
Mr. ~~Frazer~~'s father (the supt. of the estates) and mother

John Medford, lightkeeper at Fort Charlotte, says that he saw "a light of glory of fire in the clouds" of steam that rose from La Soufrière Sunday, ~~18~~ 4 May, 6:30 P.M. This looked just like the reflection of fire under an overhanging cloud. No dust. Roaring. Note that this was before the great eruption.

On 7 May. Great roaring at 1:50, then the great eruption with a great amt of lightning. about 2:30 Small fragments ~~bright~~ like gravel fell at the fort, followed by dust. The shower of dust fell all afternoon and night.
Angle of ~~at Beast~~ 30-35°.
On 18 May – another great outburst with much lightning. about 7 o'clock

Kingstown Hospital 26.V.02
C. W. W. Grant, chief Dispenser
showed us the wards -
Burns from hot cinders, not
from mud. Hands, feet,
arms, legs - some on face -
Negroes, mulattos, Hindoos, Caribs
One negro man whose face + ears had
been burned told me of his dif-
ficulty from breathing on account
of the hot dust in the air -
Fifty one burned cases in hos-
pital to day - 5 or 6 deaths
in hospital - One little
black Carib girl was suffering
from fracture of skull. Head
had been protected by tray.
Clothing was not burned
from these people - Clothing
usually protected parts beneath.

Wallibou river - Bed filled from
40 to 60 and even 100 feet with
the debris - River now forcing
its way through so heavily la-
den with debris that it goes by
pulsations. Waves come down
at intervals of from 15 to 40 sec-
onds - Apparently water needs to accumu-
late strength to force its way a-
long with its load of ashes -
Small amounts of steam rising
in ~~from~~ countless jets Occasional
outburst of greater magnitude
sometimes carrying dust -
Roar from descending water may
have been in part what ~~was~~
heard yesterday.

Above Barrualli the hills rise at a rather steep slope to lava bed 2/3 up

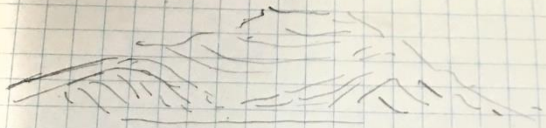
La Soufriere has Somma-like ring around northern side. Deep ravine. Summit higher than that of crater.

Chateaubelair island and the near mainland show excellent basaltic columns.

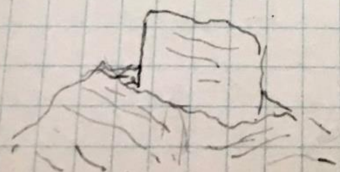
Richmond estate — House was ruined in hurricane of 1898 and only partly rebuilt. Now ruined and partly burned by eruption. Undulatory surface of dust now. Rather light gray when dry. Two to four feet deep — Some scorching — Coffee, cocoa sugar &c. Small stones up to head size mingled with the dust

~~25 May 1902~~

Fort point, west front, bluffs at water's edge fine grained tuff, occasional small boulders various dip. Light buff salmon pink, red — thin



~~Ne~~
Next little bluff has a lava bed in it and large blocks lie at its base. ~~Chase valley~~ Camden Park has rather gentle slopes which head up into the steep sides of Mt. St. Andrew (?) Promontory north side of ~~valley cove~~ York Bay is a low bluff of rudely columnar lava. Instances of local slipping along shore. Especially good in promontory south of Wynne Bay



Kingstown harbor lies open to southerly and westerly winds. On the eastern side ~~the~~ an ancient lava flow showing columnar structure forms the eastern shore of the bay. The ~~flow~~ lava bed rises toward the north and seems to disappear in the top of the hill just east of the town. Most of hills seem to be composed of volcanic tuff and agglomerate. The town has been built on a small alluvial plain. Handsome villas occupy high ground - Old Fort Charlotte is 627 ft above sea on promontory to west of harbor 1/2 mi. from town. The lower part of this point, at sea level, is composed of tuff and agglomerate. Two thirds of the way to top the bed of columnar lava is evident - another bed of lava occurs at the water's edge, small extent, point between fort & town.

small opening (like crab holes) ~~Depth of~~. At edge of sea removal of few inches showed hot water. ~~Man jum~~ as hot as hand could bear it. Man jumped from boat into water & as he sank into the sand he pulled himself out again saying his feet got into hot water. This was on Friday 16th - ~~AF~~

Lake formerly in old crater was sounded and no bottom found at 70 fathom ~~20~~ 30 yards from shore -

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Eruption of 1812 -
Kingsley's "At Last" pp. 53-58
Humboldt "Personal Narrative" Book V Chap. 14

on Wednesday. Clear sky during the outbursts of Tuesday (6) & also on Wednesday (7)

Richmond Point – Pile of ashes 50-60 ft deep covers site of Richmond village – Top of bluff also covered with ashes Manager's house in ruins –

Eruptions seem to show marked sympathy with those of Pelée

Roar today as we lay off the coast sounded like that of Niagara. Very continuous – probably caused by the rain falling on hot ashes – enormous volumes of steam –

Morne Ronde – (T.M. ~~McD~~) there is an extension of new land into sea – steam jets rising from

North cape of Wallilabu Bay – fine material, well stratified dipping northward –

Shortly after passing this cape we noticed from the "Wear" 12:40± P.M. – a column of vapor suddenly rise – – from valley of Wallibou river – Chateaubelair point & Island basaltic columns –

Burnt area on south west slopes of Richmond Peak south of Kukumgare –

Came down to sea shore about ½ mile north of Chateaubelair

Drops of mud fell as far as Barrualli

Drops " " in abundance at Chateaubelair

Heavy reports Tuesday 6 May when individual explosions took place

The continuous roar of the great eruption began between ~~&~~ 10 & 10:30

west side from Richmond to Windsor Forest (Petit Belair)
This zone was "fire swept" Devastation extended in less degree to Fancy Estate. Devastation was worse on west side but people had taken warning + fled.
Fifty feet of ashes where Wallibou was located - At Richmond estate a new headland has been formed.

~~Mr. Powell~~
Fragmental material forms bluffs all along sea - west coast - one lava bed noticed north of Clare valley. Basaltic columns in bed of lava in middle of bluffs back of Barroualli village. (photo)
Bottle + glass rocks (photo) roughly stratified, coarse agglomerate -

round the column of steam &c.
Did not experience suffocating gases himself.
Could not tell whether both craters were in action. Thinks new openings were formed on flanks of mountain. Before he left he observed the flat spreading of the top of the column. More to east than to west.
Noted height of column before great eruption at about 7 times the hight of the mountain, or 28 000 feet
(Griffiths) — about 2:45 (or 2:50) P.M. 7 May - the ashes began to fall in Barbados. Before that the telegraph operator there had been asking the cause of the roaring + noises heard from direction of St. Vincent.
Dust began to fall in Grenada about 4 o'clock.
(Began in Kingstown about 2:15 or 2:20)
At 4 P.M. Barbados telegraphed that they were lighting lamps there on a/c of darkness from dust cloud.

(24 May)

Mr. MacDonald – staid at his house till 2 P.M. on Wednesday, 7 May

4 men on lee side island saved themselves from the gases by constantly diving + coming up to their boat – One of them became too weary to dive any more and he had the tops of ears singed –

Saw large blocks (flour barrel) issue from ~~the~~ column at height of 4000 ± ft above top of mountain. Such blocks as could be seen very distinctly from his estate wh is four or five miles as the crow flies.

These blocks seemed to him to issue from the eastern side of old crater –

Site of Wallibu factory + mouth of river now show deep water where there was a sloping beach – before the eruption.

Mr. McD. saw light playing a–

Wm J. Durrant – Bet. 2 & 2:10 P.M. of 7 – May one of the huge brown clouds of dust, referred to previously, was just leaving the dense column when a flash of pinkish purple light resembling lightning seemed to disconnect (split) the cloud, as it passed to windward, wh. opened + closed again instantly – Half of this cloud passed on to windward + the remainder came back on the island.

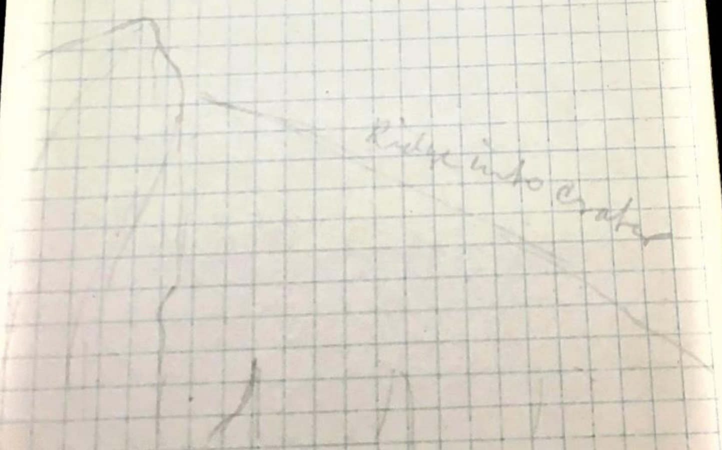
H. Matthes, from Bolivar, Venezuela, who came here for his health, will publish in German periodical

Clara E. Taylor -
Photographer - St Thomas &
St. Croix. Photos of Pelée &c.

Was in St. Pierre ~~several times~~
~~between~~ ~~8~~ 17, 18, & 19 May -
Some houses intact, even
preserving roofs & windows.
Altar & painting in cathedral
uninjured -
Other houses had lost roofs
but retained upper stories
Others preserved only the lower stories.
Many houses were burned but
he thinks that the fire was
due to lamps & domestic fires
and not to eruption directly.
He found dead woman & children in one of the houses, cloth-

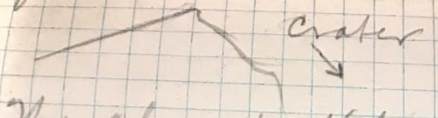
Box B11: Edmund Hovey Collection: Box 3, Item 31, St. Vincent east, June 3-9 and July 8-10 1902

the saddle. Turned eastward
along rim of new crater. At
intervals the clouds broke
away sufficiently so that we
had a dim view of part of
it and thought we saw the bot-
tom - Ridge runs down from
saddle into crater -



Some dust heaps at
bottom of the slope of ridge. Those
we saw were not strikingly large.
Dust on rim of new crater

first reached the summit -



The clouds did not permit
us to see into the old crater
at all. We walked along the
summit of this safe ridge un-
til Brown said that the "New"
crater was on our right and the
saddle should be directly in
front of us - Heavy cloud
of mist. Sudden drop here to
the saddle, even before the erup
tion. Aneroid where we stood
= 3550 feet. Roaring in
old crater very plain & dis-
tinct from the howling of
the wind - No sound from
New crater - Too much
fog to attempt to reach

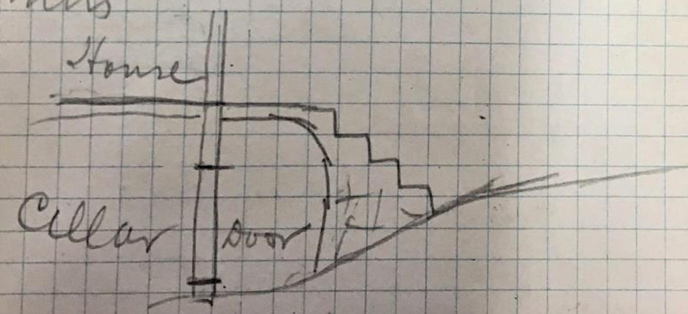
The great plain which slopes down from 1100± ft A.T. to the ocean is deeply eroded at upper part but only partly channeled in lower.

We got clear up to the rim of the old crater, but did not dare to go quite to the edge because it was so sharp (overhanging?) and had open cracks ∥ to its edge, one of wh. was 1½ to 3 inches wide, too suggestive of landslides into the crater! Went along then N & N.W. Very rough travelling on acct of rain channels after 200 or 300 yds the edge of the crater was not so dangerous and we went to it. Then could see the steam issuing from even the very rim where

When I asked Friday how high he meant that the wall of water was mountain high he pointed to the factory chimney, wh. is 60± ft high. Friday did not feel hot air at first, later it was hot and hard to breathe on acct of dust. He did not notice backwash from the sea, because he was in the house. He said that the downrush of boiling water through the Dry river valley took place about an hour before the big outburst, as nearly as he could judge. He said there was no rain during the eruption.

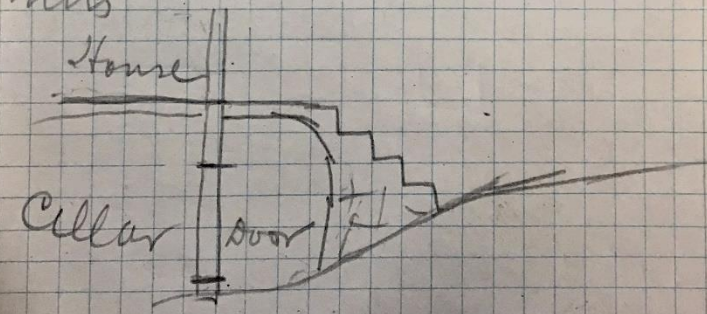
[It seems as if this flood of boiling water must have been the lake thrown out bodily]

Mr. John C. Brown, wife and three children took refuge in the cellar of the house. This cellar has a small iron-barred window in it which was open during the eruption, and it and the door are both on the side toward the crater, but there is a slight rise of ground directly in front of them thus

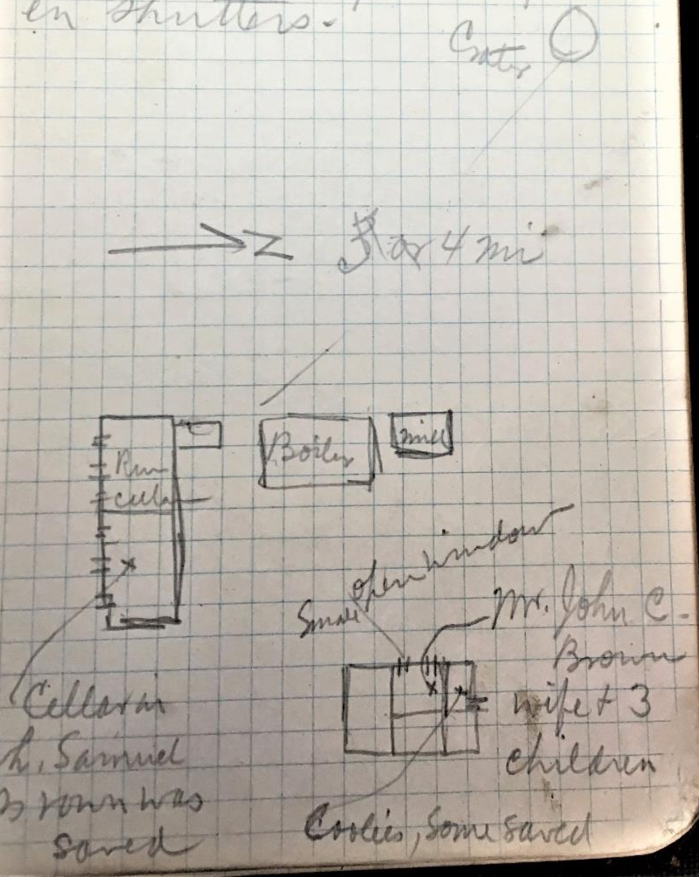


The family crouched down together in the N. W. corner of the cellar and all were saved

Mr. John C. Brown, wife and three children took refuge in the cellar of the house. This cellar has a small iron-barred window in it which was open during the eruption, and it and the door are both on the side toward the crater, but there is a slight rise of ground directly in front of them thus



The family crouched down together in the N. W. corner of the cellar and all were saved to that of Orange Hill, i.e. it faces the south. Here again there were no openings on the side toward the crater & the others were protected by heavy wooden shutters.



Frederick Friday, sugar boiler & overseer on Lot. 14 Estate was saved by running to Rabaka Estate & getting into the manor house there. Says no rain attended the eruption except a little drizzle in the morning. Dry river came down "mountain high" with boiling water filled with sand. Great puff from mountain & burst. (See beyond)

The openings of the curing house cellar in which Brown took refuge are not directly opposite the crater, as at Orange Hill. The curing house & cellar are about at right angl

Saw some sand blast
action on one of the old
slopes –
Photo. 4/02 of large "Sam-
tamien" tree 1250 A.J. S. 60° E. blown down
by blast from crater –

It seems to me that when
the great volume of confined
steam rose to the top of the
crater it expanded sudden-
ly in all direction causing
this great tornado down
the sides of the mountain
Could not expend all its
force upward –

Brown says a small pond was formed
in the south fork of Dry river
where it joins the main valley
formed by dam of ashes in
the big valley

Scarcely breathe. Lasted but
a few minutes. Dropped to
floor to breathe. "When you
stand up the heat so you could
not breathe. It no strike
you down, but you must
drop to ground to breathe."
"We see the gutter (the dry
valley) lead the fire down"
Smelled sulphur strong
[These people donot seem a-
ble to distinguish between rotten
egg smell & the smell of matches]

S. Brown stood outside watch-
ing the eruption time the
great explosion at 2 o'cl.

Ridge just as narrow be-
fore the eruption as
now –

when they struck the ground
"the fire opened" - No rain
at all -
Thunder at 10 a.m. Wednes-
day - a little rain. Mud
"plenty" fell then from above -
about 1 inch deep - Ran
off as fast as it dropped -
~~[illegible]~~ Warm but not scald-
ing -
~~At 2 P.~~ after noon small
stones (1 cm) then larger ones
then the big stones with
great explosion at 2 P.M. -
when this came the black
cloud rolled down the mt
with a great blast leveling
the trees. Wind + stones
wrecked the buildings -
The air was so hot he could

James C. (white)
Brown, the manager of the es-
tate, his wife + three children
saved themselves by going into
the cellar under the manorhouse -
~~Others (coolies black) were saved~~
~~in the cellar~~ - 11 blx + 29
coolies were killed in buildings
in which there were openings -
but some were saved out of a number in a cellar with open door
Samuel Brown describes the
cloud from the eruption as
going down on both sides of
the building and rushing
to the sea where it made a
"line of fire" when it struck.
He says the cloud did not come
back from the sea - Samuel
Brown went into cellar at first
2 P.M. 7 May + remained
till 5 a.m. next day -
Big stones dropped, hot -

along the [illegible] trend of the main
valley. Tremendous blast

~~New~~ deposits in Dry riv
seem to exceed in quantity
those of Wallibou

Photo 8/02 looking southward
across the Dry riv. valley to
show the leveling of the trees in
a direction down the main val-
ley by the great explosive blast
from the crater. The trees
on the near slopes of the Morne
Garu Mts (Mt Brisbane) show
the effects of this great tornado

Samuel Brown (blk) watch
man + ranger at Lot 14 est. was at the
estate during the whole eruption.
Saved his life by going into a cellar
underneath the curing house
+ closing the doors (2) tight.

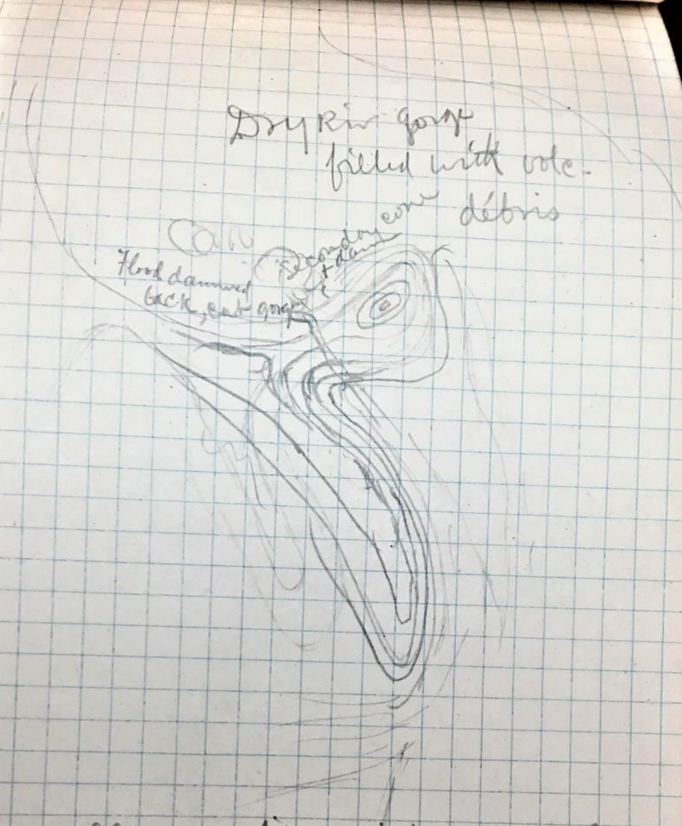
8 June –
Did not go out –

9 June –
Started 7 a.m. –

The debouchement of the Dry riv.
ash bed from the hills looks like
a glacier issuing from a valley.
The stratified "coastal plain"
deposit runs up a pretty uni-
form slope to 1100 feet a. t. where
it butts against the ridges. But we
saw no sign of elevation at this
height. Wld be inclined to
place one old shore line at
200-225 ft.

Valley to right contains
ash beds + terraces 50-60 ft
deep in bottom.

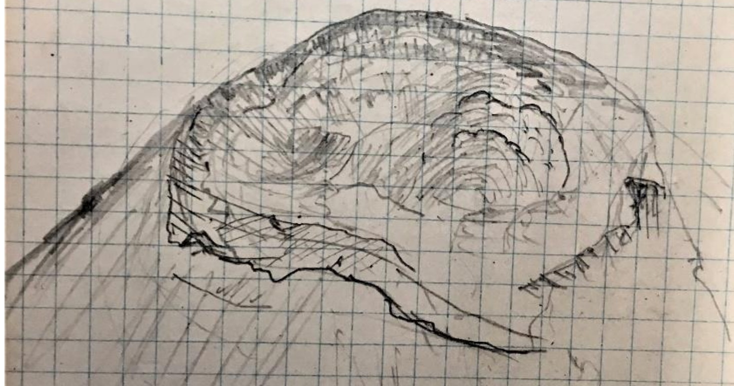
Trees on this ridge blown down
by blast from direction of crater



History – Old gorge filled with ashes – Part of drainage turned over lip of old gorge into Langley Park Riv. – Waters dammed back behind spur by ashes + flood turned over the spur cutting ~~a~~ gorge 20± ft. deep through old tuff – Trenching of ashes to point below level of divide – Last flood sent some ash laden water into Langley Park Riv. but then trenched too deeply to repeat the process –

On the south side of the natural outlet of the river the ashes formed so much of a dam that the waters flowing down that side have cut a new gorge through the spur + discharged through ~~[illegible]~~ of the ravine ~~wh has always fed the Langley Park river~~ – to south of main channel – Gorge somewhat tortuous – Pot hole erosion by sand laden water. Under cut banks &c &c – Splendid instance of torrent carving – The sides in their minute carving show the varying direction of the water currents by the lines of cutting + protection by pebbles, "Glacier mills" &c in the old tuff body –

surface about shows the vigor
with which it has exploded -
Steam has but little odor of
sulphur - The water has
been ponded back in the
craters along this drainage
line.



face torrents are particularly the lines of steam now.

Some crevices produced by sinking are now regular fumaroles + are making deposits of sulphur in minute Xls.

Odor of SO_2 rather strong ~~over~~ from the steam holes + crevices here.

Current of steam strong enough to keep small pebbles (1 cm diam) in suspension in a small hole.

Photo of the little cone taken at L to lass view.

Another blowhole to the south east of the one just mentioned has built up for itself a little cone + regular crater. Crater breached on one side. Right beside drainage channel. The great amount of dust on

depths of the bed. These ash beds contain a large proportion of bombs and blocks and are mostly now composed of particles the size of gravel. The configuration of the old surface here was such as to form a strong eddy causing the ashes to drop in the gorge. Morne gain (Mt Brisbane) range partly responsible for this as the Richmond Peak range was for the accumulation in the Wallibou river valley.

Noticed bombs (i.e. blocks whose surface had been melted) up to 2 ft across. Occasionally a rounded boulder of old lava was seen.

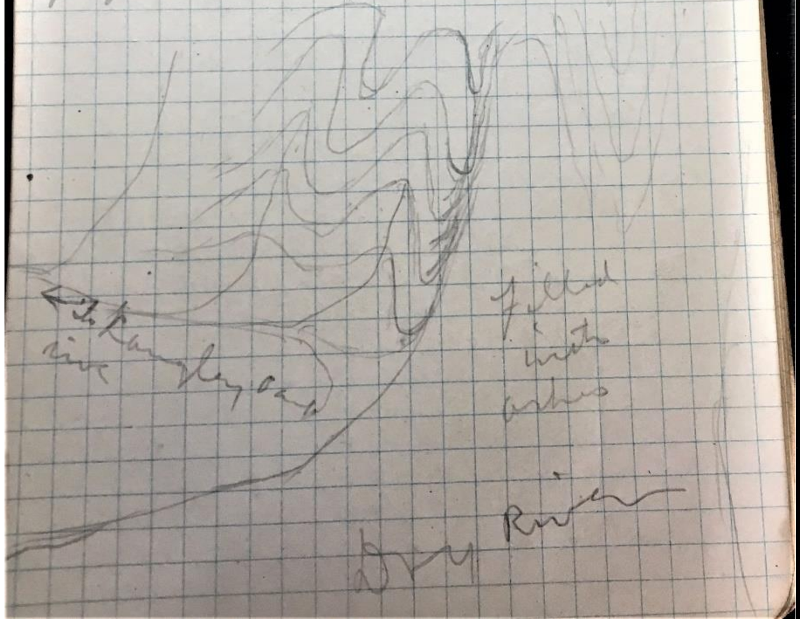
The courses of the present sur-

Showing fine curve
Collected (five) some "bombs" from the surface of the ash bed near some steam holes - This steam does not smell particularly of sulphur, but the foundry odor is pronounced - Went on up the now hard ash bed to where the steam outbursts were so strong ten days ago - Some steam still issues -
Photo 8/02 of one of the largest of these secondary ash cones - In the background there is a ponding of two streams shown, one much larger than the other. Much hissing from the water percolating thro these porous beds Evidently much heat still in the

The top of a big grau palm tree orig. perhaps 40 ft high shows about 5 ft above the ashes - 15 ft from the edge of the old gorge
This diversion of the drainage of the Dry river has ceased or is about to cease because the torrents are cutting down to the old channels. The old gorge at this point is variously estimated as having been from 75 to 100 feet deep - A little steam is still issuing from the ashes & the ground is warm to the touch. Overloaded stream phenomena with built up fed illustration here also
Photo 4/02 Near view of ash filled Dry river issuing from hills

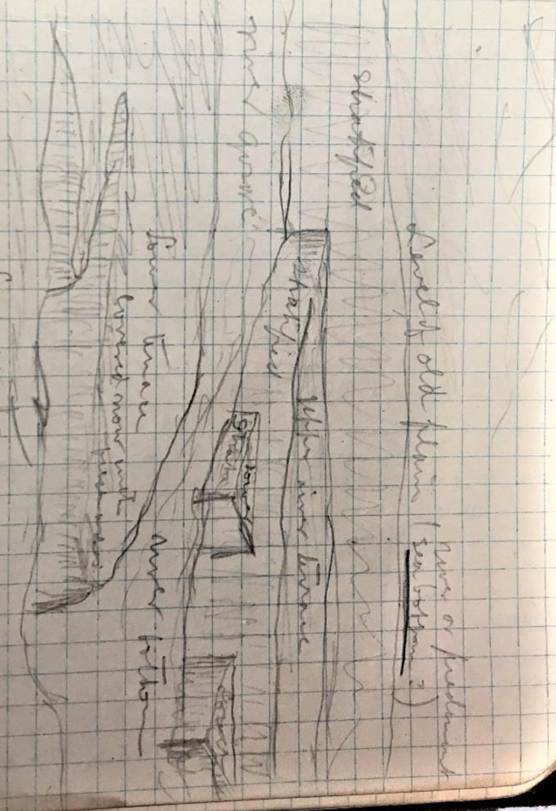
Langley Park river by the ashes
filling the bed of the Dry river
The back or west side of Happy
Hill is a kind of infacing
escarpment formed by the river
coming out of the hill there

The divide of the old plateau was
at the very edge of the Dry River
gorge before eruption



The main plateau is about 200
feet above the sea where it reaches
the base of the mountains. Made
up of waterworn boulders gravel
& sand black & yellowish brown
The detritus of the hills & volcanic
ash brought down by the streams
& rearranged by the ocean then
elevated to present position.
Photo of Happy Hill showing a
few huts beyond which the pla-
teau is shown against the base of the
old shoreline – Numerous
delta fans in the recent river valley
where the little rivulets from the
ash covered hills debouche into
it.
Photo showing diversion of
water from Dry River across
head of coastal plain into the

rains have produced sheet floods which have carried away great quantities of ashes when at their most vigorous stage + have deposited some during their last stages of diminution -



View northward across Dry River - from upper river terrace.

7 June - 9:50 a.m.

Dry River - Photo 8/.02 showing the stream of ashes coming out of the hills - Old terraces in the lower portion of river - recognized by the line of roots + other vegetation below the coating of ashes - Much erosion done since the eruption. The overloaded side streams have deposited load from the slacker water along their sides. Apparently the streams were so thick with ashes that they rolled along somewhat above the general immediate level. The new trenches in the old terraces have vertical or nearly vertical walls. On the comparatively gentle slope of the plateau the recent heavy

roof of the porch on sea ward
side of Spence's hotel. One of
these was an irregular hole
about 8 in. in longest diam. 2
or 3
others were smaller, but by
far the most were only suffici-
ent to let the daylight through.
The long axis of the largest hole
was nearly at right angles to the
street line -

to town. The reports were heard at Kingstown + Chateaubelair according to 'phone from former place inquiring as to cause of noises. No ship entered harbor. The upper part of the mountain has been covered with clouds all day. Sometimes very thick. and dark. After 11 o'clock high cumulus clouds stood over the mountain, but this seemed to be of no significance because cumulus clouds were to be seen at the same time continuing to the N.E. over the ocean. There were heavy rains last night and early this morning.

Counted about thirty perforations of the galvanized iron

Note. A man who was inspecting the crown lands on the mountains above Owia heard the reports - one heavy, then after a few minutes a lighter one, then a double report. He thought they came from seaward fr. man of war at target practice. Could see no ship + concluded they came from the Soufrière on St. Lucia. People on the north shore of St Vincent were frightened by the reports and fled down the ~~lee~~ coast. In Georgetown the people generally thought that the Soufrière of St Lucia must have begun an eruption. They said the northern sky looked just as the sky over this Soufrière did on the day before the big eruption. It seems to me, however, that we cannot judge about it because the whole mountain on this island and the northern horizon are covered with heavy mist, very dark. Cumulus clouds have stood above this Soufrière, but similar ones are all about. Have observed no dust falling.

7 June. These phenomena prove to have been due to another outbreak of Pelée. Lieut. Marshall, in command of U.S. collier Leonidas, arrived at Kingstown today. He tells me over the 'phone that yesterday at 3 P.M., when 102 miles west of Martinique, dust began to fall upon the deck of his ship. The shower continued for nearly three hours and fully 1/4 inch fell on the Leonidas in that time.

Two of view down the main street (looking S.W.) showing refugees receiving clothing and food -
Two of Hindoo coolies with new clothing under their arms -

(About 10:45)
Between 10 & 10:30 felt slight shock to building, as I was sitting in hotel. Like a distant blast. People in the street heard (or felt) the same and we heard them saying "De Soofree go boom - boom". The people say they heard four (some say 5, & others 7) reports like those of cannon. Saw one man from (work at) Rabaka who said he and others heard the reports, that the sounds came from the direction of the crater, that he & the other work people were scared & came at once

down - not burned -
Bluff 150 ± above sea -
Police station burned -

6 June - ~~to~~ Staid in Georgetown writing, watching Soufriere and looking at the people. Crowds of refugees receiving their dole of provisions to last till Monday. Clothing given out today. Recipients proud as peacocks. Never before have these people had as good clothing as that which was sent by U.S. Those who are not refugees look on with envy at this easy method of getting a living -

Photos - Transportation - Tandem team of donkeys with load of (vol.) ashes from the streets. Two donkeys with crates for carrying loads on back

(The stream south of Overland has cut into its banks deeply but has filled up its flood plain.)

At the mouth of Agrika river ashes have made far out into the sea & have been cut into again by the waves & the material distributed along the coast. New beach may be 100 yds wide.

Delta fans superb & well marked by the lighter colored shore material contrasted with the black beach sand.

Overland village picturesquely situated on high bluff over-looking ocean. Houses blown

Building up of sea beach noticeable along coast. Photo of Robin Rock by Curtis showing the new beach beyond the rocky point.

All region up to Overland terribly devastated. Village of Overland wrecked, partly by wind during eruption.

Worst devastation extends to just beyond Karo Pt. Some uninjured (?) trees show back of Karo Espagnol Pt. saved.

We turned back at point south of Karo.

Straight beach south of Karo pt much built out. Fine delta fan to dry stream wh flows into sea here.

Agrika river much cut back

5 June
Tivena Est. (prop. of D.K. Porter - like Lot 14, Orange Hill + 19 others) Four people saved
Over 300 killed on the estate
A man and his wife saved themselves by going into his shop and locking the door. Fine dust got in however. Manager killed - House wrecked
Roof of boiling house also + the chimney wh. was comparatively new was thrown down. Some "trash" houses were burned - Several tamarind almond and other trees were blown down + now lie pointing away from the crater. The little shop or store was about 15-18 ft square.
Every living thing destroyed

the erosion will progress rapidly. Large proportion of erupted material was gravel, size of dried split peas (3 mm) up to size of ~~small~~ marbles (10 mm). Commingling of country rock and scoriae in this stuff. Ejected blocks of considerable size (cu. ft. + more) numerous, also found a good many "bombs" of the Vulcano type with "bread crust" surface showing that they had been fused. One such mass was 3½ feet long, but showed the peculiar surface less satisfactorily than the others did.

Deep scouring in the basaltic(?) lava. Photo of one ~~river~~ portion of the river course where the rounded rock channel is about six feet deep – narrow V shaped. This was taken looking down stream. Looking in the upstream direction the narrow, deep trench or channel in the rock was very evident. There is no permanent stream in this valley and the great erosion has been done by the torrents which rush down these slopes ~~after~~ during the rainy ~~sea~~ season and after heavy rains at any time. In the present condition of absence of vegetation and presence of vast quantities of loose dust ~~erosion~~ ready to be carried along by the water

Journey up windward side of La Soufrière, 4 June.

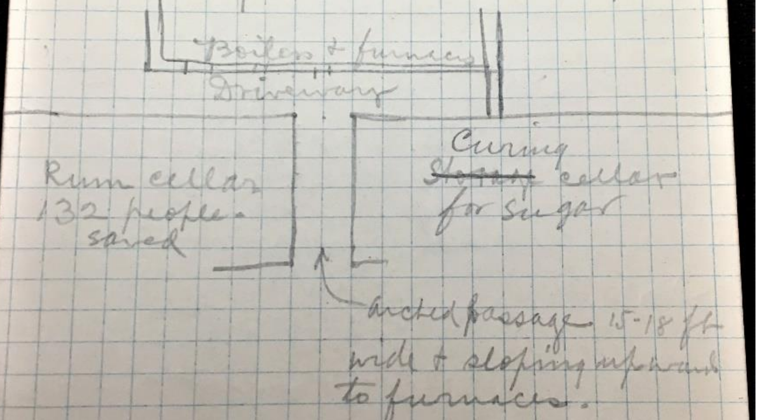
The great ash bed of the Dry River which was steaming so vigorously at the time of my visit to Georgetown 27 May has quieted down, so that only a few mild steam columns are to be seen. Other smaller such areas were noted, but these do not seem to be as extensive as the deposits in the corresponding valleys on the leeward side.

Ridges on this side are not as continuous as those of the lee side. (Trenching greater?) Our road traversed several beds of lava after we descended into the bed of the north fork of the Dry river.

which this cellar and the storage
room are has a second story
on a level with the boiling
house. The portion of the gal-
vanized iron roof which is a-
bove the rum cellar was broken
down by the debris during the 7th
of the May, the roof over the
other part of the building is intact.
Roof had rather low angle.
The roof of the boiler house is
of shingles, rather steep &
was not injured. The roof
of the shed south of the main
factory, where the squeezed canes
were stored, was burned, but
not by the eruption.

5 June Photo of hotel Splendide
" " S. S. Garrett
Mayor of Georgetown

Between the two parts of the lower
portion of this building there is
an arched passage way leading
to the ~~boilers~~ furnaces of the
sugar boilers and this passage
opened out on either side of
the boiling house. Several per-



sons took refuge in this passage
way and lost their lives because
the dust-laden hot air + steam swept
through it and suffocated
them. ~~The~~ The building in

openings. Heat was very oppressive. air suffocating. Smelled of sulphur (rotten eggs, one said) For four or five minutes it seemed as if every one would die from suffocation & cries for water were heard on all sides. Then the air cleared a bit, though the rain of dust and stones continued." Taylor's statement is that 132 persons were saved in this rum cellar - not one was injured except a little child that was somewhat burned before it got in. Several persons died in the cellar who had been outside and had received part of the fury of the storm of dust, ashes &c, before they could get or be gotten into the cellar.

Wave of dust &c came down the Rimeh (?) Hill dry river on South side of mill - a deep ravine 100-150 ft deep - also down the slight ravine on north side of house. A coolie told me that trash in front of cellar & some of the houses were set on fire by the hot stones. Taylor (who is a very intelligent black man) and the others said that the "cloud rolled down from the Soufriere along the ravines, struck the sea, burst into flames poof, poof, poof, and at once turned back toward the sugar factory striking the building with great force and forcing shut the heavy doors and the heavy wooden shutters of the window

Grade of slope 5½ feet in
90 ft
Roof of wheel house was broken
in 7 May –

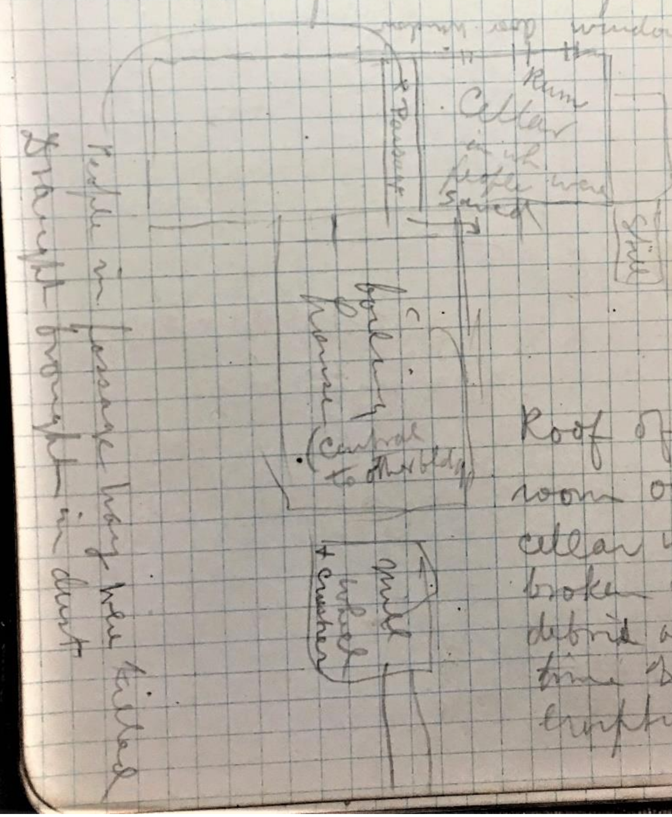
Mrs Fraser's body found on
face head toward sea 50
ft from house in the public
road S.E. of house
(Jacob Taylor (black) 48 years
old, cellar-saved) informant)

Mr. Fraser was found on
west side of house near door
head toward house arm over
face
Taylor thinks the nephew
& Grant were found in cellar
with many black people

10 long paces wide
46 " paces long } outside of where cellar

dust we found on windows
cases – Some outbuildings have
been crushed by weight of
sand &c ~~235 ft from mill.~~

Cellar again – the floor over the
cellar has been broken through
since the eruption – ~~the gal~~



Roof of
room over
cellar was
broken by
debris at
time of
eruption

Saw four black people who were saved there. afterward saw others From 2 P. M. 7 May till next morning they staid there Cellar was on ground level on side away from moun-tain. No opening toward Soufrière, one wide door and two ~~&~~ windows with wooden shutters on sea side. Hard to breathe on account of heat ~~[illegible]~~ Smell of rotten eggs - (Hard to make these negroes understand one)

Frasers house - 235 feet from mill no evidence whatever of fire. One unpro-tected window on west side was stripped of its glass the windows on sea side were protected by a porch roof. Some impalpable

fresh fracture surfaces + enor-mous blocks

North Fork of ~~Pabatea~~ or Dry R.

Photos at 1750 ft - group - down - up - 1530 - toward sea

Photos at 1500 ft - up gorge with group in foreground - erosion channel in the lava -

Party -

Jag - Cunt. Hovey

J. C. Wilson, Photog. Kingstown C. E. Taylor for Photogr. Sic. Soc. Grenoy

Osmond Phills (blk) ~~vet~~ - surveyor Kingstown

James Beach (Wh) manager Sans Souci Est.

Orange Hill - Cellar 20 paces long outside 8 1/2 paces wide inside 10-12 ft high -

Whole bldg. - 46 long paces long + 10 wide outside.

4 June

Started 6.40

Left horses 1800 ft 8.20

Very deep ravines - Followed up the course of the Rabaka Dry River in bed or on ridge. High up on the slope found goodly number of "bread crust" bombs besides the ejected blocks. Some of the latter show the effects of having been red hot (Specimen) Passed over several lava beds. One of our men said Jaggar was "perfectly active" ——

Surface has only a little of the fine dust. ~~of~~ Tops of ridges harder and firmer than those to leeward - ~~P~~ Halted for lunch at 2700 feet at base of cliff of

Road east of ruined factory at Jambu
boulders of breccia within a breccia. These boulders or rounded masses are quite large, two & three feet in diam. Mostly whitish or greenish white, a few black, in a red brecciated matrix - Sea beach?

Photo. of Baiabu (?) Point showing two sea benches at elevation of 60± ft & 100±.

Pink breccia at sea level, overlain by beach deposit at adelphi - This is a volcanic breccia.

Stable with donkey, Hopewell
Mariaqua valley
House & family
Jungle –

Montreal Spa at foot of Petit Bon-
homme head of Mariaqua valley
considerable iron, rather sweet taste & CO_2 very slight
H_2S – cool just beside the stream
(Yambou river) Bank of ferns –
Bamboo Geommier tree (or gum tree)
Many air plants wild bamboo, ~~[illegible]~~
wild palms (palmist) &c.
1450 ft a.t. (aneroid – Curtiss approx)
Mesopotamia vill – 450 ft.
Gorge of the Yambou river – Colum-
nar basalt flow showing in west
side – weathered tuff or breccia
on the east side –
Photo looking north near the middle
" " " southern end
" of village

Road to Mariaqua valley – (3 June)
Much decomposed basalt (?)
Breccia – apparently some, ~~or~~ one flow – badly decomposed
Colors deep red, black greenish-
yellow-gray – Boulders of de-
composition as well as those
~~others~~ of the breccia (or agglom-
erate).
Photos of Mariaqua valley general
from Pleasant Hill – S.E. corner
2 at 4/02 Dark green background
Some clouds –
Spheroidal weathering in tunnel
S. side Mariaqua vall – 4/04
Mesopotamia Police Sta – near
outlet of the valley – Valley for-
merly closed by old lava (Basalt)
flow, now cut thro by gorge

diminishes in quantity as you go away from the rim of the old crater. [We saw the saddle from the lee side 31 May & Mr. MacDonald said then that its ~~outline~~ sky line was essentially as before]

It seems to me probable that the "New" crater has taken no part in this eruption, reasons:

1 – Ridge sloping into crater seems intact.

2 – Saddle is ~~as~~ about as before.

3 – Small heaps of gray dust at base of slope, as if from old crater.

4 – No sound

5 – Condition of its rim

Appendix C: Photographs donated by Lance Peters of 1971-72 and 1979 activity

Figure C1: Georgetown, 1979

Figure C1. Men driving through ash covered Georgetown in April 1979.

Figure C2: La Soufrière, unknown date

Figure C2. Unidentified researchers in the crater of La Soufrière, unknown date. Likely after the 1971-1972 activity, but before 1979.

Figure C3: La Soufrière, 1979

Figure C3. Ash plume of La Soufrière, unknown location. April 1979.

Figure C4: La Soufrière, 1979

Figure C4. DaSilva A. (1979) La Soufrière in the clouds, unknown location. 1979.

Figure C5: La Soufrière, 1979

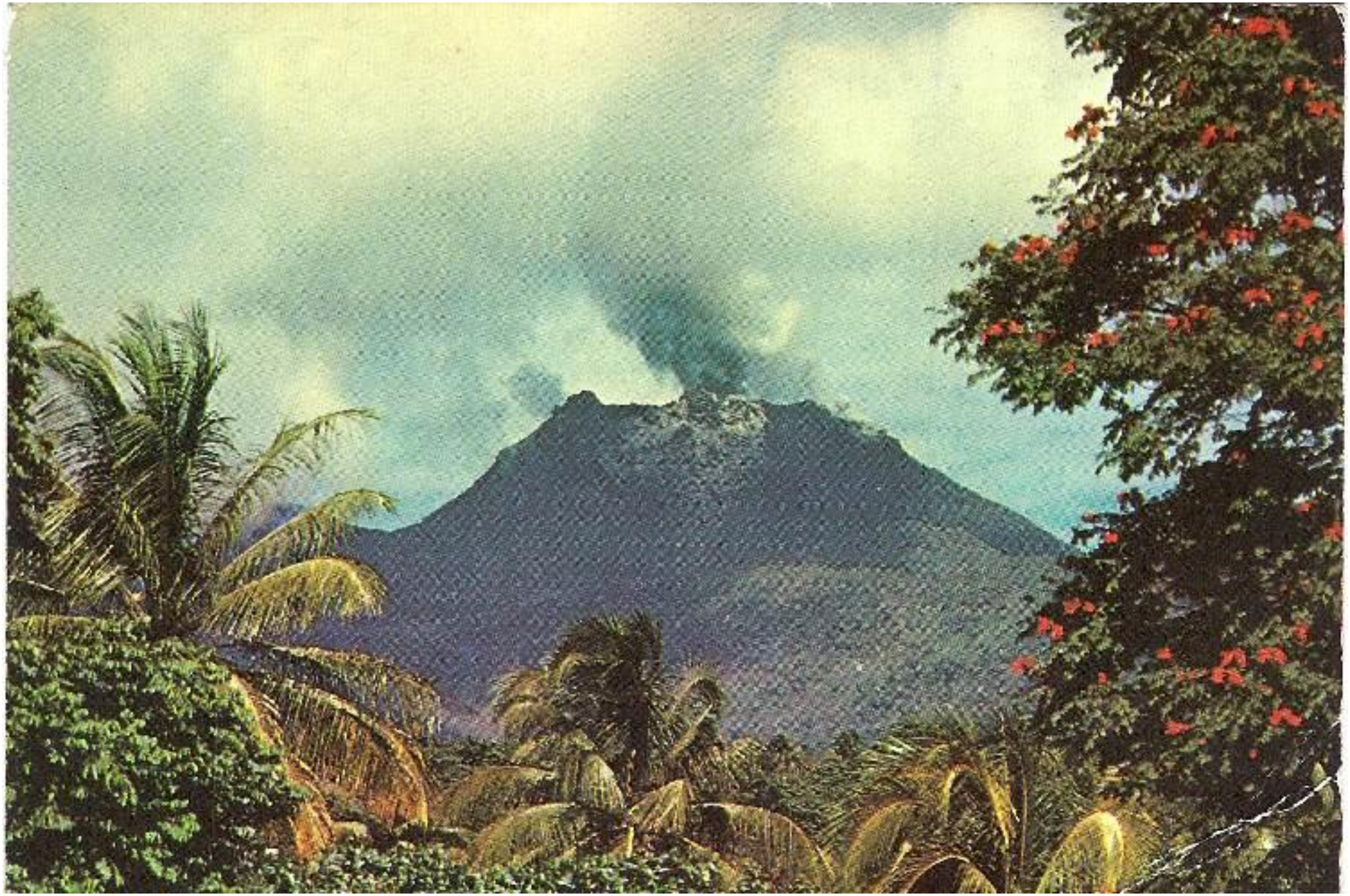


Figure C5. La Soufrière, unknown location. 1979.

Figure C6: La Soufrière region, 1979

Figure C6. DaSilva A. (1979) Unknown location in the vicinity of La Soufrière. 1979.

Figure C7: La Soufrière, 1979

Figure C7. DaSilva A. (1979) La Soufrière crater, due to presence of lava dome in the right-hand side background, this would be approximately May 1979.

Figure C8: La Soufrière crater, unknown date

Figure C8. DaSilva A. (N.D.) La Soufrière crater, unknown date.

Figure C9: La Soufrière crater, unknown date

Figure C9. DaSilva A. (1979) La Soufrière crater, unknown date.

Figure C10: La Soufrière crater, unknown date

Figure C10. DaSilva A. (1979) La Soufrière crater, unknown date.

Figure C11: La Soufrière crater, unknown date

Figure C11. DaSilva A. (1979) La Soufrière crater, unknown date.

Figure C12: La Soufrière crater, unknown date

Figure C12. DaSilva A. (1979) La Soufrière crater, unknown date.

Figure C13: La Soufrière crater, unknown date

Figure C13. La Soufrière crater, unknown date.

Figure C14: La Soufrière eruption, 1979

Figure C14. DaSilva A. (1979) “Actual eruption”, unknown location. April 1979.

Figure C15: Chili, 1979

Figure C15. DaSilva A. (1979) "Taken from Chili", looking at La Soufrière hidden in cloud. April 1979.

Figure C16: Table Rock, 1979

Figure C16. DaSilva A. (1979) “Table Rock”, La Soufrière region, unknown date.

Figure C17: Northwest St. Vincent, 1979

Figure C17. Northwest St. Vincent, most likely in the Chateaubealair region. April 1979.

Figure C18: La Soufrière crater, 1979

Figure C18. La Soufrière lava dome, May 1979.

Figure C19: La Soufrière crater, 1970s

Figure C19. DaSilva A. (1970) La Soufrière crater. As there is a presence of a crater lake, this is likely in the early 1970s before the 1979 eruption.

Figure C20: La Soufrière crater, 1970s

Figure C20. DaSilva A. (1970) La Soufrière crater. As there is a presence of a crater lake and also lava dome emplacement, this is likely post-1971-1972 activity before the 1979 eruption.

Figure C21: La Soufrière crater, 1970s

Figure C21. DaSilva A. (1970s) La Soufrière crater, post 1971-1972 activity.

Figure C22: La Soufrière crater, 1970s

Figure C22. DaSilva A. (1970s) La Soufrière crater, post 1971-1972 activity.

Figure C23: La Soufrière crater, 1970s

Figure C23. DaSilva A. (1970s) La Soufrière crater, post 1971-1972 activity.

Figure C24: La Soufrière region, 1979

Figure C24. DaSilva A. (1979) La Soufrière region, 1979.

Figure C25: La Soufrière crater, 1976

Figure C25. Mart D. (1976) La Soufrière crater, 1976.

Appendix D: Field notebook

Below is relevant personal communication and data within the notebook taken on fieldwork to St. Vincent.

D1: Personal communication

2nd March 2016, with host: "Many people from low Leeward [Chateaubelair and the south] moved from the Soufriere are down to here [Vermont] and to town [Kingstown] before Soufriere erupt and afterwards, most are still down here".

27th April 2016, with Historian Dr. Adrian Fraser: "Rabacca Dry River would have greatly impacted the plantations in that area, there was a wharf…[In] 1838, sugar declined, [and] settlements developed after this time. Mostly leased by landowners and turned [into settlements]…1838-99, sugar experienced problems, [as] land wasn't well developed, geography was a key restriction and was late to develop. Former slaves moved away, planters reluctant to give up land, they had control on labour [which was] mainly sold between planters…Royal Commission report 1887, people [were] getting restless due to [the] lack of employment and land. A lot of the land [was] left idle, [there was] a fear there would be riots. In the 1870s, there was no longer elected officials, the governor acted on the empire, and got advice from mainly planters, people wanted to get rid of the system. [In] 1899 [the] peasant land settlement from the commission [was developed] and started with a few estates mainly on the leeward side. The [colonial] government moved people to Richmond Hill, Park Hill, Cumberland Valley, Keatles, Chauncey, Clare Valley and Camden Park. In 1902…Orange Hill manger killed, owner tried to get help from [the colonial] government, but didn't so sold it to the Bernards that held onto it until recently. For Morne Ronde, some land disappeared, there was a big dispute between them and [the colonial] government for some time".

30th August 2020, with Brad Scott: "The eruption catalogues from Ruapehu and Tongariro have been used to inform hazard maps, part of the data set used to create them. Combined with eruption observations, modelling and field geology".

D2: Other

Table D2.1. Agriculture report detailing the years of various commodities. This was used to find a suitable replacement record for the inconsistencies of data lost from 1901-1905.

Cotton	Arrowroot	Cassava	Sugar	Maize	Cacao	Groundnuts and peas
1905-1929	1908-1932	1908-1932	1913-1937	1913-1935	1900-1904	1914-1934
					1908-1923	

Appendix E: Semi-structured interviews transcriptions

Information provided for each interviewee is gender and location at the time of the eruption. Not everyone provided an age, therefore this was largely excluded however, in the transcribes, ages may be included. However, all interviewees were alive and witnessed the eruption of La Soufrière in 1979. All interviews are transcribed in full verbatim by a hired transcriber.

Interview E1: 17/03/2016, interviewed in Kingstown, Female (x2)

Speaker Key:

IV Interviewer
IE1 Interviewee – in Villa at the time of the eruption
IE2 Interviewee – in Byera at the time of the eruption

00:00:00
IE1 Really something that I [unclear].
IV Yes, you was around 12 years old, you said. Yeah.
IE [Over talking]
IV So it does feel exciting, yeah.
IE1 Not just exciting you are [unclear].
IE2 Yeah, jittery, jittery, jittery.
IV Yeah.
IE2 I was scared the evening when I see the big cauliflower. The ash going up in the air.
IE1 When it coming over just like...
IE2 I start trembling.
00:00:19
IE1 Coming on you.
IE2 Coming on you.
IE1 Which I remember they sent me to the shop.
IE2 I have a radio in me hand, it drop.
IE1 And when I went [unclear].
IV Oh, huh.
IE1 You see ashes boiling over. Oh they're coming, oh they're coming. And the place get dark like it [unclear].
IE2 And you know, funny about it, when you living at Villa Flat, no ash falling. With that big thing, it go by, but it was grenade that kind... and it did fall back in.

IE1	When it did boil up, it spread. And then...
IE2	It just rolled in our plate.
IE1	Rolled in... When they're coming up and it [unclear] it boil, it come up, and then it spread across.
00:00:51
IE2	Mm-hmm.
IE1	So some go to buy a [unclear] uh.
IE2	Mm.
IE1	[unclear]
IE2	Mm-hmm.
IE1	Especially people who are [unclear]. How they some more ash, they get more ash. More than we.
IE2	Mm.
IV	Mm, inter...
IE1	It was a time to remember.
IE2	We would always remember.
IV	Okay, well thank you.
IE2	You're welcome.

Speaker Key (second recording):

IV	Interviewer
IE1	Interviewee
IE2	Interviewee
US	Unidentified Speaker
00:00:00
IE2	Okay, do you wanna turn this on? [Unclear] Soufriere, so I just blank her out [unclear] no good Friday and so on.
IV	Oh yes.
IE2	You want to sleep and this kind of thing.
IV	[Laughing].
IE2	So when I eventually got up, you know, and I went out the road to see trucks upon trucks passing down with people covered with ash. So I call out to one guy and ask, what happened to you? He say, don't you know what's going on? I say, no. He say, it's Soufriere.
IE1	What time was it? In the morning?
IE2	Yes, in the morning.
IE1	[Unclear].
IE2	It was in the morning. Say about... Because my neighbour woke me up about say seven. [Unclear]. I continue to sleep at seven. 9 o'clock I got up.

But it's Saturday night I think.
00:00:42
IE1 Ash [unclear]. Because...
IE2 Yes.
IE1 In the night we was hearing like thunder rolling. And my [unclear] Tom [unclear].
IE2 Yeah.
IE1 And on Good Friday. [Unclear].
IE2 Mm.
IE1 When we woke up I will look out. [Unclear]. Soufriere in action. And then as with the progress, when you went out on the road. Then the place start to get dark, get dark and dark [unclear].
IE2 In the end ashes was falling, people from Sandy Bay.
00:01:20
IE1 Start from on that side.
IE2 Yes, not down by us. It's in the afternoon we see the big cauliflower in the air, then it reach Barbados, all in different Grenade. All those countries get ash from us.
IV Yeah.
IE1 Some of them get more ash.
IE2 More ash than us in St Vincent. Barbados get more ash.
IE1 [Unclear] blow.
IV Yeah.
IE2 They have to use umbrella and these kind of thing in Barbados because blow that side.
IV Yeah.
IE1 If anybody pass in your yard, you know, because of footprints.
IE2 All over was cover and some people get sick from it, like who have sinus problem.
IV Oh right.
IE2 I, my throat. I got sore throat.
00:01:57
IV Mm-hmm.
IE2 Because you inhaling the ash you have to wear a mask.
IV Yeah.
IE2 Because when the wind blow, your head grey, every part of you because of the ash. Your house cover over. People had to wash out their roof and these kind of things. And after that, um, because we have a different eruption we didn't have one big blow. You have different, um, thing, and every time, like the night now, you see like lightening.

IE1	[Unclear] trees.
IE2	Yeah, yeah. You hearing the...
IE1	[Unclear] trees.
IE2	Grumbling and so a lot of trees...
IE1	Like firewood.
IE2	Dry. Like turn coals. We can [unclear] the thing. Then like one evening... It was the next evening in the market down there, the whole place just get dark.
IE1	Mm-Hmm.
IE2	Then, um, you see people start running from one way to the other and so on.
00:02:49
IE1	[Unclear] back to [unclear].
IE2	Yeah people couldn't go back then. The next... The Friday.
IE1	They found out who was in the camps.
IE2	Yeah. Yeah, yeah. Like the market people and so on. You see some people running to the car, leaving all their stuff on the ground that they're selling. And, so because there was the next eruption at that time again. We was getting them in different thing. Different eruptions.
IV	Different bursts?
IE2	Yeah. Yeah it was getting it like that.
IV	Mm.
IE2	Then, we, we [unclear] some time because after ten years still getting these mild eruption and so on, until eventually it stop and a dome up in the Soufriere. Water around it. But right now it's still a smoke, but it's still there and we have to live in it.
IV	Mm.
IE1	[Unclear]. [Over talking].
IE2	But the people, how long they stay these shelter?
00:03:39
IE1	[Over talking]. [Unclear] they stay [unclear].
IE2	About a while, three months or so in the shelter?
IE1	More than that.
IE2	Because, um...
IE1	It was April. Our school normally give vacation for like two weeks.
IE2	Mm.
IE1	April, May, June we never go back to school until like maybe to the end of July.
IE2	Yeah because the school was [unclear] the place.
IE1	[Unclear] [Over talking].

IE2	Because some...
IE1	[Unclear] went back was from [unclear].
IE2			Oh.
IE1			[Unclear].
IE2	Mm-hmm. Mm-hmm.
00:04:06
IV	Is that when you went back to school?
IE1	[Unclear] [Over talking].
IE2	Yeah a few months after.
IE1	Most of the school was [unclear]. Shelters.
IV	Yeah. May I ask where you were living when you went to school?
IE1	I was living in Barraouallie.
IV	In Barrouallie? Okay, great.
IE2	And I was living Villa Flats. I had to bring my parents from Byera Hill to stay with me in Villa Flat. Because of... That was one of the danger that was close to the Soufriere.
IE1	Most of the people had to leave, and they bring them to Barrouallie in camp. But Most of the camp was in Barrouallie.
IE2	Yeah and from the way north side they bring them Calico [?].
IE1	Calico.
IV	Okay. Hmm.
00:04:46
IE1	So all the schools and community centres and churches.
IE2	Churches and all of that.
IE1	[Unclear] used to bring the people and then they met at the station, so they could give a report how many people they bring in.
IE2	Mm-hmm.
IV	Oh. Hmm, um, I don't know there's some other questions here, I don't know if you'll be able to remember?
IE2	We will answer what we could remember.
IV	[Laughing] Um, going back to the year before do you remember anything unusual happening? So, in 1978.
IE2	With the Soufriere?
IV	Yeah with the Soufriere.
IE1	No.
IE2	Mm-mm.
IV	No?
IE2	No, nothing happened. You didn't say, get a warning or anything like that to say well, you expect something will happen. Nothing, it was normal.

00:05:35
IV Oh.
IE1 Only on that [unclear].
IE2 Good Friday.
IE1 Night. When it was boom like it was thunder rolling. [Unclear]. It's Good Friday.
IV That's interesting because actually before 1978 there was actually earthquakes happening, underneath La Soufriere at that time.
IE2 No. Well we only get it bam.
IV So, yeah.
IE2 The same time it erupting, you're getting the earthquake, you're getting the lightening. Well we saying lightening, but I think it was fire from the Soufriere...
IE1 From the Soufriere.
IE2 And it grumbling.
IE1 [Unclear].
IE2 Yeah people want get calls [?].
IE1 Yeah when people go up to the house some of [unclear] standing but it...
00:06:20
IE2 Dead.
IE1 They dead [unclear].
IV Hmm. Okay, interesting. Um, a bit, um, did you learn... What did you learn about the volcano in school? If you can remember [laughing].
IE2 Well to be honest, I must be honest with you they never really taught us anything. I can't remember doing any volcano. Like now they're doing it.
IV Mm.
IE2 But in my time...
IV They didn't?
IE2 I can't remember if they ever say anything about volcano.
IE1 [Unclear].
IE2 But... We are more aware of what happening now.
IV Mm-hmm.
IE2 But, before, you know.
IE1 [Unclear]. [Over talking].
IE2 Even though with the hurricane and so now we have awareness with these things, what before they might tell you, yes you know that we have a volcano up there.
00:07:11
IV Mm.

IE2 People used to live [unclear] Easter Monday and so go up to Soufreie and so on.
IE1 [Unclear].
IE2 Yeah they still does it.
IV I think I'm going to do it [laughing].
IE2 [Laughing] that will be good because I went up there and have a look at it and so on and it was just water.
IV Mm.
IE2 In the crater, you know?
IE1 It was just [unclear] for me. It was just [unclear] for the Easter went up there [unclear].
IE2 I went up there when I was small, during school. I went up there. But I can't go up there now.
IE1 [Unclear].
IV Hmm, okay.
00:07:44
IE1 [Unclear]. Yes. What is god. [?]
IE2 Mm.
IE1 [Unclear].
IV Do you both go to church frequently?
IE1 Yes we do.
IV Yes? Um, so during the time of the eruption or just before it did the school, [mouth click] school. Did your church actually talk about the volcano in anyway?
IE2 Yeah, yeah, yeah. You know they used pray for people in shelters and so on.
IV Okay. Okay so they were involved in the shelters?
IE2 Yes.
IE1 Yes, yes.
IV Okay. Okay, um, so you said you noticed when it erupt... Was starting to erupt on Good Friday.
IE2 Mm-hmm.
IV Um, and you said that you evacuated.
00:08:21
IE2 Mm-hmm.
IV Um, when you evacuated did you stay with family? Um or were your friends or were you in a...
IE2 Who had family... Who had family stayed with families. Some stay with friends.
IE1 [Unclear].
IE2 And some stay in the shelters.
IV Okay.

IE2 The majority is shelters. Because, um, only few like, I, I... My people stay with me like I was living down there, but a lot of people, you know, they don't have.
IE1 And that is how, many people get to live in different areas. [Unclear] some live in Barrouallie, and they never returned back to their regular homes.
IE2 [Unclear] Villa too?
IE1 And some living in Camden Park because they never returned.
IE2 They never returned.
IE1 They just move in and stay.
IV Okay. All right. Um. So, when you evac... Well when you evacuated did you do it just on your own initiative or did you wait for the government to tell you to?
00:09:22
IE2 No, we had to wait. Well some people moved before. Who had transportation move.
IV Okay.
IE2 But who don't have to wait to get government transport.
IV Okay.
IE1 [Unclear].
IE2 Some people walk.
IE1 Some... I remember in Barrouallie they told [unclear] right down, so you couldn't just go. And the chauffer is right there, you open the door and you go in and they take you. And just tell them where you want to go. And they take you.
IV Okay.
IE1 That used to happen. That happened in [unclear].
IE2 What all over?
IE1 Mm-hmm.
IV Hmm, okay. So how long do you think the... This activity actually went on for? Do you remember?
00:10:04
IE1 Like two weeks. [Unclear].
IE2 You mean the eruption?
IV Yeah.
IE2 No, it go further. It go longer than that because it's so minor that thing. [?] I will say certain... Like for a month, it was like in a month.
IE1 I remember that night and everybody settle down and like [unclear]. Call [unclear]. Call all the people and wake them up for the shelter. I tell them come, come with me, come with me [unclear] that is when it... When I [unclear] the trees, them catch a fire light up as well.
IE2 Well you see that same night, my experience with it. My house was full. I had to look to walk my bed.
IV Oh [laughing].
IE2 So my husband took me for a drive, you know. And when we came back I went in and I lie down and he went, um, elsewhere. When [unclear]. Hear

my mother, he say, [unclear] rain.
IE1 [Unclear]
00:11:01
IE2 The rain is the ash.
IE1 Ashes.
IE2 Falling on the house.
IV Oh right.
IE2 Then he tried attempt cell phone and so wasn't popular [?] to call me to tell me to look outside but he could not get to me. And he can't come back to me because the [unclear] not moving because the ash and kinda seize it up. When I get up next morning, I do so [action]. Hey wait. What happened here? What happened here? Pure ashes seen all over. I heard it and I thought it was rain, but it was ashes.
IV Hmm. Okay.
IE1 [Unclear].
IV Yeah.
IE1 That was mostly because [unclear] and when the people running [unclear].
IE2 Mm. They had to put tree over their head and so.
IE1 [Unclear] houses, trash [?] houses.
IE2 Caught fire.
00:11:53
IE1 Catch fire.
IE2 But you know what happened in this last one here too? Somebody was in Canaries [?] and I have to dress their wound. They get caught quite in Canaries. I say, about how much miles? From the Soufreie to that where the stone drop?
IE1 Where the stone drop.
IE2 Like from here to. But you were not St Vincent. You know Barrouallie?
IV Yeah, I, I, I'm... I know. I know it quite well I've been here before.
IE2 Oh.
IV I stayed in Byera actually, last time I was here.
IE2 Byera?
IV Yeah.
IE2 Where you from? Byera?
IV No, I stayed with someone called Angela Griffiths.
IE2 Them Griffith?
IV Yeah.
00:12:28

IE2 Oh Jesus, have mercy.
[Laughing].
IE2 [Unclear] from Byera, them Griffith [unclear] from up that side.
IV All right.
IE2 Okay, you see. But you see like Byera to Georgetown?
IV Yeah.
IE2 Well it's Canaries. Well you know Canaries? Well and you know where the Soufriere is?
IV Yeah.
IE2 Well it's Canaries where the guy get caught.
IV Really?
IE2 Yeah. With this stone trap him. And you know what happened to people [unclear] galvanised punch from this stone in Georgetown that fall. Mash up the toilet, mash up the face basin [?], punch through galvanise and all them kind of things.
IV Wow, it's quite powerful isn't it?
IE2 Mm-hmm.
00:13:08
IV Yeah, yeah. Um. Okay, yeah, so, yeah the eruption did actually... Well for the explosive stuff, it happened for two weeks, but you're right it did go on for...
IE2 Yeah it go on.
IV A few more years.
IE2 It go on.
IV And created the lava dome.
IE2 Yeah, yeah.
IV Yeah so um, so did you... You were saying some people didn't return home. They stayed where they, um.
IE1 Yeah, they stayed.
IV Did you guys actually return home? Or did you move to...
IE1 [Unclear].
IV So you were fine?
IE1 Yes.
IV So you stayed when it happened?
00:13:37
IE2 Well my parents went back to Byera.
IV Okay.
IE2 They went back to Byera after the dust settle.

IV	Mm-hmm.
IE2	They went back to, to, to Byera.
IV	Do you... Do you remember how long after the eruption was when they went back?
IE2	They went back maybe a month or so after.
IV	A month or so after?
IE2	Yeah.
IV	Hmm, okay. Yeah. Um, what... Do you remember what made them want to return? Or did they just like, oh it's over now, we'll just return.
IE2	Well remember, they have their house, they have lands, and so, the mountain land, and all that and for the time they by me, they could not have done anything. So they have to go back and secure their properties.
IV	Okay, okay. Um, do you remember any other people returning or did some actually stay where they were evacuated to?
00:14:23
IE2	A lot of them, especially my area of... I'm in [unclear].
IV	Okay.
IE2	From Sandy Bay [unclear] and all of that. A lot of them stay, well they're squatters they say.
IE1	Well land [unclear].
IE2	And build up something and stay there.
IE1	[Unclear]. [Over talking].
IE2	There're there right now.
IV	Okay.
IE1	In Campden Park there are a lot.
IV	So their... So that their houses were damaged but then they just went back and rebuilt it.
IE2	I think, I don't know if it's right or what, so they didn't want to.
IE1	Some of them didn't return back to their...
IE2	They didn't want to go back.
IE1	Whatever they could have gotten from the area they take it.
00:14:52
IE2	Mm.
IE1	And elsewhere.
IV	Okay.
IE2	Yeah, yeah.
[Interruption].
US	Hi.
IE2	Morning.

US [Unclear] yesterday [unclear].
IE2 Oh.
US [Unclear].
IE2 Okay.
US [Unclear].
IE2 Okay, okay.
US She went to the shop.
00:15:16
IE2 Okay.
US [Unclear]. Okay, thank you.
IV Okay, so after when you returned home and stuff, um, what was done to rebuild? Um, like their lives and the houses and that.
IE2 Well they had a lot of cleaning up to do.
IV Mm-Hmm.
IE2 Some had to change their galvanise. Some had to back tile it and [unclear] and these kind... A lot of cleaning up. Then after a while they settle.
IV Mm. So was it... Did people do anything different? Like... Did they like secure their properties more or? Did they take out insurance? What... Something different?
IE2 I doubt. Because taking out insurance... Insurance is very expensive.
IV Mm-hmm.
IE2 For sure my... My people didn't pay for the insurance. It's just there and you suffer [unclear].
IV [Laughing]. Okay, yep, fair enough, fair enough. Um, so, I don't know if you remember, but um, what... What help came from the community, or charities or church, government or families. Was there any help coming from outside? Helping you to like clean up and...
00:16:26
IE1 Yes, plenty.
IE2 Plenty, plenty, plenty.
IE1 Plenty, plenty.
IE2 From all them different countries overseas. A lot of people, um, things was flown in.
IE1 [Unclear] shelters for a long time and it's like if I take in a family they will give me...
IE2 Yeah.
IE1 To help the family and so yes, plenty.
IE2 Because I did have to go.
IE1 It went on for months.
IE2 But I did have to go, but to calpo [?] and collect stuff because I have uh 20... 20 of my people in my house, so they used to give me supplies to, to, to feed them.

IV	Okay, okay.
IE1	And so they will help them getting homes yoo.
00:17:02
IE2	Yeah.
IE1	[Unclear].
IV	Okay, um.
IE1	To rebuilt homes and [unclear].
IV	Yeah. So, um, don't know what you... How... Soon after, what did the government do in terms of responding and stuff. Do you remember if they did anything differently, did they announce [unclear] we will do this, this and this.
IE2	The government helped to rebuild some of the, the houses that were damaged. Some of the roads that was covered with ash. Because the ash at that time and the rain wet it, it get like cement.
IV	Mm-hmm.
IE2	And so on. So they try and clean that up and so on. Try to make people life easier.
IV	Okay. Okay, um... Okay yeah, so I think that's everything I wanted. So overall what to you feel the impact of the eruption was on you, and your family and your community, if you can summarise it?
IE2	Well, it was um... What to say?
IE1	[Unclear] mix of [unclear] society [unclear]. Yeah.
IE2	Okay you have to remove family.
00:18:03
IE2	Whole life was...
IV	Yeah.
IE2	You know, torn up because you have to move from your home. You have to be somewhere, because if not my family didn't get to stay with me, they had to be in a shelter and you know that shelter is not that comfortable.
IV	Mm-Hmm.
IE2	And so on. So it kind of [unclear] torn up your life.
IE1	I think for some people, after the Soufreie, they were better off, than when... Before the Soufriere.
IE2	Before the Soufriere.
IE1	They come in to say for living [?], little place, [?] the government were able to help you to get something that is much better.
IV	Okay.
IE1	Yes, you know. I find it [unclear] that way.
IV	So...
00:18:36
IE1	For some people it was.

IV Yeah.
IE1 Good.
IV Yeah.
IE1 You understand?
IV Yeah, yeah.
IE1 No life [unclear].
IE2 Mm-mm.
IE1 [Unclear] business, thing and so they found out that everything was okay, the government help [unclear].
IV Okay.
IE1 And as I say, like who was poor and they don't have much thing, when the government build for them, build something what is much better.
IE2 Than what they had.
00:19:07
IE1 Yeah, because, you know, like you had [unclear].
IE2 And could tile it, and bath [?] this kind of thing.
IV Okay.
IE1 It was well taken care of.
IE2 It was rough with the ups and down and so...
IV Of course.
IE2 But after it turned out.
IE1 [Unclear] it was unexpected uh.
IE2 Mm-Hmm.
IE1 Yes, they could never prepare for these things.
IE2 Sure.
IV Okay.
IE1 It just happened.
IE2 Because we go to sleep the night...
IE1 Yes.
IE2 And no body no nothing about Soufriere.
00:19:37
IE1 [Unclear].
IV And on Good Friday.
IE2 Good Friday, okay, you know you're going to church and this kind of thing.
IV Yeah. You thought it was just going to be a normal day.

IE2 But when my neighbour wake me up and say, what she want all day? [?]
IV [Laughing].
IE1 [Unclear] Until you [unclear] Easter.
IE2 Cross buns.
IE1 [Unclear].
IV Yeah.
IE1 Ready for the day.
IE2 Sweetest thing, how I didn't.
IE1 Woke up there, [unclear] somebody shouting, [unclear] Soufrie in action, [unclear].
00:20:07
IE2 Yeah [unclear] cross buns and so, in spite of that...
IV Yeah.
IE2 You know, you're telling me [unclear] the mackerel to soak, the potato they can cook but when I really realised.
IV Yeah.
IE2 What happening, you know?
IV Yeah.
IE2 When I get scared, the afternoon.
[Alarm]
IE2 Excuse me please.

Interview E2: 17/03/2016, interviewed in Kingstown, Male

Speaker Key:

IV Interviewer
IE Interviewee – in Montrose at the time of the eruption

IV Good morning.
IE How are you doing? Are you good?
IV I'm good. It's just a struggle getting into town and then internet, tried to connect, so, yeah. But yeah, yeah, finally got it working, so…
IE Good. So you're in the library, are you?
IV Yes, yeah. Um, I managed to ask to, um, speak in the, in the conference room, so I've got the conference room to myself, so that's nice.
IE Yes, sure.
IV Okay. Um, so shall we just…?
IE Are you, that's good, [unclear]?

IV Sorry?

00:00:29

IE I say, you ask your questions and I respond?

IV Yes, yes. So we could just get started. So first question was, how old were you in ’79?

IE Um, I think I must have been 18.

IV Okay, okay.

IE If you look [unclear].

IV [Laughs].

IE [Overtalking].

IV Yeah.

IE But I’m, I’m [inaudible], I’m [unclear] born…

IV [Laughs], okay.

IE Um, 15th February ’61, so you got to recalculate that.

IV Okay, great. Um, and where were you living at the time?

IE I was living at, um, New Montrose in Kingstown.

IV Okay.

00:01:08

IE [Unclear] to Kingstown, you know that, as, uh, quite close to where Nemo [?] is located.

IV Okay, okay, yeah. Yeah, I know where you mean. Great, um, so just to keep things broad and general for now.

IE Yes.

IV And then after you've talked about it I will go into more detail with some other questions. But, um, describe what you remember from 1979.

IE Um, well, [clears throat] well, I don't know if you know, but 1979 was essentially uh, uh, a, a big turning point in, kind of, my, my life.

IV Uh-hmm.

IE Um, that, it, it really is the thing that led to my becoming a, a volcanologist, in a sense.

IV Uh-hmm.

IE But, okay, so in ’79, I was in Sixth Form. Um, I was in [unclear] six at the time, so we would have been the exiled [?] form, so we would have had to write, um, GCE in [unclear] in June of that year. So, um, I, I’ll, in a sense, when the eruption happened, um, I would have been, it was Good Friday morning, so I think the whole country woke up to the, I guess you could have, I, I, I think one could have heard the sounds, some rumbling in, in, in, um, in New Montrose.

00:02:31

But I certainly, certainly saw. We knew something was happening. We came out and you saw this, this amazing plume that was going up, you know.

IV Uh-hmm.

IE [Unclear] of ash that went up in the air, that looked like it was, it was alive.
IV Yeah.
IE Um, and that was quite impressive. Now, one of the things that happened, I think me, like most other Vincentians, we had relatives in the north. I had a grandmother that lived in Rosehall. So my father decided that morning that he would go towards Rosehall to evacuate it. Well, you know, the eruption happening, so…
IV Yeah.
IE You know, the next thing is that you go and get your relatives out. And I just happened, I don't know why, but I happened to, I asked and I went with him. So I was, early on Friday, on that Friday morning, I headed towards the volcano.
IV Uh-hmm.

00:03:21
IE [Laughs]. I went to saw, that you could imagine a, you know, I was, I, I guess I was always interested in the outdoors and that, that kind of thing, but I…
IV Yeah.
IE And I was always vaguely interested in Geology and Maths, kind of thing. But, um, but you can imagine the impression it, it had on you, because when I, when I went, basically once you get past, I guess, Barrouallie…
IV Yeah.
IE Once you got to, you know, um, Belile [?] Hill and you start going further north, what you saw was it, the whole country, in a sense, it was on the move towards the south. You met people, from then on you met people along the way. There were, like, people driving vehicles, there were people walking, there were people on donkeys, there were people on, on, on, on motorbikes.
You got the feeling, I don't know, subsequently, you know, you, you would have, I would have seen news footages about refugees and refugee crisis, it was like that.
IV Uh-hmm.
IE That was my first. I'd never seen anything like that. I, that was my first impression was the whole country was moving towards the south. [Unclear] of course explosions that, that, that first explosion that happened, you would have had subsequent explosions while we were in Rosehall.
00:04:28
IV Uh-hmm.
IE I mean, the whole community, everybody was, tried to get out. Um, you know, you, if you, if you ever, I mean, you, you, have you been, if you ever go to Rosehall, you, you, you would realise how close the volcano appeared, just across the mountain you saw the explosions happening.
IV Yeah. Yeah.
IE But we left, we left Rosehall, and I think the vehicle that he was in, that we were in, was a, something like a truck with a open back, with him for one person, for my grandmother and her stuff. When we left Rosehall, the whole vehicle was [unclear] hard with people.

IV Oh wow.

IE Because [inaudible], yeah, well, everybody basically put out to leave, so everybody [unclear]…

IV Yeah.

IE Anybody who had a vehicle. But once you were there, you [inaudible], so we left with our, um, [unclear] of the people.

00:05:11

So I think, because I think that was the first thing, be, because of the fact that I had that experience, it kind of lived with me. Subsequent to that, so by, by the, by the afternoon, I was also in cadets. I was in cadet force, so I think I was a [clears throat] a sergeant at the time. By the next day, the cadet force was mobilised.

Um, of course, the schools were closed, so you didn't have any school to go to, so it was, it was a Friday, the cadet forces mobilised by next morning. And we came out as, as one of the, kind of, I wasn't an officer but I was honoured [?] by senior persons who would mobilise you [unclear] where we were based.

Uh, we then began to help out to the evacuation effort. So initially cadets were sent out with, with vehicles to, um, either to help people to, to relocate, or else initially I was involved in the effort to [unclear] your, your, you were one of the people that was, were on the trucks that were sending [unclear] supplies to, to evacuation centres. You know, from unit [?] [unclear] centre it would have been activated in Kingstown, the police barracks.

IV Uh-hmm.

IE And they would have been, you know, setting up the evacuation tents, camps all over the place, mostly schools and stuff like that. And when they, when they got to relief [?] supplies in and that's, sort of, the big, subsequent to that, you would have had to have, sort of, somebody in addition to the driver there, to have somebody else who would have gone out to carry some to the shelters, to make sure that, you know, you have to sign-off on things that they receive.

00:06:37

So I was involved in that. We all, so I mean, it was a very exciting time, because we were all so, essentially St Vincent didn't have a military [unclear], and the cadet force was close to anything like a military force, apart from the police. The cadets really played a big role in the, in the, in the [unclear]. We were all over the place. We were on the backs of trucks, helping our people to move and various things. That's the second, that's the other thing.

And then subsequently, yes, I can't remember whether it was a week or two after, by the time the shelters got mobilised, um, one of the things that happened at the end is that they soon ran out of people to be in charge of the shelters, in a sense. And I was stationed at one point, I think it would have been about two weeks or so that I was stationed, me and another cadet, we were in charge of [unclear] evacuation centre [inaudible] that was based in a school, uh, the Anglican Church in Biabou.

IV Okay.

IE So again, I mean, I'm 18 years old. The other guy that was with me was probably about 19, I think. He was a sergeant too, maybe.

IV Hmm.

00:07:40

IE	Trained and [unclear] same, but again, we were in charge of caring for, I, I suspect we had up to about 20 or 30 families there, in a church.
IV	Hmm.
IE	Um, you know. You had to deal with all the things that, I don't know if you've ever been in an evacuation shelter.
IV	No.
IE	But I mean, we had, we, we had absolutely no training in doing this, you know.
IV	[Laughs].
IE	And you had families who, which meant that you have to deal with feeding people, you have to deal with issues of people and space, because you are move people who are [unclear] living in, um, far away from each other all in one… You're talking about people who, you know, you, you have very little privacy in places. You have issues with privacy. You had to have people who [unclear], you know, a blanket, next to each other. And [unclear] got issues with that.

I mean, and I was, I, I gained a lot of experience. Um, I have to deal with [unclear] and, and really, we were totally unprepared for it. But we did do it [unclear]. The, the tourist [?], the, kind of, another experience I had with ’79, was the fact that one of the things, and again I can't remember the timeline, I think it must have been two or three weeks into the thing by now, this time, this what established Belmont Observatory by then.

00:08:53

In [unclear] size [?] they can mainly and others, who were by then on the island, um, and operating from Belmont.
IV	Uh-hmm.
IE	Uh, Belmont Observatory was, uh, an old agricultural, um, experimental station, and uh, it was the [unclear], the, the little that they actually used was the building that they are going to [unclear] with us, with our [unclear]. So it was our, uh, it was an observatory, [unclear] basically a building that they, they put all the, the, uh, of, on the monitoring equipment.

Now one of the challenges I signed, this, uh, earlier on, was to maintain 24/7 operations.
IV	Uh-hmm.
IE	Because, of course, no [unclear] have to sleep at some point.
IV	Uh-hmm.
IE	So many things that they get, again, as I said, cadets were helping in all kinds of things. One of the things that they did, they turned to the cadets and asked for volunteers to help to man the, the, the locally drums [?], essentially, during the night, um, to help to make sure that they tried to get some sleep.

00:09:46

So again, one of my, one of my last experiences was that I actually spent, I think, a weekend or something like that at the Belmont Observatory, amongst the scientists.
IV	Hmm.
IE	Again, a young, impressionable, I guess, teenaged, um, person.
IV	Yeah.

IE	I was exposed to that. So all of that meant that by the time the eruption… Uh, we, we subsequently, this is in Sixth Form, if you [unclear] Sixth Form. I, I, I didn't continue [unclear] effort, because the Sixth… The only school that was, was re-established, because you're talking about April. Well, we had exams in June, May, June.

IV	Uh-hmm.

IE	So one day, I mean, only schools that was called back, the only set of students who were called back were the people in the Sixth Form. So we went back to school, I suspect probably in May, maybe May, just before [unclear] exams. So I, I got disconnected from the effort from then.

00:10:34

So I think probably for about a month I was intensely involved, and then I was disconnected. But by the time I [unclear], I wanted to be a geologist [overtalking]…

IV	[Laughs].

IE	Or, or one like that. Um, so I think mainly because of the impression, but also, the other thing that impressed me in [unclear] is the fact that all the people who came [inaudible]. Well, we had this volcano, um, and we had delays [?] and, and, and all these people, and we called them [inaudible], you know. They had, yes, they were all -ologists of various kinds. You had geologists and volcanologists, seismologists, so we tended to just, so just call them all -ologists or just call them scientists.

IV	[Laughs].

IE	But all -ologists and all the scientists came from outside. There was nobody, there was no, the only face that looked anyway like ours was Keith Rawley [?], who was, um, he was the only kind of face, West Indian face in the crowd.

IV	Yeah.

IE	So I took it upon myself that I, I thought that that was a, if we had a volcano we needed to know [unclear] volcano.

00:11:33

IV	Uh-hmm.

IE	So that became my, my life passion, to become someone, a local person, who knew about the volcano as much as anybody else did. So I went to Sixth Form, I did… By then I was, at that time I was actually an Arts… I don't know if you understand how, uh, am I on Skype? Um, but how they streamed students at that time, you're, from about Fifth Form, I think Fourth Form, you either went into Science or you went into Arts…

IV	Okay.

IE	Depending on what your performance was and what your interest was. Up until Sixth Form, I was an Arts student.

IV	Okay.

IE	I had not done, really, Science.

IV	Hmm.

IE	So, of course, that was a bit of a challenge.

IV	Hmm.

IE	My deciding that I wanted to become a geologist, um, at Sixth Form was, so, you know, it didn't make it easy.

00:12:25

IV Uh-hmm.
IE So that, basically, it's just, '79 was why, '79 is fundamentally the reason why I'm in the job that I am, and why I'm doing [unclear], because I have decided, I decided that I would become the person that would know most about the volcano, as much as anybody else did.
IV [Laughs].
IE Which is why, as, as I said, which is why I am who I am.
IV Yeah.
IE Right?
IV Yeah. I was just, yeah.
IE Something that was, was a big, was a big deal.
IV Yeah, uh, and it's great that you had that experience and you are this person you are now because it's, you're influential to other people and it's brilliant. Certainly an influence to me, so thanks for that. [Laughs].
IE [Overtalking].
IV Um, okay.
00:13:02
IE Well that's happened just, um…
IV Yeah.
IE Yeah, [inaudible]. Yeah, yeah, yeah, yeah, do that, please. No, no, not to me, to somebody else, [unclear], yeah. Yeah, go ahead.
IV Okay, yeah. So, um, so now I'm just going to ask some questions to pick out what you've told me. So…
IE Yeah.
IV Starting off, do you remember anything happening the year before in terms of maybe earthquake activity or whatnot?
IE No.
IV No.
IE No, I, I don't think, I don't think from the perspective of the local population there was any, in our head, precursory signal. I know, having studied the eruption, I know what happened. I know that seismic would have detected that there was some, some things that looked like precursory after the [unclear]. I don't think that, at that time, it translated down to the population.
IV Hmm.
00:13:54
IE The only thing we knew prior to '79, apart from the fact that if you grew up in St Vincent, you know what the volcano, you know the volcano is dangerous and you have to respect that. But before '79 you had the '71, '72 eruption.
IV Uh-hmm.
IE Which, I mean I was around, but a little bit younger.
IV Yeah.

IE Oh well, most Vincentians' recollection of the '71 eruption was, was mainly the fact that the people from north of the [unclear], well, we call them fancy and older people…
IV Uh-hmm.
IE And what we would have said, country people.
IV Okay.
IE Basically I evacuated them. And one of the places they, they put them was in Indian Bay. Um, I don't know if you've been to Indian Bay recently, but there's, you've, have you been to Indian Bay recently [overtalking]?
IV Um, last month I did, yeah.
00:14:34
IE Right, okay, now if you actually drive down to Indian Bay, um, before you get to the beach there's a big wall, there's a property on the left that is behind a, basically there's a property just close to the beach, right next to the beach, right on the beach in fact.
IV Yeah, yeah.
IE Right, there's a property there on your left. You see that, all that space on the left that you consider that you, well, you can't really see now, it's a private property.
IV Uh-huh, yeah.
IE And that space there is where they put the people from Sandy Bay [unclear]. They had tents all over the place there, as a result of the '71, '72 eruption. So our experience of, for me, personally, of the '71, '72 eruption was, was having to share the beach with, with these evacuees.
IV Mmm.
IE Which we weren't obviously pleased about.
IV Yeah.
IE [Laughs], I mean, I…
IV [Laughs].
00:15:18
IE And of course, nothing had happened to the volcano. We just knew that it apparently was an eruption and these people had to be moved. So prior to '79, that's the only thing that you can have heard about the eruption. You didn't know the year before '79. I don't think the local population knew that anything was happening. So the '79 eruption was, for everybody, extremely surprising.
IV Mmm, okay. Um, so following on from that, um, when, when was the first moment you know, you knew that the volcano was erupting? Was it when you saw the ash plume and you had to go and get your grandmother?
IE Yes, yes. Friday, Good Friday morning. We all woke up to the eruption. That's when…
IV [Laughs].
IE [Unclear] knew. I think the people who were close to the volcano might have heard something earlier than that, because they would have had eruptions, they would have had explosions, um, very early. They had some activity very early on Friday morning. But the people in the south, just when we woke up, when we woke up in the morning and saw the, the cloud and heard the rumbling.

IV Okay. Um, did you, um, before the eruption and maybe even before ’71, did you learn anything about the volcano in school?
IE No.
00:16:35
IV No? Okay.
IE Well, no. Well, well, do you think…? No, there, there wasn't any formal programme of… It didn't have seismic earlier. Nobody had any education on [unclear] programme, no.
IV Okay.
IE Um, the education of [unclear] of seismic, really, there was some ongoing, uh, a lot of it was targeted towards, um, government. So the scientists in seismic would have briefed the governments. They might have done some, you know, periodic talks to various people at different times.
IV Okay.
IE Um, but really the concerted effort as done now, in terms of us actively engaging with the population and the public developing, which [unclear], a lot of that was developed fairly recently, only after this, the eruption of Montserrat, in fact.
IV Uh-hmm, okay.
IE There was no, nothing. There wasn't, there, there wasn't any formal education. The information that you got from the volcano is from the fact that we all, it was, a, a, a big attraction. It was, you know [sneezes], with the volcano [unclear] someone there was something that you did.
00:17:32
IV Yeah.
IE Uh, [unclear] you had to go at least once. That was up, that was a kind of, that, that’s when you know of the volcano. You didn't know about, you know, its [unclear] and its danger. Well, you knew that it was dangerous but you didn't know, you, you didn't learn about it in school.
IV Okay. Okay, um, so you were a cadet. Did, um, actually, being a cadet were you briefed about them, if there was an emergency with the volcano or any other hazards, um, before the eruption happened? Were you briefed as a cadet about it?
IE I don't think so. I can’t, we would have learned… I mean, I was a cadet and I was, I did Geography. So I would have known about hazards from…
IV Okay.
IE Natural hazards and things like that.
IV Yeah.
IE So I knew about it, but it wasn't something that I would have learned. Cadets would have been trained to deal with, uh, assisting in emergencies and assisting in, in institution [?] that we did.
IV Yeah.
00:18:30
IE But not specifically on, on the volcanoes. Um, so, we, we weren't really… We, we, I don't think we were specifically briefed and trained to be emergency responders. But the way that we were trained, we were able to function in that capacity.

IV Okay. Okay, um, were you aware of any, like, community meetings that took place, maybe, um, um, during this, um, crisis was happening? Do you know if people, like, came together to talk about the volcano and, um, what…?

IE What, well, once the eruption had started, yeah, there was a, there would have been a… Not prior to. I think during the, during the period of activity of the volcano there was a lot of talking…

IV Uh-hmm.

IE About what was happening. Um, one of the things that happened quite earlier, apart from the, I think there was some significant things that happened in terms of, of people managing the eruption. A lot of the, a lot of the early parts of the, the day, well, once the eruption started, they all, actually there was a lot of movement of people who were living in the south to take care of themselves.

IV Uh-hmm.

IE And I think a lot of the [inaudible] happened in the early, during Friday, sort of, um, you know, early morning until, I, I believe, I can't… I believe the official evacuation, in terms of government evacuation and sending trucks and stuff like that, didn't really kick in until probably the next week, because just, there's Good Friday.

00:20:00

IV Uh-hmm.

IE So the public holiday. So I think evacuation happened, um, from people's own initiative. And I think in terms of the coming together and destruction of the eruption, once people [inaudible] as in [inaudible], basically [inaudible] volcanoes erupt is what dominated any kind of… The volcano, I mean, there are [unclear] discussions that you had during the period it was erupted, so one thing [unclear] is known for was, there was the scientists would have sent out regular updates on the volcano, which was read on the local station.

One of the things that people did was listen to that. The local radio station, which prior to '79 operated like any other, you know, operated during the day from, I think, six to six, that radio station, N, N, NBC…

IV Uh-hmm.

IE Went during, from Friday it never went offline. It went 24/7 automatically. They just, they just, everybody, people just, just never stopped broadcasting.

IV Okay.

00:21:00

IE So you know that they, they move from being a daytime operation to a full night-time operation. And one of the key things that they did is to tell people what people… Remember people were, were moving here. People are…

IV Yeah.

IE And so, as much as they can, so what, one of the things that happens, family got separated, so there was a lot of calling the radio station and telling the radio station, you know, this particular family, there's the father here, telling them where to... And that's how families knew where their siblings were, where they were, because sometimes ended up in the [unclear].

IV Mmm.

IE And they had a lot, that kind of coordination to help, and a lot of it happened because people spoke to each other through the radio station.

IV Mmm.

IE Um, but there was a lot in the, the shelters. A lot of the discussion would have been about the eruption. I don't think it, in the context of formal, sort of, community meetings, I suspect [inaudible] in any shelter you would have to have community meetings. You have to, you know, when I was in charge of the shelter, one of the things you had to do, you had to talk to the, you had to have meetings to sort out things in terms of how people lived in the shelters.

00:22:01

Um, not necessarily about telling them about the volcano. People would have been on the radio listening to the radio station, and that’s how they kept in tune about what is happening with the volcano. But in terms of community meetings, um, in terms of, in the context of any getting people involved in it, there wasn't anything like that. But during the eruption, there was a lot of this discussion. That’s, that’s what [unclear] the discussion on the volcano, what was happening with it.

IV Okay. Um, since you were, um, stationed in the church for a little bit…

IE Yeah.

IV Were, do you remember if there was actually services, um, held at that time? Um…

IE No.

IV No? There wasn't?

IE No, the church, basically the churches, the community centres, the schools, any space that was able to hold people was taken up as evacuation centres. So all the schools were shut. School, I don't think kids went back to school until probably September.

IV Okay.

00:22:58

IE Because the teachers, after a while the teachers were called out to help to man evacuation centres in the schools that they’ve taught that. Um, so the only school that was called back in, as I said, was the grammar school, Sixth Form.

IV Uh-hmm.

IE We were the only people who went back to school before the term finished.

IV Hmm.

IE Everybody else, um, so all the community centres, most of the churches and the church I was in, basically, the pews, the, the church was empty. The pews were taken out, the, the, and, and the whole church became an empty space.

IV Mmm.

IE It was, I think some repairs and some things were used to cordon off the place. It was about, it would have been impossible to, to hold church service properly in the church that, certainly the one that I was in, that I, uh...

IV Okay.

IE I was in [unclear] shelter.

IV Okay.

00:23:43

IE I think what the, what the government did subsequently is that they tried to organise the shelters such that people who might have been in things like churches, they were shifted to a proper shelter.

IV Mmm.

IE But a lot of the shelters in churches were, you know, things that were mobilised quite rapidly just to respond to the fact that you are having, um, all these people [unclear], they have a place to stay.

IV Okay, um, so after the explosive activity ended, um, what, um, damage was done? So did you, like, take your grandmother back to Rosehill, for example, and what did you see there? Um…

IE Um, I can't recall, well I, we must have, thinking about that, and she, she would have gone back once the explosive fears had ended. I think a lot of the damage that you would have had, if anything, was ash. In places like Rosehall, it was mainly ash. There was ash all over the place. Um, but once you really see the key [?] and the ash would have been washed out.

IV Uh-hmm.

IE Most of the, most of the sort of, the, the damage that was done in the areas that were affected, certainly any volcanoes have the, they didn't really have any pyroclastic flows that, I think the pyroclastic flows only came down Larakai. Um, some of, one came down Rabacca, but it didn't really come very far down.

00:24:58

So a lot of the damage was on the flank of the volcano itself, in terms of damage from [unclear] and pyroclastic flows and ash. That was intense there. Um, for the field, it will be mainly ash. The ash would have damaged the, um, agricultural, you know, banana, banana. Um, the banana crop for that particular year would have been, would have been trashed.

IV Uh-hmm.

IE But the following year it, it recovered quite quickly.

IV Uh-hmm.

IE Um, I have been, the other thing that happened is that, what happened with people, because of the, the, the rapid move to the south, people in, there, there wasn't provision for accommodating animals. So we had enough accommodation for people, so what happened with the animals, they just let the animals loose. So the animals then found ways of feeding themselves, which meant that all the crops that would have been planted would have been damaged also by animals, apart from the impact of ash.

So there was a lot of agricultural damage, both form the ash, from the direct impact of the ash, but also some of it was from, from animals that were, were in the wild.

00:26:00

IV Hmm, okay. Um, we're nearly finished here, so just to talk about the recovery. Um, you went to school, went back to school earlier, so what changed in the school environment, um, because of the eruption, if anything changed?

IE Well, in, in the context of our class, I guess we were the only class in school that was operational at that time, only junior option.

IV Uh-hmm.

IE Um, I don't think, I think that by the time the school started back, off, later on this year, the year, I, I, you know, my class went back to school, and then we just would have been in school probably for a month and then we had exams. Um, and nothing really had changed, except that there weren't very much, there weren't any, any other students besides ourselves around, and the teachers are dealing with us.
Um, in terms of any physical damage to, I don't think they had any official damage to the south. A lot of the ash steered towards the north, over [unclear] towards the sea. There was one girl, indeed there were two occasions when ash came south, um, on, and that was, that caused a lot of inconvenience, a lot of, you know. We got to walk around with ash masks and things.

IV Uh-hmm.

IE This mask and handkerchiefs over the faces. But it got washed out quite quickly once the rains came. I generally, there wasn't much lasting damage to the southern, southern part of the country, not the way this is really to the, to the north. I mean, [unclear].

00:27:27

In terms of the school and later on, I don't, so it didn't really affect, once the term started back in September, which is when the, the next school year would have started. By then the impact of the eruption as, at there's basically gone. Most people were, be out of shelters. Um, mostly schools were able to open. Um, and things would have been more or less almost back to normal, apart from, you know, they would have still had some people in shelters.
So much so, I think, that, I don't know if you realise that 1979 is when St Vincent became independent?

IV Yes, yeah.

IE Right, right.

IV Yeah, six months after the eruption, yeah.

IE Right, so between the eruption ending and, um, and the, the, the independence, they would have had a lot of social activity. We, we were, there was, there was a lot of, um, mobilisation in terms of [unclear] constitution, and there was a lot of, there was… In fact, I was in various youth groups then. There was a, there was a, a feeling in St Vincent that the government was pushing towards getting independence.

00:28:29

I [unclear] using a constitution that, that a lot of Vincentians wasn't, hadn't bought into. So there was a natural, there was a, in, in addition to the government's push, there was a counter to that from, I guess what you would call now civil society, where the youth groups and various church, uh, groups and non-government organisations came together and developed their own constitution.
Well, I, I was, you know, I was then part of the youth movement back then. So I was part of that, and we came up with our own version of the constitution, which we tried to get the government to, to, um, buy into and use instead. But they, of course, they ignored us.

IV [Laughs].

IE So, um, so independence was a, was a bit of a, a contentious issue, because some people felt that the government used their, their, their high rating following the eruption...

IV Mmm.

IE Um, to push for independence and using a constitution that was dangerous, and not necessarily in the interests of everybody. So it was a bit contentious when we actually became independent. Um, you know, it was, I, you know, it was shortly after, at the event, they hadn't really consulted the population as much as they should have. And even when they did, they didn't really listen to what people said.

00:29:41

So it was, it was not, as I said, it was, it was not, a, a very, um… Uh, it wasn't as pleasant as it should have been, I, I should say.

IV Mmm.

IE I, it was amazing that it happened so soon after all this turmoil [unclear].

IV Mmm, yeah. Yeah, I mean, I've, I've been discussing that with my supervisor. She's like, that's rather suspicious that it happened six months after. And she was saying…

IE [Unclear], yeah.

IV Uh, and then, yeah.

IE I, I have my own suspicions of that. I think the, I think the British, it, it is, it's, it's not, it, the independence movement was always there.

IV Yeah.

IE So there was always, there was always this high optimism to become independent. I think the fact that they got independence at that time so quickly from the British is partly because the British didn't really, in my opinion, want to have to deal with the recovery effort.

00:30:23

IV Yeah, that's what, that's what my supervisor was, because, like, did the, was it just the way the British could be like, yeah, you can have your own problems to yourself now?

IE Of course, yeah.

IV [Laughs].

IE No, no, I, I, I believe it's that. I, I, I think there would, might have been a little bit more hesitancy. I think the Brits were probably amazed that St Vincent were asking for independence at this particular time…

IV Mmm.

IE When you had so much damage. But I think they also, the government also had benefited a lot from… They had independence on, so elections too, you know, that year. They also called elections shortly after.

IV Oh, did they?

IE So the government used, there's a, there's a story in, in this [unclear] anyhow about, about politics and about that kind of thing, because the government used the, they were perceived in the end as having done very well in terms of responding to the eruption.

00:31:11

I think they were perceived in a better way than they should have, because they, they got a lot of aid, a lot of aid was flown into [unclear], a lot of, a lot of what we call a radiator [?] [unclear]. Have you come across that word?

IV Yeah, Howie explained that to me, yeah. I heard that, yeah.

IE Right. But there was a lot of buddo [?].

IV [Laughs].
IE But you, you, what, what did, did he explain to you how did they come about?
IV Um, it was someone described what the, the, it was the noise that the volcano made when it first erupted, wasn't it?
IE Right.
IV Yeah.
IE Yeah, so, but it sounded like buddo, but it also became a term that was used to describe all the freeness in a sense that came in.
IV Mmm.
IE So people had all kinds of things, and the government used that to, to gain more support. So they got, they, they therefore then able to go and push through a, a, an independence movement and, and request independence and a constitution that may, may not have had as much mass support as it, it, it would have if that wasn't the condition. And secondly, they then had the elections, which they then won.

00:32:09

IV Hmm.
IE So it was, it was used quite effectively, like, by them to, to get what they wanted.
IV Mmm.
IE But I think [unclear] bad, but they were bad. They should have waited another year or two, allow the British, get some aid from Britain…
IV [Laughs].
IE [Overtalking] the country.
IV Yeah.
IE You know, independence.
IV Mmm, yeah, and that, the, the politics bit is, yeah.
IE It is [inaudible] you know that Montserrat in 1995 would have been also thinking about… You know, I guess, in the next couple of years Montserrat would have been pushing for independence, but that has been very quiet. They were smarter than we were.

00:32:40

IV Yeah. Mmm. It’s interesting, yeah, and that’s why I'm interested in the, just the politics of, following eruptions. I mean, been looking at the 1902 and there, there was, um, um, I think it was in the early parts of 1903, a lot of the public were calling for Governor Llewelyn to actually step down, because they were felt that…
IE Yeah.
IV That he handled it badly. And obviously, obviously, you know that he like, um, escapes to St Lucia for a while. So that probably didn't help his case. He actually, um, I mean 1812, there’s, um, probably a lot of, um, the relief they got, there was, uh, unfair distribution of the relief between the planter classes. So those… Yeah, so the political bit…
IE Yeah.

IV Is very interesting, that I'm going to bring up. So, yeah. [Laughs]. Yeah, but, um, we're nearly finished now, so last, last bit was, um, well actually, kind of explains that question. Um, okay, so to finish off then, what was your, what do you feel your overall impact of the eruption was on you and your family and your community?

00:33:47

IE Well, on me, it, it, it helped a bit as, as you see it helped determine what profession I became in the end.

IV Yes, yeah.

IE Um, I think quite apart from that I guess I was always, sort of, interested in service and, and helping out in various ways. I think it, it really forced, it showed, it shows to a large extent the utility of having a group of scientists and a, an expertise in this particular field, resident within the region. And a need for monitoring volcanoes and being able to, having, you know, plans in place and, and…

You know, it, it, it showed how, if you are prepared, if you had, you, you could actually, how disasters reduction could actually work, and how preparing for hazards could, could be beneficial. Um, it showed how the impact [inaudible] hazards [unclear] on people.

Um, in terms of family, I, I think it's, it, it didn't really have, I don't think it changed anything fundamentally in terms of my family. Um, my, uh, you know, it, it, no, I don't think it would have had that much effect, because we would have been not one of the people who would have been directly affected. It didn't, didn't displace us.

IV Okay.

00:35:02

IE Uh, um, it displaced my grandmother, who went back and continued to live there as, as normal.

IV Uh-hmm.

IE I think it would have had effects on people, the impact in terms of family life would have been on people who would have had to be evacuated. Um, the same thing with the community. I, I belong [?], for example, one of the… I don't know if you, you've ever heard the name Aysha Samnia [?]. She was a, a geologist. She was in charge of the Soufriere Monitoring Unit until fairly recently, until three years ago. She went away and she's now in Canada.

IV Okay.

IE She did her MSc and she's working in Canada.

IV Okay.

IE But she's actually a geologist who came out more recently.

IV Hmm.

IE And her whole life was changed because the eruption. She actually got evacuated.

IV Oh, right.

00:35:44

IE Um, in fact it might be interesting for you to speak to her. Uh, I'll see if I can find her email and you can probably see if you could do a Skype, because she have a story to tell.

IV Yeah, that would be great.

IE But basically her family were evacuated from Georgetown, uh, and she came to the south. And she individually, basically, Aysha herself never actually went back north.
IV Mmm, okay.
IE And she had, had been with her grandmother, who then essentially became like her mother.
IV Oh, right.
IE Um, so her whole life changed completely…
IV Hmm.
IE Because of that. Her, her parents went back, I think, to live, um, in the north, and, and she still keep in touch with them, but she never, she never went north after that. She became, I think she ended up living in Vermont for most of her life.
00:36:26
IV Oh, right.
IE Went to school there, [unclear] up with somebody, uh, basically for the person outside of, well, part of her family, her grandmother, became essentially like her mother for most of her life.
IV Mmm.
IE And she subsequently became a geologist. Um, not quite, quite sure why she became a geologist. I suspect there's a story there somewhere.
IV [Laughs].
IE A lot of people who are, who I have interacted with to, you know, I've, I've, I, one of the things that, because of the outreach programme, I speak a lot in schools and various things, and I, I [unclear] of people who became geologists subsequently. So I, I did it because of somebody, a geologist, spoke to him.
IV [Laughs].
IE But I said to Aysha, I think she has a story in terms of the '79 eruption. She's now in Canada. She should be reachable via Skype or [overtalking].
IV Okay. That'd be great, if you could, thank you. Um, yeah, so I've finished my, uh, little interview bit now. Um, I just wanted to ask you about this project that you asked me back, was it before I came out here, about. I just wanted to know if you heard more about it?
00:37:28
IE You mean the community project?
IV Yes.
IE Yeah, well we, we [clears throat] we basically put in the proposal for this community project and, and they said that we have passed the final stage.
IV Uh-hmm.
IE And they were supposed to get back to us at the end of last month to tell us what is the, sort of the final, final stage [unclear] we actually got implemented. But they haven't, um, so it's going to, I'm waiting on Citime [?]. Essentially it's a project which is going to be funded by the Community Development Fund.

We have a tranche of funds that they got from SIDA and, uh, um, DFID and, uh, somewhere else that funds, um, community-based projects on [mobile phone rings] disasters reduction and climate change in the islands, and all those [unclear] several have been funded this year [unclear].

IV Okay.

IE The plan for the project is essentially to work in the areas in St Vincent that, uh, follow the volcanic hazard…

00:38:26

IV Uh-hmm.

IE To, to, to develop various, various things. We'll do various things with them, but the, the, the, the theme of the whole project's to make them what we call volcano-ready. So we'll be working with them in the context of, and it's also we're looking at it, yes, in the context of volcanic hazard, but more, looking at it more in the context of normal geohazard environment that you have usually on a volcano.

So we want to do things like, um, I'll be working at the community, at the community level in [unclear] with the communities, with community groups. So the same groups that [unclear] would have worked with.

IV Uh-hmm.

IE We, we'll partner with [unclear] on this. This is [inaudible] project [inaudible] seismic [inaudible]. Most are working with me, but [unclear] work would be done…

IV Okay.

IE In St Vincent [unclear]. Uh, we'll probably, we'll have somebody employed at Nemo who would actually [unclear] the project. But already we're working in Sandy Bay, [unclear], Georgetown, uh, [unclear], all those communities, with the community groups, to do things like, um, community hazard maps, plans, um, community plans, response plans, training community on, on hazards, getting some equipment.

00:39:33

I don't know if you know there's an effort, there's something that they call community circus [?], community, um, response teams.

IV Yeah.

IE Essentially that they have, that they have started in so many communities. We'll be, we, in the project we have some funds to help equip them to respond to, to hazards in the community. So it'd get various, people would have the training. Um, and also we'll, we'll develop materials that they could continue training others, um, that they could all [unclear] community level in responding to, to hazards but in a volcanic environment.

So it's, as I said it's culturally a thing that you're making the communities volcano-ready, um, and better able to respond to future options with volcano. But because the volcano don't erupt, you know, so often…

IV Hmm.

IE You have to couch it in a multi-hazard context. So we have other things [unclear] respond to all kinds of hazards in community. And the idea is that you would have in the communities people who are better trained and able to respond to, to any kind of hazards if they do happen, um, in the communities. And they're going to be the first responders.

00:40:36

So, so that's the plan. It's, it's a two-year project. If it's, the rate at which they're going now, I don't, I was hoping that they would have, sort of, when the [unclear] team was out there, it would have been when we would have [unclear] started; it would have been a sure thing.

IV Mmm.

IE But it's looking like it's not going to happen, you know.

IV That's a shame.

IE [Unclear].

IV Mmm.

IE So…

IV So what would, you, you said that I could, like, potentially participate in it somehow. So what would that role be, do you think?

IE Yeah, well, I was thinking that, given, given that you, you're working in these, in communities, it might be useful [unclear]. Only things I… This is basically a, in a sense that it's a big [unclear] project for the communities, but there is some element of science that one can do in, in, sort of, evaluating the impact of some of the things that we wish to try and implement in communities and, you know.

00:41:26

IV Okay.

IE It, it's a, it's um, you could get some information on, on the status of preparedness and how things change as the project rolls out, you know. Before and after, that kind of thing. So I was thinking as a, as a researcher who's doing stuff in St Vincent...

IV Mmm.

IE Like might be, might be useful at some point. I, I'm not quite sure. Well, once we have the final okay, we'll have to start drilling down specifically on how things will go. But there might be components of the project that you could probably come in and, and help to execute. Um, either we, we, you know, if you [unclear], if you are going to [unclear] have another [unclear] events, and this is whether or not you have one, or if you have a, um, uh, or if it is just to have designed some sort of, um, assessment that we may do, that would, would help your research as well as, as help us. And we both would be in the project. That's the kind of thing I was thinking of.

IV Okay. Okay, well, yeah, that, that's great. Thank you for, for your…

IE Well, [overtalking], I'll, what I'll do is, is keep in touch.

00:42:28

IV Yeah.

IE And, and let you know [unclear].

IV Yeah, so, and that, I don't have another field season here, um, after this. Um, if I secure some extra funding, I'll be going to America, because there's some archive stuff in America.

IE Ah, right, yes, [overtalking] see that.

IV Yeah, apart from that, it'll be just writing up the thesis. So, um, see, uh, let, let me know, um, keep in touch and yes, and I will, um, I'll have a think about how I could do this assessment or evaluation. I might ask my, um, old lecturers in Coventry University, since they're disaster managers. They might be able to help with that as well, and help me go to...

IE Yeah.
IV But yeah, okay, that's great, thanks.
IE Glad to help. Okay, all right. Cool. Nice talking to you.
IV Yes, nice talking to you too, thank you.
IE How much longer do you have in St Vincent?
IV I have until the end of next month.
00:43:20
IE Okay.
IV Yeah.
IE You'll be there for your birthday.
IV Yes, I will be there for my birthday, [laughs], yeah, yeah.
IE Okay.
IV So yeah, that'll be a nice birthday.
IE Yeah.
IV But now I'm just…
IE You take care [overtalking].
IV Yeah.
IE Get, get a little bit of caramel too.
IV Yeah, [laughs], that'd be nice. Okay, well, thanks again, talk to you soon.
IE Yeah, all right.
IV All right.
00:43:43
IE Yeah, bye.
IV Bye.
00:43:50

Interview E3: 10/05/2016, interviewed in Orange Hill, Male

Speaker Key:

IV Interviewer
IE Interviewee - in Orange Hill at the time of the eruption

00:00:00
IV Um, so, to begin with, can you tell me how old you were in 1979?

IE	Oh, um, in 1979?
IV	Yes.
IE	Oh. You're, uh, you're, you're a doctor, so, you can do this, um, this subtraction.
IV	[Laughs].
IE	Two, two years ago, two years ago was my 60th birthday.
IV	Okay. I can do that. Okay, so, um, where were you living? Were you living here?
IE	No, um, matter fact this village here that we're living in now.
IV	Yeah.
00:00:36
IE	We just move across here, well, [unclear] just over 20 years. The village [unclear] is behind that hill there.
IV	Okay. So, okay, so you're just… Okay, and who were you living with at the time?
IE	At the time?
IV	Yes, at the time?
IE	Um, well, isn't anybody, uh, where I was living. I was living with my children and my lady.
IV	Okay, great. Um, so, to just keep it general, um, tell me what you remember from 1979.
IE	I was a police. A [unclear] inspector [?] police.
IV	Okay.
IE	I was on duty at Central Police Station and the officer that was in charge said some… He got a telephone call from Richmond to say that the La Soufrière is erupting. Matter of fact, there's one Mr Graham, he was monitoring the station down at, um, Richmond, [unclear].
IV	Uh-hmm.
IE	And he had called to say 'Soufrière is erupting.
00:01:52
IV	Uh-hmm.
IE	So then we go outside the police station and we go to the, um, other side of the road where we can see the mountain range. And there we see that, um, this ball of fire into the sky. So, that was the beginning of it. Then, uh, well, from that time, okay, we start mobilising, waking up others and start mobilising because the job just begins.
IV	Yes, of course. So, what was, so, um, so what's… You were called to start the job, um, were you positioned at the stations to co-ordinate, or…?
IE	Okay, as I said, I was at, working at Central Police Station. So, we start mobilising to get people start um, get the police involved. Uh, I went to, like, to call one gentleman by the name of, this is now Biscuit McIntyre [?], coz he was the manager of Quarry Caesars [?] and he was short of vehicles. I have a relationship with him, so I called him. Asked for some assistance with his company vehicles.

Eventually gave us two vehicles and um, there we start to work. Despatch people to other areas, um, we start locating, trying to locate where the different people have gone. Most of the people from this side the country coz there it were, more people on this side.
IV	Yes.

IE Also evacuated to that side more so than those on the West side.
00:03:56
IV Uh-hmm.
IE So, we start mobilising to see what we can [unclear] people, um, government have a supermarket tent. So, we went to start to take stuff. Foodstuff from government supermarket to move to this, different areas where people was being housed in the different centres.
IV Okay. Um, trying to think, um, what was, how did you feel at the time? Were you, like, were you like, excited to like…?
IE No, no, no. I couldn't be excited at that time, I mean, when your family is on this side just behind the volcano.
IV Yeah.
IE The volcano.
IV So you, so you were concerned about them? Yeah.
IE Yes, I feel otherwise, that is the position with my, with my family.
IV Of course.
IE Um, 79, that was 30-odd years ago. Telephone was not that frequent as it is today, very fewer, if there's any mobile phone.
IV Mmm.
00:04:59
IE I call a cousin of mine, who, has a telephone, answered the phone and within ten seconds the phone went dead.
IV Ah, no.
IE Because um, what he did said to me, phone drop from him, he didn't bother to take out the phone. He was so, he was frightened.
IV Okay. Okay. So, um, how did you arrange to get, to make sure your family was safe then?
IE Okay, um, there's a fair amount of vehicles, public vehicles through [unclear] and then this will be the estate of Orange Hill Estate, and you have a lot of vehicles, and the driver was living around. The less-used vehicles were to start moving people from the community town, for one, a safe zone a safe area.
IV So, obviously you were doing a job as an officer but then, um…
IE Still concerned about family.
IV Yes, yeah, of course. You're still concerned about family. So, um, did you have the time to like, just to see where your family were, were evacuated to?
IE Later the evening.
IV Later in the evening. Yeah.
00:06:12
IE Um, I did, [unclear] I had to move foodstuffs to [unclear] side, and away from they start making checks. They evacuated Kingston, and there were road-stops.
IV Okay, the road-stops, okay. That's good. So, they were okay then?
IE They were okay.

IV So, um, did, while you were an officer were you, um, was there an emergency procedure in place for you to just, like, quickly mobilise everything and get things into action?
IE Um, it take a bit of doing, in that, um, everything from a police stand point. In that, um, people were not really properly pleased, because then, um, mother, father gone, your children gone, you're away and everything. It takes some time to, sort-of, get people settled in.
IV Uh-huh.
IE And it doesn't just work automatically. Takes some time to, um... Couple of days to get people settled.
IV Okay. Um, so, where during this whole period of time were you able to… Sorry. Was there like a router, so that officers could take a rest and go and check on their families? Or… [Laughs].
IE The first, um, couple of weeks there was staff leaves.
00:07:52
IV Okay.
IE So, um, if you happened to be coming, going to the areas, coz you have to carry on the ration for them [?], carry [unclear] six o'clock. You have to carry people to work, and to work from six o'clock in the morning, then you have to carry a midday-shift and you carry the other six o'clock shift so, every six hours. So, you plan how you can get in these six hours. Just see how to visit the family.
IV Okay.
IE That is it really given that time off to go and look for family. [Unclear] is a relatively small place, so, within a couple of days people know who is there and who is not there.
IV Okay, um, so, so when was it, did you feel that, um, your job in the emergency of the eruption was over? When it did return back to, I don't know?
IE Normal?
IV Normal. If there is a normal, such a thing. [Laughs].
IE Well um, it take a few months before, um, people actually moved back to...
IV Okay. And, um, when you managed to get home, back home, and your family were safe back at home, um, what did you have to do to, um, rebuild? Was it just mainly cleaning the ash?
00:09:33
IE Just cleaning. Not repairing, cleaning.
IV Okay, just cleaning. Um, and um, did anything change about your home? Did you do anything to the property to make it more secure for the future? Or did you just clean it and then leave it as it was?
IE Just clean and leave it as it is.
IV Okay. Yeah.
IE Okay [unclear] happen because it was, um, in the estate area, so there's very little you could do to, um, [unclear].
IV Okay. What was, um, [unclear] like when you went back to work, when it returned to normal? Uh, what, did you get, like, briefings from your, um, superiors, or like…?
IE Um, yes, we had a briefing as to the whole scenario as from the mornings of 19th, 20th of April, until a few months. And as police, it wasn't so easy,

because from there we move into, uh, election, independence, and, you know, certain sentiments that are happy for us as a [overtalking].
IV Yeah, it was very busy, yeah. Okay. So um, yes, so, what did you feel that the government did as a result of the eruption?
IE Government?
IV Yes.
00:10:51
IE Well, I think they have done what they could. And at the time we were still, they were, um, state-owned. Part of our [unclear].
IV Yes.
IE So, whatever government could have done, I think they done their best. In my view. Other people may say otherwise. In my view, I think, the government, at the day, have done their best. And then, uh, we were very fortunate, there's a lot of outside help. We get a lot of outside, um, people volunteered and stuff. Americas, Cuba, Barbados. Barbados is just next door, and…
IV Yes.
IE I think they would have been right there with us. Their coast guard came down, and um, bringing in stuff, and the Prime Minister came across, um, couple of days after. So, Barbados was right there with us. [Unclear]. Other counties they carry on. They were really supportive.
IV Mmm. Okay, so, um, what do you feel, in terms of the help, was there from the Orange Hill community from the church, the church groups, um and charities? Did you feel, was there any help, like afterwards to, like, get everything back to normal? From these people?
IE Um, what I think, government take more part in getting back to normal [unclear]. Government really did, they give little, um, foodstuffs to go back home with and all, people, as I say, we settled and then start back to work. I mean, life would not have been the same. I believe it and um…
00:12:34
IV Yes.
IE Because, I mean, they're [unclear] the psychological.
IV Yes.
IE [Inaudible]. It work after a while.
IV Okay, well, that is everything. Just to end, just this question of, um, summarise what you feel the eruption impacted, how did it impact on you as a person.
IE As an individual.
IV Um, and your family, and also on the community.
IE Well, um, as an individual [inaudible].
IV Yes.
IE Let me, let me back track. Let me back track a little. In 1971 I was the first person to survive [unclear] in La Soufrière.
IV Wow.
IE I went to La Soufrière twice that day in question.
00:13:38
When I went back, the evening, I saw that the water boil and, um, the colours are changing. So, then I was looking at this, this morning. So, I, when I

came back I told Martin Barnard, Barnard was owner of the estate then, and um, there's a gap [unclear] bananas. So he flew over the next morning, and saw what I saw. What back then saw rocks start coming up and, so...
IV Yeah.
IE Back then you start even your, it could have happened 1902, but um, you have never experienced anything before.
IV Uh-hmm.
IE So, the only fore-signs of things start [unclear].
IV Mmm.
IE And after, after the 79 eruption, and then have a small main one after the big one.
IV Yes.
IE And a small main one. So, you always think something that, I mean, it plays on your mind.
IV Mmm.
IE To watch out next time. I think it goes the same for most people in the communities. If rain come heavy, you'd smell the sulphur on people. Start sulphur, there you go.
00:15:04
IV Yeah.
IE [Unclear] quick. Um, people still got this itchy about them.
IV Mmm.
IE But, uh, sulphur [unclear]. But I mean, we're… It's there.
IV Yeah.
IE And we are living here.
IV Uh-hmm.
IE So.
IV Mm-mm.
IE You better pray to God that you don't, you come again in my time.
IV [Laughs]. Okay.
IE I mean, I know what it is. I mean.
IV Yeah.
IE As I said, I'm a police man and um, actively involved in most of what was happening. At times. Not very easy, not something very nice to, um, experience.
IV Yeah.
IE So, that's my bit about it.
IV Okay. Great. That's everything. Thank you.
00:15:57

Interview E4: 30/04/2016, interviewed in Sion Hill, Male

Speaker Key:

IV Interviewer
IE Interviewee - in Sion Hill at the time of the eruption

00:00:00
IV So to start off with, general information, uh, how old were you in 1979?
IE I was basically about 13.
IV 13?
IE 13 [unclear] 13.
IV 13. Hmm. Okay, just hold that there for a sec. Cool, so you were 13.
IE 13, yeah.
IV And where were you living?
IE I was living right over there, Rosa.
IV In Rosa. Okay.
IE Rosa's a part of Sion Hill. I was living in Sion Hill.
IV Okay. And who was living with you at that time?
00:00:39
IE At that time my aunt. My mother and father was... Were in United States. And they left there for a better life. And we were behind and my aunt and my older sister was our guardian.
IV Okay. Okay so to keep things general and then what you've told me I will pick out some more questions to ask you but, can you tell me what you remember about 1979.
IE In regards to the volcano right?
IV Yeah. To do with the volcano yes.
IE Well I think it was somewhere in the afternoon when I look up towards the St Andrews mountain and I saw... I never saw before... Monster like. Smoke billowing, like it is rolling and going up. In my mind I said, the world has ended.
IV Oh, oh no.
IE Yeah and I waiting for Christ to come over the clouds. Then my aunt screaming, and she held her head in, like, in turmoil and said, oh mummy and daddy, cause they were living in just a cottage at the time.
00:01:47
IV Okay.
IE And then I realised that, that was a volcano erupting.

IV Yeah.
IE I told myself, I'm way in Kingstown and the volcano is way up...
IV Hmm.
IE In the countryside. How am I seeing this thing down here?
IV Yeah.
IE So I was... It was awesome. It was awesome to me, I was struck. And I couldn't believe it. Even today looking back at it man, I never saw an experience like that again.
IV Hmm.
IE How awesome it was to me. You know, so... And it was... It was something I'd never seen before and I don't want see again.
IV [Laughing].
IE It was beyond my control, we were waiting to leave the country too.
IV Mm-hmm.
00:02:31
IE Because the government said that the people who... International people came in and they were saying that, um, people that ready their pass... Their passports ready cause they were going to have to leave the country. Cause of lot of earthquakes, um, and so forth. So I was basically struck. And at that age I didn't know what to expect, all I know is what they said, and they were true. I didn't know anything. So I was ready to leave the country at any time.
IV Okay. Hmm. Is that what you remember?
IE I remember. That was basically what I remember yeah.
IV Okay, no problem. Um, so, since... Trying [unclear], so, think back a year before in 78, did you notice anything different about the volcano?
IE No.
IV No?
IE No. I was going to school, I was doing my [unclear], I was play football or, um, have fun with friends. Um, and... But when the volcano erupted school finished for me for the... Until about...
IV Oh yeah, because it was, uh, Good Friday, so it was Easter.
IE Easter.
00:03:37
IV Easter holidays.
IE And then Common Entrance was coming up soon. And I sat it a year before and I failed it.
IV Oh right.
IE And I was going back to take it this time.
IV Okay.
IE And because of the eruption.

IV	Mm.
IE	I couldn't take it, because I got too old.
IV	Aww, that's a shame.
IE	Yeah. So that set me back, senior one and senior two and so forth. Which I didn't really want to.
IV	[Laughing].
IE	I went to the senior, because of the volcano. Cause people took over the school, the people came from all over the country.
IV	Mm-hmm.
00:04::06
IE	And all the schools in town were occupied with, um, people who was, um, disadvantagly removed from their houses. You know?
IV	Yeah, okay, so it would be interesting to know that actually in 1978 there were some earthquakes going on, up at the volcano at this time.
IE	There was?
IV	So yeah, that would have been sort of like a sign for people in the north that something was going on.
IE	Okay.
IV	Um, but no, people I spoke to they've never noticed the earthquakes.
IE	And there were actually earthquakes up there?
IV	Yeah, up at Soufriere at that time.
IE	Wow.
IV	Yeah.
IE	Because you know, after that day it did erupted again.
IV	Mm-hmm.
00:04:43
IE	A second time I was in Kingstown at the time. And I, looking from Kingstown to the St Andrews mountain and I saw fork lightening.
IV	Mm.
IE	In the smoke. And I was like, again, didn't know what to say.
IV	Yeah.
IE	Didn't know what to compare it with.
IV	Yeah.
IE	I never saw it before.
IV	Of course, yeah.
IE	So it was awesome for me, man. And our prime Minister was in St Lucia at that time.
IV	Oh right.
IE	And he came on the radio and said, don't panic.
IV	[Laughing].

IE He's in Barbados. Don't panic. I'm like, yeah right [laughing].
IV You're in Barbados, you're fine [laughing].
00:05:17
IE And I was... I think at that time too we had a football game at the Sion Hill playing field and my sister told me do not go and play no football. Cause if anything happened and they can't find you, how we going to locate you? So, please stay home. My friend were mad at me too. Because the game... They needed me to play with them right?
IV Yeah.
IE And I were caught between a rock and a hard place.
IV Yes.
IE I say, you know what, family first.
IV Yes.
IE I stayed home.
IV Mm. Okay.
IE My mom's always on the phone with us from New York, and telling us don't worry, get your passport ready, cause when you gotta go we pay for your ticket to go. Wherever they had to go. So, I was ready.
IV Okay.
00:05:57
IE I was basically ready to.
IV Okay.
IE Evacuate.
IV Mm. Okay so, um, did you remember learning about the erm… About the volcano in school before the eruption?
IE Well yeah.
IV Yeah?
IE Yeah, but because they didn't really impact me to that degree of actually seeing it erupted, you don't take it seriously.
IV Okay.
IE So we like brush it... Oh yeah volcano. And I went to it after the eruption.
IV Mm.
IE Not before the eruption, after, to see what it was like. It was still scary.
IV Hmm.
IE Cause, um, I saw photos before it was, um, erupted and it had a water in there. Like a reservoir of water.
00:06:36
IV Mm-hmm.
IE And then when it erupted then there's no water in there no more.

IV	Yeah.
IE	And... Yeah. And all the mountains was basically dried out. Because the lava it [unclear] kill all the plants. You know, so...
IV	Okay. Um, you might be too young to remember, but do you remember any like community meetings about the volcano happening?
IE	No.
IV	No?
IE	What I remember about that is when the American and other counties begin to give aid, my grandmother came and stay with us.
IV	Hmm.
IE	My grandfather said he wasn't moving.
IV	What in Chester cottage?
IE	Yeah.
00:07:11
IV	Oh right.
IE	He wasn't moving right?
IV	[Laughing].
IE	[Unclear] it'll be nothing.
IV	[Laughing].
IE	And before you know it rocks fell in Chester.
IV	Oh yeah.
IE	And that is about... How long... Far is Chester. How far?
IV	Not, not, quite... Well...
IE	What a distance right?
IV	Quite, quite a distance from... Yes. Trying to picture it but yeah it's a fair distance away from the volcano.
IE	Yeah.
IV	Okay.
IE	And the rocks fell in Chester cottage.
00:07:35
IV	Right.
IE	He pack his stuff, he say, I going to town.
IV	[Laughing].
IE	He said, no way I'm staying up here. So my uncles, my aunts, my grandmother, all them came to stay with us.
IV	And they were all from Chester cottage?
IE	From Chester cottage, yeah.
IV	Okay.

IE	So we were basically like their, their, um, refuge.
IV	Yeah.
IE	From that. And people had to walk with basin over their head, man. It interested me too. I read about snow, cause I went to [unclear] back then.
IV	Yeah.
IE	I read about all this snow falling on the ground. But at that time ashes felt like snow.
IV	Mm.
00:08:12
IE	The whole country was full of ashes. I mean, like, inches off the ground. All the trees in the yard turned, um, black because of the ashes. Because they got scorched. You know, so, all the trees lost their colour.
IV	Yeah.
IE	And to me that was fascinating. And I begin... I began to shovel up the ashes.
IV	[Laughing].
IE	In a heap.
IV	Yeah.
IE	And put them in bottles and so forth.
IV	[Laughing].
IE	I don't know why, but it fascinated me. So, I did that.
IV	Hmm.
IE	As a child.
IV	Hmm.
IE	You know?
00:08:41
IV	Yeah.
IE	So, could you imagine that? Could you imagine how many ashes that was for me to... And I'm in Kingstown.
IV	Yeah, I, I can only imagine that, that must have been. You must have been like what's going on?
IE	Yeah.
IV	Why is this happening here? Yeah, yeah.
IE	So, I was basically trying to put sense out of nonsense. I tried to figure out what was happening. So, I shovelled the ashes, put them in bottles. And interesting, I was told that the ashes destroy, um, the majority of the farmer's crops.
IV	Mm-hmm.
IE	That particular year. But, the year after, they got double.
IV	Yeah.
IE	Because it became fertiliser.

IV Mm-hmm.
IE And...
00:09:16
IV Yeah. So sort of like a good thing that came out of it?
IE Good thing.
IV Yeah. Yeah. Um, okay so, back when you first [unclear] did you go to church?
IE Yes I went to church.
IV Yes, okay, so was there any discussions about the volcano in your local church group?
IE It was. But you remember exactly what was said. It wasn't... Something as prophecy being fulfilled. Um, they spoke about it in a prophetic way. God has come for the world. You have to repent otherwise you get caught off God.

And it was... To me it was an awakening for all of us. Children, fathers, mothers, sisters, brothers, to check their lives out. They never know when, um, even how strong and intense it will be. Cause I heard on the night when it erupted people died. I think it was in Martinique also, when it erupted.

IV Mm-hmm.
IE [Unclear] too.
IV Yes.
IE So, it kinda gave you the idea it could happen worse, you know? So I was ba... I was scared. I was scared.
00:10:24
IV Okay, so, um, well a lot of stuff you've kind of told me. So, you didn't evacuate because you were here?
IE Yeah, I was in Kingstown.
IV But your family from Chester cottage came to stay with you. Um do you remember how many people they were?
IE Yeah, my aunts. I had three aunts, one uncle, my grandfather, my grandmother, that's six persons. No, seven persons.
IV That must have been busy household.
IE Busy, yeah, yeah.
IV Yeah. So...
IE Then again my grandmother was very, um, conscience, she went out there to the, um, the relief centres and she got food, clothing. You know, cause they say it's for all those who were dislocated and they went and got their rations of food and so forth.
IV Okay. Um, mm, mm, mm, so, did your family... Did they come to you, um, before... Before an official order was given by the government or did they wait until the government said to them to leave?
00:11:40
IE I think they came when they saw the smoke and the eruption.
IV Okay. So they left on their own accord?
IE Yes.
IV Yeah.

IE And then when the call was issued, my grandfather say he's not moving.
IV [Laughing].
IE Cause he not afraid, the volcano.
IV [Laughing]. Till the stones...
IE And then when stone begin to fall he said, okay.
IV [Laughing].
IE Time to go.
IV [Laughing].
IE So he packed and come down. But, once they saw the smoke they evacuated themselves. They came to town.
00:12:07
IV Okay. Okay, um, so how long after the eruption did your family return to Chester cottage?
IE I think probably month or two months perhaps.
IV A month or two, okay.
IE Two months perhaps, yeah. Cause after they realise that the... I mean, they saw two major eruptions, from the first one and the second one. And after the two, [unclear] a while the professionals came from all over the world, came to examine things, and gave us the warnings. And then they say, you know what? It is okay now to go back to your villages. So they begin to go back.
IV Hmm, okay. Um, did they want to return? Or were they eager to return?
IE I, I believe so.
IV Was your grandfather eager to return? [Laughing].
IE Yes [unclear]. He's the kind of guy, he don't believe in all... He's old thinking, arcane thinking. He think like, why do I want to leave for it's only a volcano?
IV [Laughing].
IE Until the stones fell. But once it receded, the volcano stopped acting up then he went back. And he was first to go back. He was first to go back.
IV All right, cool. So, um, was there much damage done in Chester cottage or was it just the ash and stones that fell?
00:13:23
IE Ashes and of course Chester cottage is, a, um, a farmer's village. [Unclear] plants and work on estates still. So, all the crop that year was destroyed. My grandmother's a farmer, she farmed for a living. My grandfather was a farmer also, farmed for a living. And all the crop that they were working on died. Destroyed because of the ashes. Bananas turned black, bananas turned black.
IV Oh right.
IE Crops, [unclear], everything turned black because the ashes.
IV Hmm.
IE I think because the heat of the ashes burn them and spoil them.
IV Yeah, okay. Um, did anything change about your home as a result of the eruption? Did your... Was it your aunt and your sister... Did they behave

differently? Or did you have any in Chester cottage... Did they change their lifestyle because of the eruption, in any way?
IE No.
IV No.
IE I think the, the immediate effect of it, of course they change because we had to live, less space, in the house. Less food to go around. So it had to change, somewhat. They wouldn't go to church as they would normally have. Because of the [unclear]. You know what I'm saying? There's so much persons in the house.
00:14:39
IV Mm-hmm.
IE It kind of disrupted our lives to some degree. But, after the eruption stopped then going back to normal life was like, I mean, it's like going back to what they did before. And that wasn't difficult for them.
IV Okay.
IE And the only thing that was really disruptive was the fact that the crop got destroyed. So they had to find other means of making some money. That's when the aid from the government came into effect. They gave them canned food and clothing and things of that nature. Well the clothes wasn't necessary because nothing got burned, you know? And nobody was vandalised in any way.
IV Hmm.
IE You know? So... Their loss. Only loss was their crop.
IV Okay.
IE Their means of making an income.
IV Hmm. Okay.
00:15:26
IE The economics side of it.
IV Yeah. So, um, did you, um return to school as normal in September?
IE Well yes, September yes. I think, uh. Um, I think school was out from that time until September.
IV Mm-hmm.
IE Cause they were closed down. And I think the... Some of the people stayed in the school extra long. You know? And that and the way they left the school too, even after they left, the school was in such a bad state. They had to wash the school down again. Cause bugs were living in a school too because of the conditions.
IV Yeah.
IE You know, they had to clean the school out and, um, sterilise all of the furnitures. And you know, it takes some time after the... After the eruption. You know, two months after the eruption they was still there. And then they had to get things in, um, bring in people to sterilise the school. And then it took about a couple of months to get it back to normal.
IV Okay. So, um, what did the government do as a result though actually, apart from helping farmers get back on their feet? Do you think they did anything else to help?

00:16:31
IE Well... Well they beg for aid.
IV So it was aid?
IE Aid, yeah, they beg all the countries. And all the countries came to... Well I think when things of that nature happens, now, is the government have to receive the aid.
IV Mm-hmm.
IE And properly give it to the communities, don't have one person hold it.
IV Yeah.
IE Make sure they give. This community get their rations, other community get their rations and so forth. You know? And because as I said before, the um, the destruction of the crops.
IV Yeah?
IE They gotta find a way to make some money.
IV Yeah.
IE Not because...
IV Yeah.

00:17:00
IE They got to pay their bills. They got no money coming in.
IV Yeah.
IE All the crops are destroyed so they have to find ways to give them some kind of help.
IV Mm, mm. Okay, um... Um, as a result of this, um... After the eruption in terms of recovery, uh, what help was there from communities, charities, church and families to help people rebuild?
IE You know, to me it was a disaster that did not really destroy homes in the sense of burn them down or burn up their property. It wasn't that way. It was basically the crops.
IV Mm-hmm.
IE The ashes. And because we are, um, at that point in the countryside they were basically farmers.
IV Mm-hmm.
IE So in that regards, they got disrupted financially. But they close and got burned up, the building got burned down. Only their crops got destroyed you know? And because they were basically farmers, they now... They now would have to, um, try to find some other means. And I think church came together to help them, give them a couple of dollars and so forth to help them make ends meet.
IV Mm, okay. Well that is all. Uh, just to summarise what was... What do you feel the overall impact the eruption was on you, your family and your community?

IE Give me one second. Just pause it there.
00:18:34

Speaker Key (2nd recording):

IV Interviewer
IE1 Interviewee

00:00:00
IV So, overall just, um, summarise you, um, thing that the... What the impact the eruption was on you, your family and the community.
IE I think when the eruption happened, [unclear] things that were happening at that time like sports. Like I was involved in sports.
IV Mm-hmm.
IE And we had a football, um, competition going on and had teams couldn't come out to play because of that reason. It disrupt their whole life.
IV Mm.
IE Of course churches became packed because when things happen like that, people want to find meaning.
IV Yes.
IE They go to the church for meaning. I don't want to go to hell too.
IV [Laughing].
00:00:39
IE So think about, oh god, what does this mean? I don't want die. So, in that regard the church got... Kind of got bigger. I mean, the other social, um, the whatever is fat [?], no more fat, because people want to go to hell. [Laughing]. Don't get caught off god. You know? And, uh, but all the community in general, people got... We get more closer, nuh? Get more closer.
IV Hmm.
IE Cause they were there to talk about things and to comfort one another and so forth. Even internationally speaking to be, be, begin to call us a lot more from abroad. My parent's called us regularly to make sure everything is okay. Cause they saw the news in America.
IV Yeah.
IE And people get concerned. So they would call and tell us, don't worry about it, we got your back. If anything happened, we had to leave, we will support you.
IV Mm.
IE You know? In that sense I think it changed, you know? We became closer, more God fearing, more fearful of our, um... Our future, because if for some reason whole islands sink, as they were saying.
00:01:38
IV Mm.
IE What would happen then?

IV	[Laughing] yeah.
IE	You know? And they got me to make a [unclear]. That would have been a serious tragedy for all of us.
IV	Of course, yeah.
IE	You know? But I think it changed. My, my... My attitude toward it I was, I was still in shock cause I was 13.
IV	Mm.
IE	And I'm looking at this as if it was doom. What is this? What is the meaning of this?
IV	Mm.
IE	You know? What did we do wrong?

00:01:59

IV	Mm.
IE	You know?
IV	Yeah.
IE	How can we make amends for this wrong? I don't know. So, I was happy because, in one sense, because if they say we gotta leave the country and go somewhere...
IV	[Laughing].
IE	My bags are packed.
IV	[Laughing].
IE	I wouldn't mind travelling another country, you know? But it ultimately did us good in spite of the fact there was a disaster. You know?
IV	Hmm.
IE	That's the way I look at it.
IV	Hmm. Well, thank you.

Interview E5: 06/05/2016, interviewed in Chateaubelair, Female

Speaker Key:

IV	Interviewer
IE	Interviewee - in Barrouallie at the time of the eruption
UM	Unidentified Male

00:00:00

IV	Shouldn't take more, it should take around about ten 15 minutes.
IE	Okay, um, I have my supervisor in here early and I'm like self-employed [?], so.
IV	Okay, we should be done by then. Great, so, um, to start things off we'll keep things general and then what you ask me I will pick out some more questions to get more detail. So, to start off, can you, um, just recount what you remember from 1979?

IE	All right, 1979, 13th of April.
IV	Hmmm-mm.
IE	I woke early because it was custom that we wake early as children.
IV	Hmmm-mm.
IE	And we do our chores, get ready for church. It was Good Friday, so it's customary that we go for our Good Friday church.
00:00:42
IV	Hmmm-mm.
IE	And we got up. We were still in bed, but we were awake.
IV	Hmmm-mm.
IE	And we heard sounds like thunder. We thought thunder was rolling in. We were kind of excited because we said rain was going to come and we lie around, and idle [?], and so on, but we heard some people who were screaming at the top of their lungs, Soufrière is erupting. Well, in the local [unclear] Soufrière erupt, that's the dialect.
IV	Hmmm-mm.
IE	And so, well I had to do my wears, wash my wears, and I went outside and I thought rain was coming. I saw what we would say in chin [?], um, our local [unclear] is calling toward the… It appeared as though the rain was coming from the sea.
IV	Hmmm-mm.
00:01:33
IE	So, but we were not getting wet. When it got to the village, to, we noticed that these, it was ash. We didn't know it was ash.
IV	Hmmm-mm.
IE	This thing that was falling down outside.
IV	Yeah.
IE	Our parents explained it was ash and then we heard this, um, uh, um, we heard this sound that, of the thunder.
IV	Hmmm-mm.
IE	And then we looked across. When we had [unclear] Soufrière, we could see it across because we were living on a hill.
IV	Hmmm-mm.
IE	We saw the fire coming out [knocking]. So, we knew now that Soufrière was erupting.
IV	Yeah.
IE	It may be [unclear].
UM	[Unclear].
00:02:14

Speaker Key (2nd recording):

IV	Interviewer

IE Interviewee

00:00:01
IE So we, we were a little concerned, but not so much scared, because I think we were still together as a family.
IV Yeah.
IE Like we were explaining, my father worked with the electricity company, so he got ready and left to check, to see what was going to happen. And so by then the community was awake from all the sounds and so on, people were screaming out, wake up, Soufrière has erupted! Whatever. [Clap] And then people start running.
IV All right.
IE They just start to scamper.
IV Hmm.
IE Well, I remember one of my brothers, Joe-Nichole [?], he ran away.
IV Oh!
00:00:39
IE He left. We was, we, we were told to stay, have our breakfast, get ready. My duty now was to pack, my mother said, two suits of clothes for everybody, every member of the family, pack our schoolbooks, get ready. We had to have church clothes. So that was my duty. Our duty was to pack us breakfast, and the others were to get dressed appropriately for travelling. To where, we didn't know.
IV [Chuckles].
IE [Chuckles] But she had her… We had breakfast, but at that time, my brother left.
IV Oh, my!
IE And all the other people were leaving. But my father had then returned and knew that there was not going to be any work. And he had contacted his brother, who was then living in Arnos Vale…
IV Okay.
IE That we were going to go there to stay. So we knew then that we were going to Arnos Vale. I had an older brother; his task was to lead the others. He knew where my uncle was living, and, first of all, he had to find my younger brothers [laughter]…
00:01:51
IV Yes.
IE So he went and found him, little dummy [?], wandering [soft clap]. He probably was looking for transportation. I know he didn't know where he was going, because he was young. So he came back, and then he took all the boys to my, ah, uncle's house. My father took them; they got transportation, and off they went.

There were two girls, my sister and myself. We stayed with Mum. And, ah, she started cooking. It is shell, the shell that you make callaloo soup. She made callaloo soup. The only thing is that we didn't get a chance to eat the callaloo soup, because by then the VINLEC vehicle, okay, that was the company vehicle for my father, and they took me to Arnos Vale with all the clothing and everything that was packed for the family to be okay. And then my mum

took the boat. She was on the last trip. There was a boat that came to take all the others who had remained.
IV Okay.
IE So that was uncomfortable. Then we had known, seen and understood that Soufrière was in action. What we didn't know was the length of time; we didn't know all of that. Mm-hmm.
00:03:05
IV Oh, that's very interesting, thank you.
IE Yes.
IV So where, where were you living at the time?
IE I was living in Chateaubelair, in a…
IV In Chateaubelair?
IE In a village called Barracks.
IV Barracks.
IE Hmm.
IV Okay, great. Um, so that's very interesting. Thank you for sharing that. Um, just say, do you remember anything happening the year before, in 1978? [Overtalking].
IE 72, whenever I came…
IV 72, yes. The main, actually…
IE Yes.
IV Yeah.
IE But it was not… We just know that Soufrière had, um, erupted and so on. It made that kind of impact in 79. And what I remember was that the people who were living in Richmond [?], there were some people who living, who were living across the river, um, in Richmond and in Wallibou. They were relocated, because some of them came to our area to live.
00:03:58
And so they were relocated. The Government had said that they didn't want them beyond the river, because just in case that we had the lava flow; they would've been cut off…
IV Yes.
IE And could not have been rescued.
IV Okay, great. Um, so thinking back to your schooldays, did you actually learn about the volcano until, about Soufrière, in schools, before, before 1971… Oh, no, 1972 and 1973?
IE I could remember, I can remember the reading book, not reading, history. One of those books had, um, recordings of Soufrière, um, and St Vincent, Martinique, you know, and Mount Pelée. Because there was a connection, somewhere in 1902, where both of them erupted. I remember what they said.
IV Yes.
IE Mount Pelée. So that was part of the history...

00:04:50
IV Okay.
IE Story that we did in school. So we know a little bit about that. But I also knew the history from my great-grandmother.
IV Okay.
IE My great-grandmother, Esther Adams, knew about the volcano, because we had lands working on the hill of the volcano. So her agriculture lands were there, and she went there daily, along with my mother as a grandchild, and the other siblings. They would go to the mountain and do their work. But my mother didn't know anything about that except from the story that she told.

But she worked on the volcano [chuckles] side, the mountain hillside. And she told us there were days when they would go, and she would hear, they would hear the rumbling, but they didn't know what it was. She told us that there were four days of rumbling. I'm not sure if that was correct. But she recorded four days. And I think it was between the second and fourth day that they realised the rumblings were from the volcano.
IV Oh, right.
IE So she was in a very little board house. She said, she said, what little holes that were the spaces between the roof and the rafters and the building itself, she said they covered them with cloth to prevent ash from coming in. And any holes that were caused, the windows or any of the seams, from boards or whatever, they covered them.
00:06:20

And she told us that they collected water and had water inside. They had some clay pots. I met with her with her clay pot. She called it a monkey.
IV [Giggles].
IE And she had that monkey; it kept water very cool, because at that time, they didn't have fridges and electricity and so on. And they kept those. So then all she did was that she did not go back to the mountainside until everything settled. She said she was living near to the beach, and she said the fishes came out of the water, because the water, apparently, was warm, and there were many fishes that came upon the land [soft clap of hands].
IV Oh, right.
IE She also said that days after, when they started going back to the mountains, they got coals. So they get bags and bags of coals, because the trees were burnt on the mountain, were actually coals. So they had free coals.
IV It worked out.
IE They were…
IV Good benefit.
00:07:19
IE So, yes, they had a benefit.
IV Yes, okay, great. Um…
IE We have a benefit in 79. In 1979, because of the ash fall, when the produce start coming in after…
IV Yeah.
IE They were bountiful. We had a bountiful harvest. Their sheaves were larger, they had more, and so on, and they accredited that to the ash fall, hmm.

IV So that's a benefit…
IE Yes.
IV Because… Yeah. Um, so you said, um, you were preparing to go to church [overtalking]…
IE Yes.
IV So, um, were you still able to go to church during this disruption?
IE No. Everything was cancelled. Everything was cancelled. There was no church; nobody remembered anything about church…
IV [Laughs].
IE They remembered God. The people cried, God, and so on.
00:08:04
IV Yeah [laughing].
IE But there was no church, and everybody just scattered. There were few people who stayed, like the Rastas, and a few older folks who felt that they could die at any time [snaps fingers].
IV Okay.
IE They didn't. But most people went.
IV Okay. Great, thank you. Um, so you evacuated Arnos Vale. How long did you stay with family in Arnos Vale?
IE We left in April. I think we were told in June, June, July.
IV Okay.
IE When, ah, the all-clear was given, Government had given the all-clear that we can come back to our homes. And we came back.
IV Okay. Um, in terms of, um, when you returned to your home, did your parents have to, um, like repair, uh, [overtalking]?
00:08:59
IE We didn't have to repair, but we had a lot of cleaning.
IV So you had to like [overtalking]?
IE We had to wash the roof…
IV Yes, yeah.
IE From the ashes, and the yard was white, and so on. So even before we… When the all-clear was given, some people had started returning to do cleaning. So we were cleaning all the time, my brothers, and so we'd come. My parents went, came up the week before, and we had to clean, wash up everything, because all over the house was ash. Even you didn't have that quantity as what was outside.

The place was locked, but even blowing hard on the furniture, you could see all the ash and so on. We had to wash the curtains, the sheets and beddings and all of that. And it took us a while to get rid of all the ash, especially in the yard and so on.
IV Okay. When did you return to school? Was it the, the September?
IE No, I…
IV Or did you [overtalking]?
IE I was a young teacher then, and I had…

IV Okay.
00:09:54
IE To return to the teachers' training centre.
IV Okay.
IE And, um, and school started… So I think we went the September, because school would've closed around the end of June, July.
IV Yeah.
IE So we had that long… So I think we didn't go back until the September.
IV Okay. What do you think the Government did as a result of the eruption?
IE What do…?
IV How did they help…? The Government, how did they help [overtalking]?
IE Well, we were all excited. We had free food and…
IV [Laughs].
IE Places to stay. Um, but people saw it, and they found that it depended on what age group you were in. It was fun for us.
IV [Chuckles].
00:10:35
IE Now, in my case, all of it wasn't fun; I had to work, because all teachers, all civil servants were asked to give a hand. For example, when, when we went to Arnos Vale, my training centre as a teacher was in Layou. That's the community you pass before coming…
IV Yes, yeah.
IE And so I was mandated to return to this community in Barrouallie, over the old school that was a shelter. My assignment was to return to my people. So you were supposed to report to the closest shelter to where you would have worked as a, where you would've gone as a teacher. So my closest shelter was in Barrouallie, and most of the people from my community was in Barrouallie. They were in Barrouallie.
IV Okay.
IE So for the first two weeks or so, so, few, I came to Barrouallie as a helper, as one of the workers in the shelters, to assist in food, registration, name it, whatever the task was. But because the shelter, they had asked us to, um, do work, and I had to travel from Arnos Vale, I was reassigned to a shelter in Kingstown, just behind the Victoria Park that we call the Dinner Way [?]. The building had belonged to the, um, Anglican Church. Um, right now, it's… I think that area is a school now. So that location, I was there, and I was the deputy, um, shelter manager then.

My ask as a shelter manager was to ensure that there was food for all the evacuees. Those people came from South Rivers and Mt Grenan, and they were from the countryside. So I had to ensure daily that we had food, made the allocations. And we put to the manager when, when we wanted food, when we wanted clothing, whatever, really, supplies we needed. That was my task.
00:12:45

In addition to the, those who were housed there, we had what we called, um, outside, outside, well, we had outside, um, it's not evacuees, but they were living in private homes and had to come in…
IV Yeah.

IE	I, it just slipped me now what we call them.
IV	That's okay.
IE	Um, so but they had to come in to collect their relief supplies, because they too were evacuees. The only thing, that they were living with families.
IV	Yes.
IE	So they had to come in and register.
IV	Hm-mm.
IE	So there were some persons who lived with families regardless of wherever they came from. Some was from the leeward side, some from the windward, fine, but so, but they were just still at the shelters, and they did that thing [?] at the shelters. So they were still at the shelters, and we were responsible to give them their supplies.
00:13:33

Those at the shelters got daily supplies, but those outside would get weekly supplies. So I remembered, on Wednesday, that was the supply for the, they catered for the outside. So we… I would get in like six on mornings and distribute whatever the people in the shelter wanted. We called it cooped-in families. So if they needed things for breakfast, they would get their items. They collect them early. And by eight o'clock, I was dealing with outside.

So I didn't deal with anybody inside, because they had… They were to get their things within that time and then after, in the evening. But they had to contribute, because they gave their time to assist in the distribution, because we had sacks of flour and sugar…
IV	Yeah.
IE	And we would, um… We didn't weigh any scale, but we had cups, dippers, and we would hand out the bags and measure. Depending on how many members in their family, you would get how many cups of flour, how many cups of sugar, and so on.

We also got clothing, and that was also set aside for particular day. If we had clothing, everybody would wait for clothing on a particular day, so we distributed on a particular day, so that we would avoid having to deal with food and clothing at the same time.
00:14:53
IV	Hmm.
IE	Hmm.
IV	Okay. Um, so as a result of all this returning back to normal life, um, what help was there from the community, from charities, from the church and from families just to try and get things back to normal?
IE	Okay, families gathered, they collected from the shelters. Now, when we were told that we were going back, we were instructed as shelter managers and employees, sort of…
IV	Yes.
IE	We were instructed to give two weeks' supply to each family, so that was their jumpstart.
IV	Hmm-mm.
00:15:36
IE	So each family, be it inside the shelter or those who were registered as private families, each family got two weeks' supply of food and whatever else could've been given. So they got that. Well, relatives overseas and so on were able to give to some people; some people have relatives. But the, they

mainly depended on what Government offered at the time.

I cannot account for many churches. I worship at the Methodist, and I remembered we got a little stipend, families got a little stipend from the sister churches, like the sister churches. I think the church sent the [unclear] out…

IV Okay.

IE In terms of what churches and other persons outside gave. For instance, well, I have relatives in England, and they sent us food, they sent us clothing. I remember my aunt sent via the banana boat. So when the banana boat came up, they brought back. And we had some nice, big box crates; we call them trunks, and that's what, how she sent things, supplies for us, in, in those trunks. Um, so as children, when we got all the additional goodies, like sweets, maybe to keep us…

IV Yeah.

IE You know, to tell us that they're concerned and so on.

IV Yeah.

IE We got all nice, little dresses, and we got books and so on. Some people were not fortunate, but, generally, people depended on what the Government gave. And then when you went back, so you went back to your way of life, most people were farmers and fishers, and we got back and just started. We started. It was slow growth, but we started.

00:17:18

IV Yes.

IE The harvest later was bountiful.

IV Yeah, okay. Um, so that is everything, that is all.

IE Hmm.

IV Just one final question just to summarise everything. So what do you feel the impact of the eruption was on yourself, um, your family and your community?

IE I would think any onset that's not a little slow was a little scary. Um, we didn't know what to expect. We kind of just lived every day as it comes and thank God for His blessings; we were all alive and so on. There were some setbacks, because people depended on banana for their livelihood. It was a weekly business. That was a setback. Because by the time we got back, there were many ripe bananas on the fields, there was… We had a plantation, and people worked on the plantation, and so they had to restart, cut back the bananas; and so growth was slow. But by God's grace, we were able to, to come back.

00:18:18

Um, people… Well, in some cases, we still had access to whatever little remained at the Government kitty and the storehouses and so on. But by and large, I don't think we, accept for, because we were an agriculture country, um, maybe economically… I didn't… I couldn't assess that. Government-wise, in terms of a national…

IV Yes.

IE I know now that there could have been serious national setback in terms of finances and the growth, the whole history of the GDP and so on. I was contributing to… I know for sure, bananas, our export would've gone down. Maybe, if you check the figures, you would see that.

We also traded with Trinidad in terms of animals and so on; that would've gone down. And the plateau… We restart the engine…

IV Yes.

IE But in restarting the engine, we went ahead, because we depended on the soil, and we had to do it to, to survive.

IV Yes.

IE It's either you do it or you die. And that drove us to work hard and go back to, um, get back to normalcy as quick as possible. But in terms of the nation, I know that that would've been, experienced a heavy blow. Family-wise, we had, um, reduced income, but we were able to make it.

IV Do you think it may have brought people together in time for the independence?

00:19:57

IE Well, we were, we were together, you know. In those days, people were close-knit. So if you ate a bread, and the neighbour didn't have a bread, they would get piece of your bread. So it was close. And that, yes, brought people closer. Okay, we assisted in helping people to clean up and whatever and so forth, but we were always close, especially in the rural communities, and I'm from rural.

IV Yeah.

IE So I was accustomed to going to the neighbours for foods. Um, if, if we had electricity early, we would offer what… Maybe put up somebody's fish, their meat in the fridge, whatever, because they didn't have access. But the communities were close-knitted [sic]. So even it was nothing new…

IV Yes.

IE For us to be close and, and help each other. It was absolutely nothing new. We were close-knit. It's only now we, we become sophisticated, because we can now… We have goal…

IV Yes.

00:20:57

IE In terms of our livelihood…

IV Yes.

IE Maybe our status in terms of position. Nobody wants to become poor any more.

IV Yeah.

IE People, middle-income, whatever, whatever. But we still have the poor with us. But we were closer then. We wish we could go back to those days.

IV Oh, okay.

IE Hmm.

IV Okay, well, that's… Thank you, that's everything.

IE Yeah?

IV Thank you. [Bell ringing] Thank you [inaudible].

00:21:17

Interview E6: 30/04/2016, interviewed in Belmont, Male (IE2, male was listening in)

Speaker Key:

IV Interviewer
IE Interviewee - in Belmont at the time of the eruption
IE2 Interviewee 2 – listening in, son to the IE
00:00:00
IV Okay, so what I'm going to do is I'm just going to get, um, just trying to go through the whole experience of what you got, but to start it off with, can you tell me how old you were in 1979?
IE Go over that again.
IV How old you were.
IE Oh, 79 I was, um, 30. 49, 59, 69…
IV [Laughs].
IE I'm just going back to the 69, 60, 49, 59, 69, 79… Total 30 years.
IV That's… Okay. Okay, and where were you living?
IE Right, right at this spot.
IV Here, okay, you were here. Great. Um, and who was living with you?
IE Just the family. Um, Lance, then, wasn't born as yet. Just wife and four kids, five kids.
00:00:51
IV Okay, great. Okay, so, to keep things general for now and then I will, like, question you with the things you tell me, so tell me what you remember from 1979. So, what was your… Um, what you remember?
IE Okay, well, Friday morning which was Good Friday, the 13th of April 1979, I just woke up around 6:00, half past six, turned on the radio, turned on the radio and I heard that the volcano is erupting, is at eruption stage. Okay, well, I used to work at Central Police Station in Kingstown, I did [banging], so I got ready and put on some clothes and eventually went off to Kingstown, to my department which was the criminal investigation department. Well, from there, my superior, they organise, started to organise, because as a policeman we had to be, get ready and so on.
IV Mm-hmm, yeah.
IE Okay, from there we, my superior and all the members that were organising, other folks, we actually get together and we travel over to as far as Byera, and the night, came back to Kingstown. Then we went to Spring Village on the South, on the Western Coast, because these areas were, they were boarded up, they were cordoned off, because we were not able to travel beyond Byera…
00:02:38
IV Yeah.
IE And as far as Spring Village.
IE And then, well, during those time we were there, there was an announcement by the Prime Minister that, that people would be, um, how would I say this, would be… People in indoors area, they would be taken out in, they would be, there's a word, I think…
IV Evacuated? Evacuated.
IE Evacuated, yes.

IV Yes. [Laughs].
IE Yeah, they had to be evacuated. So, the trucks, the old MAN trucks they owned on those days, were big open trucks.
IV All right.
IE So they went into the area and they got the people organised, those living in those communities, Sandy Bay, Georgetown, Owia, Fancy, Chateaubelair, Troumaca, Rosebank, Rosehall… All those people, they were evacuated. Some were in different areas, some in Kingstown, to Kingstown. Some travelled, if any areas were in the vicinities, that were, that the area that weren't seen to be safe.
00:03:46
IV Mm-hmm.
IE Okay. We as policeman, um, but before that, during the time this evacuation were going on, there was heavy eruptions and, um, seen mass close, fire and smoke released in the air, you know, as parts of, uh, the volcano erupted, and this mass going, coming up and going up into the air, and so I saw fire, um, ashes, and cloud dust moving, like rolling over, coming, and so.
IV Okay.
IE Well, that took place on the Friday, but we keep on, after the people, the people were, the people were, um, evacuated and settled over in different areas, different camps and so on, we as policemen now had to go and cover these tents, these camps. So we had to do special duties to make sure that people there were safe and there were no intruders, as the case may be.
IV Yeah.
IE So, we did that for a long period of time. And over this period of time, um, the government negotiated and so on, and then they get people to take any camps, to cook for the people, them they camp, camp of the people that were evacuated, and they keep clean. And, uh, I can remember on the Wednesday after the eruption, that the news broke that there were nine miles of sulphur within the volcano and the scientists say that these, that will be having a great eruption. So, we are [unclear] as we say, waiting for the Wednesday. [Laughs].
00:05:50
IV [Laughs].
IE Because we expect that there's nine miles of sulphur waiting to explode, and everybody, you know, well, in company that we were, everybody was at a standstill on the Wednesday, because we are expecting that this gusting wind to, you know, forward and so on.
IV Yeah.
IE But still nothing happened. Yes.
IV Okay.
IE Well, and so that, [music in background] around the end of April, I was transported from Sandy, and I went to Georgetown, as a couple, as a police couple. But we went there and nobody… Well, I won't say nobody, 95% of the people had evacuated, so when we were around there, you'll have seen peoples moving and so on. Well, we had to commandeer the area, as police officers. We went about, every day, we went about, make sure that, uh, people's property was not intruded by, you know, and so on.
00:06:55
But what struck me most… When I look around, I saw so much dead dogs, cattle, goat, sheep, pugs, pigs that were all over the place. There was

cattle all over the place, because apparently they are stifling and so on, so they all died and so on, in the different areas and everything and so on. And so, we had to assist in burying these animals and, um, the houses, the houses in those areas, the roof was laden with ashes. The roads were laden, as you walk there was ashes as high as anything, that was on the road, you find on any public road.

IV Mm-hmm.

IE Fortunately, during that time, some time after, there were some heavy showers of rain, and the rain came and, kind of, um, soak away the ashes, you know, melt the ashes, melt. Not all, but a good bit of it so that eases us a lot so, the house roofs they were covered with ashes, and so on, so it wash, it washes them off and so on. But the camping for the people, that went on for a long time, over three or four months.

So over all this time we had to cover this camp, we had to walk, day and night walk, and the night walk was for security in this camp, we'll rest, another, another, another group of policemen take over and in the day we are to rest and then it went on and on and on and on. Until eventually when they say the area, such as that day, that the area is safe [phone ping]. And that was after about two or three months and so that sort of [phone ping], and then they start to take all the people then, little by little back in their area.

IV Yeah.

IE And so it went down and it went down and so on. But I could remember, on the day, on the day of the eruption, well, this is what I hold, I didn't see it for myself, but the officer who was in charge of the station, and the station orderly who was working in Byera that day.

00:09:33

He told me that when he looked towards the air, he saw this, like, the mountain was coming over, coming down towards the station, which was cloud and different.

IV Yeah.

IE So he said, well, the constable, he said, I ain't staying here and there was no, there was no transport and the officer getting the transport and a man with a diary, he walked in there, and he said, no, he not staying there, and like he just jumped on the transport one and all, and he just, so. [Laughs].

IV [Laughs]. Where was this, uh, Georgetown?

IE Georgetown, yeah, Georgetown.

IV Yeah. All right. [Laughs].

IE And he jumps on the transport, everybody, pull him off. [Laughs].

IV [Laughs).

IE It was really [laughing), it was really a joke when he [unclear].

00:10:16

Um, we were in Kingstown during the eruption, say before I was transported, and we were waiting for the [unclear].

IE2 Central Police station.

IE Central Police station. And we could hear every eruption, could have, and it was so far, could hear every eruption that take place, every one like this, boom, boom, boom, boom, and so on.

UF Guys?

IE2 Excuse me.

IE	Yeah, and it went on sometimes for about 15, 20 minutes and then it cease, you know, it might, and then, like, another two, three days, like, it started to simmer down now, so you're finally getting less noise, less noise until eventually, eventually it cease off, you know.
IE2	They would like to know if you eat fish or chicken.
IV	What? I've… I'll have chicken.
IE2	Chicken, okay. Which one?
IV	Chicken.
IE	Great. So, that is 99, 1979 eruption. But there was also one in 70… In 70, 71 you know, an eruption in 1971.
00:11:31
IV	Yes.
IE	An eruption in 70, 71
IV	Yeah.
IE	I was a young officer at that time.
IV	All right. How was that?
IE	Oh, that was mild. Even though they had, um, evacuated the people. But it was not as serious as the 1979 one.
IV	Okay, well, thank you for what you're sharing, it's very interesting.
IE	Okay.
IV	So, just to focus on the questions, um [clang], try and go back to the year before in 78. Did you know anything unusual going on with the volcano then?
IE	No, no.
IV	No, no, okay. Um, it's interesting to know that actually there was earthquakes happening at that point relating to the volcano, in 78.
00:12:14
IE	In 78?
IV	Yeah. So, it's okay that you didn't know that. Um, so, as you were a police officer, were you briefed about the volcano before the eruption?
IE	Well, we had the idea in 71… 70, 71.
IV	Mm-hmm.
IE	You know, that was the last time we knew about it. And then there was some ideas about it, and what is the option and so on. After that I had, it had ceased, you know, and there was no discussing it anymore and then a sudden, a sudden eruption in 79.
IV	Okay, um, was, um, being in Belmont, do you remember any community meetings about the volcano that had taken place?
IE	No.
IV	No?
IE	No.
IV	Okay. Um, do you go to church?
IE	Yeah.

IV Yeah. Was there any church, uh, discussions in the church about the volcano?
IE No.
00:13:08
IV No, okay.
IE Which you mean, the 79 one?
IV Yes, the 79 one.
IE Mmm, there was no discussion. Well, uh, to be frank those, those years I was not a regular, church member, going member, you know because you working and so on, and so I wasn't really regular in going to church.
IV Okay. Okay, no problem.
IE But I do think that there were no, um, discussion on it.
IV Okay.
IE Just as all was happening, you know where, after 79, you don't really hear much about it, you know.
IV Okay, yeah.
IE You just start to venture, well, recently, they might have some, um, not the church though, you know, the organisation, NEMO, and so on, might have discussion, and so…
00:13:47
IV Yeah, okay. Um, oh no, those questions are not relevant. Um, well, I suppose, some of them I can ask, mmm, that, none of these will directly affect you. It's interesting, I have to cut out most of these questions because you were working at this time. Um, when did things return to normal for you as a police officer? When did you, um, like, not become, you know, in the act of duty in Georgetown, into that?
IE Well, as a police, well, to be, uh, as a police officer you're always on duty, you know.
IV Of course, yeah. In terms, in relating to the, uh, volcano, you know, the volcanic eruption.
IE Eruption?
IV Yeah.
IE Yeah, well, I was transferred there on the force. I worked there in 79.
IV Mm-hmm.
IE Was transferred there in 79 and I worked there until 81, 1981.
IV Okay.
IE And then I moved from Georgetown to Sandy Bay, where I spent another two years.
IV Okay.
00:14:56
IE So, during that time, yeah, things had, everybody, most people had already gone and settled, started to settle down and so on, you know.
IV Okay. Okay.
IE Mm-hmm.

IV	Um. Did anything change around the home as a result of the eruption?
IE	In my home?
IV	Yes.
IE	Mmm, well, uh, you mean in terms of, of uh, structure at the home?
IV	Yeah. In terms of, like, what were you, you didn't do any changes about the property or…
IE	Well yes, because in those days it was a smaller house, was just a small board house I had in those days in 79, small house, board house, wooden house. So, after a period I changed the whole structure.
IV	Do you think that's as a result of the eruption though?
IE	No.
00:15:44
IV	No, okay [laughs]. Um, what did the government do as a result of the eruption. Like, what actions did they take, as a result of the eruption, to maybe try and make things better for the, uh, people, maybe for the police force?
IE	Well, um, they hardly did anything.
IV	[Laughs].
IE	It just went back to normal.
IV	Okay. Um, I suppose, because also you worked in here, you weren't affected that much, but what do you know, was there any help from, like, [hooter] charities, church, government, families to, like, rebuild?
IE	Yes, there was some help from the government in different areas.
IV	Yes.
IE	You know, the areas around the volcano, you know, like in Sandy Bay, Chateaubelair, those people affected by their homes being, with ashes going off, If they got too much on their roof and so on, they replaced their roof and so on.
IV	Okay.
IE	I think they helped in putting, um, in giving back some people animals that they lost, and so on, yeah.
IV	Okay, all right. Well, that's everything. Just to finish off, can you, um, describe, um, no, how did you feel the impact of the eruption was on you and your family and your community, just to summarise.
00:17:01
IE	Just in this area? There was no, no effect, no.
IV	Yeah? How did…
IE	The only, what I must say is that the ashes, the ashes, we felt the ashes here, down here, because it fell on our home here and so on, and it was dusty and so on. But one good thing about it I'll always remember is that, as a farmer I used to grow meal [?] and I remember the ashes were on the line, up here. And I planted some cucumbers, and these cucumbers I plant them in what the ashes inside the, the earth. And I tell you, I could have never see this type of cucumber.
IV	[Laughs]. Wow.

IE	If you see cucumber, those trees there, I was surprised and that was because of the ashes.
IV	Wow. That's great.
IE	The ashes enriched the soil.
00:17:47
IV	Yeah. Great.
IE	And everything around was green [laughs].
IV	So, it's good. It's a good thing that, isn't it?
IE	Good thing. That's a good thing about the eruption, yeah. A very good thing.
IV	Yeah. Cool. Well, that's everything. Thank you.
IE	Yeah.
00:17:58

Interview E7: 10/05/2016, interviewed in Owia, Female

Speaker Key:

IV	Interviewer
IE	Interviewee - in Owia at the time of the eruption

00:00:00
IV	Yes.
IE	In 1979, I was ten years old.
IV	Mmm. Okay, great. And where were you, uh, living?
IE	Right here in Owia.
IV	Okay, and who were you living with?
IE	My parents.
IV	Your parents.
IE	Yeah.
IV	Okay, great. So, just to keep things general for now, tell me what you remember from 1979.
00:00:22
IE	Okay. Um… In 1979, that dreadful morning, I remember, as a little girl, when I woke up that morning, we were all, all preparing for breakfast, because the day before… It's a tradition that you, we have Cassava Bread, and your ferry [?] and your buns to, um, to eat for, um, Good Friday morning because we didn't buy bread, that sort of thing. We had local stuff. So, we had all that prepared and ready. So, when… That morning, when we got up, everybody got up as usual.
IV	Yeah.

IE We were preparing ourselves for breakfast. Then, all of a sudden, we heard a noise of, like somebody shouting, something falling from the sky. It look like ashes that is falling. And I was looking, and I was wonder what they were talking about.
IV [Laughing] Yes.
IE Was I… I'd never experienced something like that. Then my mother went outside and then… The mount… She look up at the mountain, was looking back. Oh, it's coming, and she was coming together now. And everybody alerting one another.
IV Yeah.
IE And it seems as though the volcano's going to erupt.
IV Yeah.
00:01:24
IE So, we forgot about food and everybody got scared now.
IV Yeah.
IE Especially me, as a little girl, never experienced it.
IV Yeah.
IE So, I got scared and we all went in one house, sat down. But, after that, we decided we need water. So, this one eruption [unclear] have to go to drinking water. So, we eventually get the pipes, the taps, but the water there was very white, which means that it was, it was already there for the ashes.
IV Yeah.
IE Yeah. So, we couldn't drink that water, but lucky so, we have a spring on the outskirts of the village. So, we had to take our buckets, as little children with our buckets and we travelled to the spring. This is about, maybe about half a mile from where we were living, and we get our buckets with water. We likely [?] have to cover it because the ashes was falling now. So, we couldn't allow the ashes to get into the water. So, we drew up a little water and we, we came back home, and everybody was so frightened now, we didn't want to eat.
IV Yeah.
IE So, all the food just stayed there because nobody eating. And then we were wondering, what would be the next step. And we look up in the mountain and we see this big puff of smoke, just coming over.
00:02:32
IV Yeah.
IE And then, I remember, um, my mother said to us, um, everybody, just go in one room and, and, and, and sit down there. And we keep listening to the… We turn on the radio and we keep listening to the radio. And, that time, we didn't have a prime minister, we had a Premier, because we wasn't an independent country at that time…
IV Yes.
IE And the Premier came on the air, asked us not to panic. [Unclear] we have an eruption and not to panic. So, eventually, um, [unclear], um, remove us from this area because [?], because this area is a dangerous zone for the volcano. So, they said they were going to remove us. And remind here, we had only one bus. We didn't have those minivans then. No public transport. We only had one bus.

And, I remember my mom… My mom had a young baby, just 9 months old, and I be… I was the elder, the eldest of her children and, I remember, she said, okay the, we're going to try to get on the bus and we'll see how far they can take us… Where they can take us so that we can be a little safe. So, we all got ready. We walk with nothing. Clothes, nothing. When we come back, [inaudible] little baby. She had a little suitcase and she'd packed a few things in it, just for the baby.

00:03:52

And we got on the bus. Everybody tried to get on the bus, but it was full. It couldn't carry everybody. So, then the, the, the Premier said, we're going to send trucks. Government trucks to, um, evacuate people from the area, also. But we tried to get on the bus, lucky. So, I am take the, the, the little baby, my little brother, and I ran to the bus and my other siblings, we managed to get on the bus with, uh, with some of our family members and all our community members, and we start driving.

But, um… All the time, ashes are falling heavily. Now I realise stones were now falling and so, we wanted to… They were… Well, they was saying that they wanted to get [unclear] from [unclear] Rabacca Dry River because, um, when that… If that river starts running, it's going to be dangerous for us to cross.

IV Yes.

IE You see, that was… That was what they were really concerned about. Um, we got on the bus, we leave, and we were heading down. And it happened… So, when we got to Rabacca, it was running. As the bus was about to pass over, it got stuck. Everybody began to scream.

IV Oh, of course.

IE Yes. We're probably was allowed to scream because the water was running, and the water was a little bit hot also.

IV Yeah.

00:05:08

IE And everybody began to scream. And I know I had an aunt on the bus, and she tried to jump off and, when the bus almost ran over her. Yeah, when is the journey [?] bus full because we almost ran over her. What happens? So, we, we got to Aniem [?], we were taken to North Union Secondary School, that was our camp. [Unclear] and I remember being there and that night, it was just like fire falling from the sky.

IV Mmm.

IE And, to sleep, there was nowhere for us to sleep because we didn't walk with anything. We had no clothes, no nothing. So, we partly just sat through the night, talking and trying to comfort one another. Oh, yes, because everybody's scared now.

IV Yeah.

IE Yeah, and then the children crying because they don't really know what's going on. So, we just sat through the night and I remember, um, the [unclear] suitcase that I walked… That my mother walked with for my baby brother. We had to put him in the same suitcase to sleep. But everybody has just sat through the night and they told us that, by the next day, they'd try and get us some cots so that we can, um, sleep on.

Um, during that time, it was terrible. Day after day. You look up to the mountain and you just see fire, rolling… The, the clouds rolling over and, between this, the fire coming over. Right?

00:06:34

IV Yeah.

IE Um, the ashes keep falling, and we had some serious thunders during that time. Thunders and lightning, rain, serious thunderstorms we had during

that time. And so, we were at the camp from April until… At the camp, we… Well, they didn't have no school was going on because all the schools…
IV Yes.
IE People was using them as, um, as camps.
IV Yes.
IE At the camp we was in, North Union, another few teachers there and normally we'd, um, take, even as half, the every day with us, as children, they'd try to teach us something.
IV Yeah.
IE Even if it's just half day, so that we can keep up to date with our lessons. So, we didn't have any formal school for that whole time. We were at that camp until September. From that April until September.
IV Okay.
00:07:31
IE So, the government provides us with supply of food and whatever, whatever else we might need. The government supplied that for the time that we were, we were there. Um, we can go back September.
IV Yeah.
IE All right. And when we… Well, just before that, we had people who had, um animals and so on, they will… People will take the chance and run back to the village to see how their animals were doing and, um… Well, there were a lot of stealing going… Outside people who were… Who came back will go and steal other people's animals, and their, their, um, produce and so forth. All that went on.
IV Aw, that's a shame.
IE Yeah. So, when we came back to the village, um, our house was like, the whole verandah was filled with ashes, the roof was covered in ashes, all the windows, everything was covered in [laughs]… Just ashes all over. And when you look up at the mountain, it's like a fire passed you.
IV Yeah.
IE All the trees were burnt down. It was just looking dry and burnt.
IV Yeah.
IE Because of, of, of what took place when the, the, the, um, fire fall. All the trees, there were burnt, right? It was so strange when we come back into the village. Um, it took us some time to, um, got back to normal life but, eventually, things quiet down and we got back [laughs]. We got back to normal life. After maybe a couple of months, thing got back to normal.
00:08:57
IV Right. Right, thank you for that.
IE Okay.
IV Great. I'm just going to ask some questions just to recount some bits.
IE Right.
IV So, as you were at school, were you taught about anything about volcanoes before the eruption? About the volcano.
IE That I was taught anything at school?

IV Yeah.
IE No, I wasn't. No.
IV No.
IE At school, we were never told about volcanic eruption. Before, I heard my grandparents talk about the 1902 volcanic eruption and she said they had a minor one in 1970.
00:09:31
IV 1972.
IE Yeah, but nothing serious.
IV Yes. Nothing serious.
IE Yes. Yes, but, otherwise, on school, they never taught us…
IV Okay.
IE Make us aware of what can happen.
IV Okay. Do you remember any community meetings happening after the eruption about… To discuss the volcano?
IE In the community here?
IV Yes.
IE No. I can't remember they ever have a meeting in the community to talk about the eruption.
IV What about a local church group? So…
IE Well, yes. Local churches… The local churches came together, and they talk about, um, the volcanic eruption and what they can do to assist and support us in the aftermath.
00:10:13
IV Okay. Um… So, [unclear].
IE [Laughs].
IV It's good. It's good. That's good. Um… Do you remember if anything… Um, what made your parents want to return home? Did they… Did you return back to the same house?
IE Yes, yes, yes, yes.
IV So, what was… Did you remember what made your parents want to return with the family, back to the home?
IE Well, um, my parents wanted to come back home because she didn't want to go anywhere else to live. We had a house here already, we had out lands, we had our animals and everything. So, we decide to come back home. There were many people who didn't do that, who stayed, who stayed back, but my mother decided we're going back home. That's where we live. Whatever it is, we're satisfied. We're going to go back home because we're comfortable.
IV Hmm. Okay, yeah. That's why I asked the question, because I have come across people who said, oh, actually, like once it happened, I actually stayed [inaudible].
IE Yes.

00:11:15
IV [Inaudible]. Did you know that anyone else in, um… That came back or did they stay in the community? When they were back, did they stay? [Inaudible] or did they also return?
IE Well, um, everybody evacuated but, um, there were… There was one family who didn't want to move at all.
IV [Laughs].
IE And, after all the road access was, um, was blocked, the government eventually sent out helicopter to take them out. That one family, because they didn't want to move.
IV Oh, no.
IE Yeah, they made… The parent made up their mind. The children wanted to go but the parents made up their mind and they wasn't moving because they was saying, come what may, they're going to stay. Because everywhere they go, the volcano is… It is invasive so it can affect everybody.
IV Oh, okay.
IE Okay. So… But eventually, um, after they was [unclear], the government, they said that everybody should move out. They sent the helicopter to take them out.
IV [Laughs].
IE [Laughs]. Yeah. Well, a lot of people who didn't, who didn't came back. Yeah.
00:12:19
IV Um… So, did you return to school, back here, beginning of September, when you came back?
IE Yes. When we came back, we returned to school, yes.
IV Okay. So, was there anything different about school or did they start talking about the volcano more?
IE Yes, yes. Yes. And even also us children in the classroom, that's what we talked about, all the time.
IV Oh, yeah.
IE Because it was something enlightening and we'd never experienced it. So, we keep talking about it all the time. And even today, I will remind the kids…
IV [Laughs].
IE About what take place [laughing].
IV [Overtalking].
IE Yes, and the experience that I had.
IV Keep you [overtalking] experience and the memories alive.
00:12:58
IE Yeah, because even when I taught them, they say, Missy, you want to frighten us. We don't want that to happen. I say, well, I experienced it. So, [laughing], one of these days you might experience it too.
IV [Laughing] yeah. What do you… You might have been too young to remember, but do you remember what the government did as a result [inaudible]? How did they help people to get back on their feet?

IE Well, um… You'll have to be… Well, the government, they transport us back. They send vehicles to… The same trucks, to take us back to our various homes and they, um, still give some supplies… Even after we reach our home, they still give supplies of food and sheeting and blankets and that sort of stuff, for some time to family members, so that they can, um, [unclear] they can all get comfortable. Otherwise, I don't think anything else was really done by the government.

IV [Overtalking]. Um, what did the community do, um, to, um, like, help out… Helping people to get back on their feet?

IE Well, as a community, they, they work, they work together with everybody. Some people houses were in a real bad state so… Because the ash itself been on the, the, the roof [unclear] for some time. It start to rot.

IV Yeah.

IE It start to rot, yeah. Okay, so, you know what? You're going to help one other, clean up and even clean the community and get the animals back. Because you had to walk here and there, go looking for your animals because they went all over the place. Because we had to let them go and leave them, so they went all over, looking for food and looking for, um, shelter. So, we walk along and make sure everybody got back their animal and everybody house was in order for them to live properly.

00:14:52

IV Hmmm. Um… So, what… You've mentioned before, the churches coming together to help people. Um, what, what did they do to help? The churches?

IE Okay, um… Well, the churches, um, some churches had… Okay, they have, um, [unclear].

IV [Laughs].

IE Oversea, they have other churches that support, right?

IV Okay.

IE So, they will write to those churches and look for help, so that they can give to the community. So, maybe the churches will send barrels of foodstuff, barrels of clothing, and they share them among the community members, yeah.

IV Great. Um… That… I… That is everything. Just to summarise your… The whole experience. Tell me what you feel the impact of the eruption was yourself and your family and your community. What, what, what would you summarise the whole experience for everyone?

00:15:52

IE Okay, um… Well [laughs], Experiencing something like that for the first time, okay, at first, it was a bit frightening, but after you get to know what really has taken place, and you get to experience it for yourself, you get to learn more about it. And you know now, well, if there should be another eruption, you know, what preparation to make, what to do, how to help others.

IV Yes

IE In a case a sudden eruption should occur. Well, um, my family, we just took it as [laughing] as it came.

IV [Laughs].

IE Yes. We came back and we talk about it. We see that we talk about it and now we have the experience because my father… At that time, my father wasn't here. My mother… He usually sail so that time he was out. It was our mother and us alone. So, when we came back… By the time we came back, he was here, so we get to sit and talk to him, and tell him our experience. And I think, maybe, it's frightening, yes, but it's a good experience. Other than

something frightening…
IV Yeah.
IE It is a good experience, and it's good to have the knowledge, and to know that, yes, there's a volcano there, and anytime now, know that it can erupt. It can erupt anytime because it is still active…
00:17:11
IV Yes.
IE And anything can happen at any moment, so we are more equipped and more prepared, in the case… In the event that it should erupt again.
IV Mmm. Okay, great. Thank you. That's everything. Thank you so much. I'm sorry to take you away from you class.
IE Oh, yeah. [Laughing] That's okay.
IV Um.
00:17:27

Interview E8: 10/05/2016, interviewed in Orange Hill, Male

Speaker Key:

IV Interviewer
IE Interviewee - in Fancy at the time of the eruption

IV Okay, to begin, how old were you in 1979?
IE Um, I was about, what, 17.
IV About 17, okay. And where were you living, were you living here?
IE I was living at, uh, Fancy.
IV You were living in Fancy, okay. And who were you living with?
IE Myself.
IV Just by yourself, okay. Okay. Um, so just to keep things general, just tell me what you remember from 1979.
IE Okay, um, I think on that, in 1979, the morning of the eruption, the guys in Fancy was, they had an event planned to go on, um, more or less a local excursion, you know, a boat right, all local boats from Fancy to, I think it was, um, either Richmond or Mt. Coke [?], I can't remember exact, but it was, you know, a regular thing that we go to. But everybody kind of get disappointed too that time.
00:01:38
So, I actually changed my plan from going, you know, so while home and I went out early to look after the animals and so on. And then you just realise and you're just feeling, you know, a strange thing like a powder, you know, like dust dropping on top of you.
IV Yeah.
IE And different thoughts came to mind, because sometimes when people are lighting bushfires, uh, you know, you are getting the fire lines, when somebody set a bush fire [?] or something. And then nothing like that was happening at the time, you know, a big bush fire.

And we didn't take it seriously, but then it continued, you know, and then as, you know, the time's going and you start noticing that, okay this thing continued to fall and the more you dust it off, you cannot see it so much in the, in the air naturally like that, you are just feeling it.

And then when you look, you know, you see, you know, the powder building up on top of you. And then, you know, it started to be a concern, so then you look and realise well no there's something's wrong, this is beyond just a little dust. Just like, you know, [inaudible] and then you meet other people, you know, who have the same thing, wondering too what is this.

00:03:46

And they're feeling the dust and so on. And then one time, you know, we see a fellow running from the volcano at a speed, you know, he was saying, no this looks like Soufrière, you know, [inaudible] feeling the ashes. And everybody knows that [inaudible] and then they just do something.

But then by then we get into the bigger part of the village, you meet people who then start feeling the powder, start thinking well this could be Soufrière and people start getting ready to move and so.

Then some of the other folks decided they're not moving yet, because they still want to get good confirmation as to whether it's Soufrière or what it is. So, we didn't move immediately. Then while we're there, now the, the boat got, too much people was on the boat, so the boat turn over before it leave the shore.

IV Oh right.

IE It capsized, too much people went into it, so the drinks and stuff, it turned over. And then they were, like, falling, so we decide now we're going down there to dive and get the drinks and stuff. And then while we're planning for that, you know, we start hearing the rumbling, you know, the rumbling like thunder.

We start realising that's it's Soufrière. So, a lot of people now start running and moving out and grabbing everything they could get. Then we didn't move immediately until we hear, uh, vehicles coming from [inaudible], Soufrière erupting.

00:06:20

Early the next morning, you know, we start walking and by the time when we start realising that everything was serious, by then we were in Fancy, we couldn't really see the, the, the, the bigger explosions, except, you couldn't see the small explosions, but when the big ones goes really high, then you could see a little bit, because, like, the mountain was so high that... Thereafter, you know, we started seeing it, everybody now started to arrive from Fancy, so we decide, well okay we'll move the next day. [Inaudible].

IV Okay.

IE And then after the night now everybody started going out of Fancy, vehicles coming in and so.

IV Okay.

IE The next morning we start walking, because we've got no vehicle, then we end up walking to [inaudible], then we get a ride from there all the way into town. So, it's then now we start to visit the areas where they say they have the camps and so on set up to look for, like, family and so on.

And my girlfriend at the time, they had a house in Kingstown, so her family were there, so we end up to go there and stay. Then, you know, we start to visit our lady friend here who's trying to find out, so we were more like on the run, up and down.

00:08:33

IV Okay.

IE And then at that time you could see the big explosion then coming every now and again with the fire and so on. But then after the, the second, third day, you know, we wasn't that scared so much again, because [inaudible], we realised, well okay, if, if it's exploding so often and nothing serious happened yet, then probably that was the trend, you know, so we just relaxed. But then sometimes when it really explode and you see what is coming out, you're really chilled.

IV Okay great. Thanks for that. Um, I'm just going to ask you some questions just to pick out more things what you said. So, before the eruption, did you learn anything about it in school, about the volcano?

IE Well, um, what we learnt in school was, like, basic science and then, um, they give a little, um, background, history, like, and then geography, they show you on the map and so, places like, um, like [inaudible], these are the areas where, um, in 1902 eruption, where the lava flow came down and, you know, the areas where people died and so on.

IV Okay. Um, was there any, probably more after the eruption happened, but was there any, like, community meetings about the volcano, this was probably more after the eruption happened, did the community come together in Fancy to talk about it or...?

00:11:12

IE Well, honestly, um, we didn't have much of a vi- much a vibrant community groups and so on, people more used to look up to, like, if you have a teacher in the village, a head teacher, and, you know, you take advice and information from those people, they are looked as, you know, forefront community leaders, you know.

IV Okay.

IE So, then we didn't really have no, no major community meeting as to preparation plans and all of them things, you know, it's just that, um, okay people go to camp, people leave, people interact and then people came back and then people just start out over again, you know.

What they had in Fancy is, um, they have a uniqueness in Fancy different to other communities, in Island terms, they call it swapped labour [?], you know, people exchange labour, [inaudible] and tomorrow probably you and your family will go back and you need to work, you know. It's the only community that, well one of the only communities that had that particular type of program and it was working really good.

IV Okay. Okay, um, what about the local church groups in, in Fancy, did they come together to talk about the volcano or find ways to help people in the community.

IE Okay, um, again, in the, in the, in the logical sense, [inaudible] in fact they didn't have any formal church group as to how we would identify a group setting, you know, it's just, okay this is a Baptist Church, you're with the Baptist Church, so you are Baptist. If this is, um, Pentecostal, you're with the Pentecostal and, well that's your group setting.

00:13:52

IV So, they didn't really mix as much then maybe, so did, like, the Methodists stick to helping other Methodists and stuff like that, so was it, kind of, like that do you think?

IE Well, in a, in a sense like that, um, if they have things to, like to share, to distribute to help people, you know, a program like that, but, um, you know, that's it, you'll find they'll have, like, public group meetings and they'll discuss things and so they didn't have much of that sort of setting. The churches, they have things like, they [inaudible] to distribute to the church members, that's in a church setting.

IV Okay cool. So, um, how long did you stay in Kingstown for?

IE Well, maybe about for six or so months, but again we were always on the run, you know, because, because every day we, you know, we're up and down, despite the police looking for to stop people, restrict people from going in the area. We used to find means of passing, you know.
IV Okay. So, were you a trouble maker [laugh]?
IE Yeah. [Inaudible].
IV Okay.
00:15:49
IE Sometimes I come up and I spend, like, a day or two, because there are some other guys who are still in the village, so I go up and I eat some fish and eat some meat in there.
IV Wow, it must have been, like, really surreal, like, there's hardly anyone around, it was like, it felt like you've got the whole village to yourself.
IE Of course when you go in Fancy now, if, if you to this house and you meet someone there and he have a goat kill, so he's cooking meat, somebody else [inaudible], because everything's just, like, loose, you know, no owner.
IV Okay great. Um, so when did you officially return home, [laugh] after the eruption?
IE Uh, yes, I sometimes find it difficult to say, because, um, it was between about six, seven months, actually more, [inaudible].
IV Okay.
IE But then because, you know, we were always going and coming, it wasn't feeling so much like you're missing out, you know.
IV Okay. Um, so in terms of when you did come back, um, what damage was done to your house, was it mainly just ash and you just had to clean the ash?
00:17:35
IE Yeah.
IV Yeah.
IE And, um, okay well we had some cases where, like, people, like, broke in to places [?], smashed or broke the glass, and go and tried to see what they have inside, you know.
IV Okay.
IE And, um, [inaudible].
IV Okay yeah. Um, in terms of...
[Non-English].
IE Excuse me.
IV That's okay.
00:18:35

Speaker Key (2nd recording):

IV Interviewer
IE Interviewee

IV Um, is the...
IE Is the sun getting hot for you?
IV Huh?
IE Is the sun getting hot?
IV No, I've been bitten, it's a little bit itchy. Um, but don't worry, we're nearly finished. So, um, just to say that in terms of cleaning up and stuff, was there, um, much help from the community, um, and the Government to, like, clean up and to return back to normal?
IE Um, okay again, as I tell you, the nature of Fancy people, you know.
IV Yeah, okay, yeah, so they, kind of, just kept to themselves, really.
00:00:34
IE Yeah, just people just moved in, I mean, this is general now, people just moved in and, um, individuals just start tidying up and going inside and cleaning inside and then people start washing down the, like, the doors and windows and so on. And then as the days go by now, we settled more and more, people start, you know, washing off their roof and so on. But people just make sure they clean inside, the immediate areas that they have to use.
IV Okay, great, well that is everything. Just to end, could you, um, summarise, um, how you feel the impact, how the eruption impacted on you, as an individual, your family and then also your community.
IE Okay, well, um, on the negative side, okay, um, we, we lose, individually, you know, we lose a lot, like animals, um, crops and so on. And then, um, a little damage to the house. And then probably community, everybody suffer at the same time, because it's a farming community and everybody suffer a lot one way or the other.

Because, uh, again you have people, like, looters [?] who used to come into Fancy and steal things and just carry away with a boat and so on and so forth. Everybody out there lose a lot in terms of animals and crops produced. And then, um, in terms of rebuilding, you know, Fancy had this uniqueness of partnership and working hand-in-hand with each other.

So, everybody, everybody just go out and, you know, work with each other. And sometimes you have two, three families going with one family today and tomorrow you select one family to go and work with. So, as you're ready, then you just go work with that family and make sure that everybody get, like, house work.
00:03:25

The community, once people seeing doing some work, especially on a Sunday or Saturday, if, if you invited, you invite some people, they will just come and help, you know, because when you're doing work like that, you've got little drinks for later on and so on and you cook food and fellas will just come in and just help and, you know, get things, get things done.

Um, the Government did a bit, you know, some people get a little galvanised, some get some, um, well we got foodstuff, you know, because even from the camps that people were staying, you know, the camps, they're making sure that people get things like bedding [?], flour [overtalking], you know, grocery package. And like some weeks ahead, after you get back, you still receive some food supplies and so on.
00:04:39

Then some other groups came in and they gave people things like seedlings, some people give, and government, gave a little animal. Then I think there was an organisation called [inaudible], I particularly start working with them, who are the main organisation for rural development.

So, they did a lot of work in terms of food and nutrition, using local food and eating the food you grow and growing the food you eat and help to use them in different ways to boost nutrition and so on and to preserve food.

For example, we used, like, potatoes, sweet potato, and make flour, then we can use the flour to add a little to the wheat flour to make bread and other stuff. Then [overtalking], so, um, grass, the local shrubbery type that we have here, to upgrade the quality for the animals. And then some people were given chickens, so they had chicken [inaudible].

IV Well, that's everything. Thank you.

00:06:31

Interview E9: 18/03/2016, interviewed in Fitz Hughes, Male

Speaker Key:

IV Interviewer
IE Interviewee - in Chateaubelair at the time of the eruption
UF Unidentified Female

00:00:00
IV Okay, so, from what, for keeping it general can you tell me what you remember about the 1979 eruption?
IE Okay. It was, um, nine, 13th of, 13th of, um, April.
UF [Unclear].
IV Hmmm-mm.
IE Hello. Huh?
00:00:18

Speaker Key (2nd recording):

IV Interviewer
IE Interviewee
UM Unidentified Male
UF Unidentified Female

00:00:00
IE 13th April 1979.
IV Uh-hmm.
IE Okay. [Unclear] the inside, it was [unclear] and it was approximately, let me see… Minutes to one o'clock. Coming to me [unclear]. Minutes to one o'clock.

IV Yeah.
IE I was on my way home. I'm living just out there.
IV Yeah.
IE So, the, the, the area got very dark. It was looking like judgement.
IV Right.
UM [Unclear].
IE Yeah, it… All over, just dark.
00:00:43
IV Mmm.
IE And you could find, every time, you'd going, you'd find, like, some, like, dust falling and then you….
IV Yeah.
IE [Unclear] the ash from the volcano.
IV Uh-mmm.
IE Okay.
UM Yeah. Yeah.
IE And then, went home. After getting about a nap of sleep.
IV [Laughs].
IE I hear people calling to each other, saying, Soufrière. Soufrière. Soufrière, Haul it. Get up. Get up. Soufrière.
00:01:11
IV Mmm.
IE Okay, when I get up, and come out and look outside. Are you running back?
IV [Laughs].
IE [Laughs]. Okay, I had my… I had my son by the guy.
IV Mmm.
IE I took him. I said to my lady, we had to move. There's a Soufrière eruption. Soufrière is erupting.
IV Mmm.
IE Everybody now heard. Everybody now start to run. Some ran in… Run in their nightie, their pyjamas.
IV Right.
IE Okay, I… I walk from Chateaubelair straight to Barrouallie.
IV Okay.
IE That's another town.
IV Yeah.
00:01:45

IE	From here. Okay. And then, I just walk with what I have on.
IV	Uh-mmm.
IE	No clothes. No money in the pocket.
IV	Wow.
IE	When I reach to Barrouallie, and I will got a ride back to Chateaubelair, pick up some things and so on.
IV	Mmm.
IE	Go back.
IV	Okay.
IE	Okay, well, that was the Friday morning, which was Good Friday. And then, um, the Saturday, there was heavier plumes and so on. Back to the Wednesday, [unclear] another week and there was everybody now have to move out from Chateaubelair. Some say, okay. Even people from Chateaubelair, right back to Spring Village, had to move out
IV	Mmm.
00:02:32
IE	Okay, we stayed in camps. Some were in by all the schools and churches and whatever. And then… But we stayed in a private home because we have… My mom have a sister living in Barrouallie.
IV	Okay.
IE	So we stayed in her home.
IV	Okay.
IE	[Unclear]. Okay, and then we have to get… Have to go to south [unclear], have to pick up Russians and so on. Okay, and then we picked there what everyone needed and so on and anyway. And then, we spent approximately, almost two, three months or so…
IV	Okay.
IE	Before we could come back. If you so want, you could walk from Barrouallie, visit Chateaubelair, but there was nobody living here. Even us come back to the home, secure the homes, and so on. And there was a lot of animals roaming. Even though that wire and [unclear] moving. Come in. Come in. And then all you come and then now you meet all. Some of them get killed. The animals that killed them. Whatever. And then now, it take a long time before people can come back to their own home.
00:03:44
Okay, after the government reported that, um… Okay, the government said it was safe now that you can come back home. Anyway, the Wednesday after the… After the Good Friday, there had a lot of rolling as if… Um, the thunder roll. And there are rolling like it's thunder [inaudible] over the hill. And there are a lot of ash in the air. It's going over, going over, going over in the air.
IV	Okay.
IE	And then that when they start to fall back [unclear] the houses and so on. Then, then the ashing spoil [unclear] in people's home. And then, even in… When I follow the news, and ash in… They said so, it was Barbados. Barbados is 70 miles east.
IV	Uh-mmm.

IE Okay. My one… One good friend told me that he believe that there's more ash fall in Barbados than in St. Vincent. Probably, we did have wind and [unclear]. Okay, and that's, um… But after a while, when things come back to normal, the people begin farming and they farm the lands and so on, and there was a very good resort, some tool from the ground, they had ground provisions and so on. You get a lot of good return.
IV Yeah.
IE But that leaves the banana. The banana got lots removals. It's one of those removes, thing for the economy. The banana was, uh, had damages. We had to start all over again with the banana. You know? And the grease [?]. There were no…
00:05:37
UM Happy Easter. Happy Easter.
IE There were no death, to my knowledge. There were no deaths. [Unclear]. Everybody had to just move from their home down to the south and then they get back.
IV Um-hmm.
IE And, after a while, people have to go and change the [unclear] on the house and so on and replace it with new ones.
IV Mmm.
UF Go there.
IE No, I think you've got about it. [Laughs]
IV [Laughs]. Okay, thanks. Um, well, just, uh… Go back then. So, when was… Thinking about a year before that, in 1978, did you feel anything different or see anything different about the volcano?
IE Something? Something different?
IV From, from 1978. So, the year before the eruption.
IE If there's any difference?
00:06:24
IV Yeah, was there anything unusual about the volcano? And then [overtalking].
IE No, no, no. Okay, after… Okay, after 79…
IV No, before. Sorry.
IE Before?
IV Yeah, so the year before 79. So, in 78.
IE [Overtalking]. No, no, no. I don't think.
IV Okay.
IE The year before 79, if there was any…
IV If there was anything going on with the volcano.
IE No, not to… Not, not to my knowledge.
IV Okay. Uh, [name] said, actually, the year before there was actually earthquakes going on with the volcano.
IE [Overtalking] the year before. Okay, there were times… Before the eruption, there were times I used to smell a lot of strong sulphur.

IV	Okay.
IE	A lot of strong sulphur used to get all over the area.
00:07:10
IV	Mmm.
IE	You could smell a lot of strong sulphur when you go over to Richmond.
IV	Uh-mmm.
IE	Yeah.
IV	Okay.
IE	Then you'd smell a lot of strong sulphur, but everybody would say it's…
UF	[Unclear].
IV	I'm doing research about the Soufrière from [overtalking].
IE	No.
00:07:24

Speaker Key (3rd recording):

IV	Interviewer
IE	Interviewee

00:00:00
IE	It has made a lot of, sort of, a fumes.
IV	Hmmm-mm.
IE	That's oh, uh, really from the volcano, you know?
IV	Okay.
IE	Yeah, a lot of strong, sort of, a fumes and, hmm, not maybe every day, but every now and again we will smell, uh, when, when the breeze…
IV	Hmmm-mm.
IE	The wind blow, smell like a, sort of, a fumes.
IV	Okay, okay.
IE	From, from the volcano.
IV	Okay. So, go to the, that 79, to 79, uh, were you like taught, taught about the volcano in school? Do you remember?
00:00:29
IE	In, in programme in?
IV	In school.
IE	Hmmm.

IV	Was, did the volcano come up?
IE	Well, I do believe, I do believe they had the, the uses of a, um, programme that covers that, but after a while I believe it had stopped about it.
IV	Okay, um, was there any like community meetings about it? So, did the community come together to talk about the volcano, um…?
IE	Say that again.
IV	Did the community, so did like, uh, your neighbours and everything come together to, um, like talk about the volcano or…?
IE	Hmmm, no.
IV	No?
00:01:04
IE	No.
IV	Okay, um, did the, the church talk about…?
IE	Church.
IV	Talk about the volcano or…?
IE	Um, do you mean if they showed us any rule explaining within, within?
IV	Yeah, so like do they come off during the, the services or…?
IE	Yes, yes.
IV	Yeah.
IE	So, the services, yes.
IV	Okay.
IE	Yes, they did that.
IV	Okay.
IE	Hmmm-mm.
IV	Uh, so, um, so you, did you, did you say, you noticed it starting to erupt actually on the day it started, so on Good Friday?
IE	The ash, after the eruption?
00:01:36
IV	Yeah, was it Good Friday that you realised the volcano was erupting?
IE	Yes, yes, yes, yes.
IV	Yes, okay. Um, and you said you evacuated, so you evacuated to Barrouallie to stay with the family?
IE	Yes, to Barrouallie.
IV	Okay.
IE	And other people evacuate to Barrouallie, Layou, straight back to Kingstown.
IV	Okay.
IE	Mmm, all over.
IV	Okay, um, and you said you stayed with family, um, do, what did your friends, did they, kind of, if they had family did they stay with them or did

they end up in a shelter, like in a school or a church, or anything like that?
IE Um…
IV From what you remember.
IE Let me see [music]. I really, um, I can't, let me see.
00:02:15
IV It's okay if you don't remember, it's [laughter].
IE Okay, okay, um.
IV Um, okay, and so, when you evacuated, did you do it just out of your own thinking that you need to go or did you wait until the government told you to go?
IE Say it again.
IV Um, did you like, um, evacuate yourself and your family like voluntarily, so do it out of your own accord?
IE Hmmm-mm.
IV Or did you wait for the government to tell you to leave? First eruption.
IE Well, the, the, the, the government… Okay, I think they played a role, the government played a role. Okay, government, when you are, when you, when you are in the camp and, uh, okay, what, if you stay in a private home, right?
IV Hmmm-mm.
IE And then after a while, everyone they get fooled and so on when, when you go to the, the centre where, where they are from. People walk to the [unclear] in general. You go and you gave names and how much were you stay like within this house, and then they see you so then we would then sort out.
00:03:14
IV Okay, um, so did you return after the few months that you stayed with your family? Did you return to the same house when you, when it was over eventually?
IE I don't follow this.
IV So, it, so, um, did you return home basically, after the eruption?
IE Hmmm-mm.
IV Or did you like, um, move somewhere else or did you actually return back to [unclear]?
IE Um, let me see [car noise] [background talking].
IV It's okay if you don't remember.
IE Okay.
IV It's fine.
IE I don't remember.
IV Um, so after the eruption.
IE Hmmm-mm.
IV The following weeks, um, what did, did, did anything change about your home or your, um…

00:04:12
IE Oh.
IV Did you do…?
IE After the eruption, it…
IV Did you have to, or what did you, there, was there anything to repair or to clear up?
IE Yes.
IV And stuff.
IE Yes, yes. Okay, um, a few people, after the eruption a few people whose, a couple [unclear], okay? And, uh, they have to change their carbonators which are running [unclear] because they were all worn from the ash.
IV Hmmm-mm.
IE Because they have these. You have to get a couple buckets of water, go and with brooms and scrub off...
IV Okay.
IE Uh, for this [unclear] a little…
00:04:47
IV Hmmm-mm.
IE [Unclear] too.
IV Hmmm-mm. What help was there from, from people within Chateaubelair, from charities, the church, government, the families, was there any, what did they do to help? So, other people that weren't in your family, what did they do to help rebuild [unclear]?
IE Hmmm-mm. Let me see, I don't [unclear]. It was, I can't remember [laughter].
IV [Laughter] that's okay, no problem.
IE Okay.
IV So, um, that's, that's basically everything that I wanted to ask, but just to summarise it, what, what, what do you feel the impact of the eruption, um, had on you and your family, um, just the overall experience?
IE Well, it, it's like… You get up, okay, it's like you get a bit of setback.
IV Hmmm-mm.
IE Towards sorting things and so on, and then like some, some things we got to start up all over again, okay? But, uh, the government did give a bit of assistance along the line with sorting things and so on.
IV Okay.
IE Hmmm-mm.
IV Great, that's everything. Thank you.
00:06:00

Interview E10: 10/05/2016, interviewed in Fancy, Female

Speaker Key:

IV Interviewer

IE Interviewee - in Fancy at the time of the eruption

IV Okay, so to start off, um, can you tell me how old you were in 1979?

IE 20, 21.

IV Okay great, okay, uh, and where were you living, were you living here?

IE Fancy.

IV Yeah. Okay and who were you living with?

IE My parents.

IV Your parents, okay.

IE And other siblings.

IV Okay. Okay, so to keep things general, for now, just tell me what you remember from 1979.

IE Well, 1979 on 13 April, I got up about six, but then I remained in bed, I got up and I fed my baby, who was just 11 months, I had a baby 11 months, almost one year, so I went back in and my mother called and said come out and see the clouds. Why must I see the clouds, what happened to the clouds.

00:01:19

So, she said, come, come, come and see them, they keep, like they're rolling over. So, I got up and I came out and I looked at the mountains, where I saw the clouds rolling over, rolling over. And then I heard a sound like thunder between the clouds and when you heard the sound you see a light flash, like fire

IV Hm.

IE So, I say, so on the, on Good Friday, that doesn't sound real, anyway I looked up and I say is Soufrière erupting, that looks maybe like Soufrière. Anyway I went in back and I got two buckets and I run to the river, because we didn't have pipe-born water, so I run to the river.

And I, because I remember people saying when there is a eruption, you should have water, because the water in the rivers would be ashen. So, I went and I filled two buckets with water and I brought them home, back. And I, then I woke up my sister, I said girl come on, come on, it looks as if Soufrière is erupting, this has to be Soufrière.

Anyway, I left and I say, I'm going over the road to, that's the other side of the village, today, what are the people they're saying. By the time I got over I say what's happening, people say it's Soufrière erupting, Soufrière erupting.

00:02:44

So I went back home and I see, I had a small radio, I think it's this one, so I put on the radio to see if there's anything, I will hear what they say on the radio. When I put it on, they confirm it was the volcano is erupting and that people must get to shelters.

They said that the persons, they call Fancy, they say get to the school and trucks will come to evacuate people. So I went back home, I packed things, I packed for my baby and I packed for myself, and I told my other siblings, my mother and so on, to get things packed, get out because we'll have to go over to the school to wait for the trucks for evacuation.

Well, well the place, because of the ash, started to get dark, this, kind of darkness, as an anomaly. Anyway, I went over to the school, when I got there the school was already opened and other persons were there, a lot of people.

People start coming, people start coming, so the majority of persons from the community gathered at the school and we were there until about, maybe about 11, trucks starting, trucks starting to come there. Well, the first truck that came said that they will carry people with babies and the older persons who cannot help themselves.

00:04:16

Well I had [coughs], sorry, I had my baby and I had a nephew who was maybe about five, and I had our little cousin up here, she had come up to spend the Easter weekend with me, she was about four. She was about four, so I had those three small children so I got on to the first truck.

IV Okay.

IE And we went to, we went to Biabou, but I didn't stay long at Biabou. Um, shortly after we got there, I had a sister living in Kingstown and the same baby I had from Kingstown I had her, her mother, both of them came, so I said how are [inaudible], so they said they keep asking and they said some trucks have gone up to New Adelphi [?] up there.

Some trucks have gone up to New Adelphi, so they can walk there. So, when they came up there they met me there, so we all went straight to Kingston. So I didn't really stay in a camp. And then the other, the next day, which was the Saturday, because I had left my parents in Fancy, I said let me go and see if I can't find them, see if I know exactly where they are.

Well, first I went to Calliaqua and they said that they were not in Calliaqua. And then I went back to Kingstown and somebody said they may be at Richland Park, so I thought that that's alright and I went to Richland Park and I found them up there.

IV Good.

IE On that very Saturday we had a heavy eruption because all in Kingstown we could have seen, uh, the clouds and the ash falling. So, I stayed in Edinboro for the time with my, um, the April, May, June, July, until I think, August, I came back home and people started coming back home [sound slip].

00:06:27

Well, when we got back home a lot of the houses were damaged, so people had to really, kind of, start all over again, to repair their homes because of the heavy ash fall on the galvanised roof. And then other houses were board houses and because some of them, they were not strongly built.

So people had to do a lot of repairs, repair doors, repair windows because other persons would have come in to the village from time to time so there might have been some damages so they took part in some repair to their homes.

And animals, because everybody had to leave, all the animals were let loose, some of them, I guess, was stolen, others, they would maybe have died and some would have gone way up in the mountain after the eruption. So, people had to start life practically all over again, but luckily we were given some assistance.

I think, um, the Government then they give some, I think maybe some galvanise and lumber for all, you know, to do repairs to their homes, and they also gave some animals so people were able to start farm. So, they gave machine and tools [sound slip].

One good thing that happened after that, after the eruption and you're planting new crops [sound slip] I guess it will, um, the soil may have been fertilised by the ash, so we had a few good years from the crops. And long time after, when you dig the soil you were still able to, ash in the soil.

00:08:43

IV Okay, great thank you. Um, now I'm just going to ask you some questions just to pick up what you just told me. So, at the time, um, did you learn anything about the volcano in school before the eruption?

IE Well, um, before the eruption I would have gone on school trips up to the volcano, so I would have seen what it was like before the eruption. Because it was a big lake, we used to call it, the Crater Lake, and it was filled with water.

And then in 1971, we were evacuated in 71. At the time they thought it was an eruption but it wasn't really an eruption at that time, it was a bomb that blew up in the, in the crater. So I would have seen it without the dome [?] and I would have seen it with the dome, so I knew what it looked like because I would have gone on trips up there.

IV Okay. Hm, cool. Um, I don't know if there, maybe before the, probably more after, was there any community meetings that, um, came together to talk about the volcano?

IE I can't recall any, any of them. Whatever we knew about the volcano was what we'll have learnt in school, that most of the islands were volcanic, and there's a, there was another volcano in [inaudible], there's one in St. Lucia [sound slip] and so on. But like in the community, I can't recall, but I know in school we would have talked about it, the volcano.

00:10:39

IV Okay. Um, I suppose then for more after this eruption, um, did your local church groups come together to talk about the volcano, like, in services or find ways to help the people, um, get back on their feet after the eruption, in churches?

IE Well, um, I don't think, because look, it was like, groups of persons in the community would have sat down and talked about it, but not from a church point of view.

IV Okay, okay. Um, oh, you've told me all that. Um, what made you want to return, um, back to Fancy once the eruption was over? Was there any particular reason why you...?

IE Well, I was a teacher, so I had to come back to do this job.

IV [Laughs] Didn't have any choice, okay. Okay, um...

IE And then my parents came back, everybody came back, so we were, there was no reason why not.

00:11:46

IV Okay, cool. Um, did you, um, hear about anyone from Fancy that didn't return?

IE I don't know of persons who did not return. I'm trying to remember if it was 79 or it was 71. Most persons who did not return did not return in 71.

IV .Okay.

IE But 79... I think the majority of persons came back in 79, I can't remember exactly who did not come back. But I think most persons came back, except for maybe young people who would have find jobs and so on. But the majority of persons came back.

IV Okay. Um, so once you returned back was it maybe, there was many ash damaged to your, to properties, was it many?

IE Yeah, many.

IV So...

IE And as I said, to the midlands, yes. But I think people took time on cleanup their houses and as I said, they did some repairs.

IV Okay, so...

[Overtalking].

00:13:15

Speaker Key (2nd recording):

IV Interviewer
IE Interviewee

IV Not to worry, we're nearly finished. Um, when you came back, um, was there anything changed about in your home or your lifestyle, like, um...?
IE Well, in terms of the houses, after we came back, instead of building board houses people start wall structures, so that was one of the changes here in town, housing, because before that everybody had a board houses, but people start building more permanent structures.
IV Okay. Um, uh, what do you feel the Government did as a result of the eruption, um?
IE What they did?
IV Was it...?
IE Um, after that I think they set monitors, monitors in place where people were able to monitor the volcano on a regular basis, so in case there were any changes, they would have been more aware. So, I think they paid more attention to the volcano.
00:01:32
IV Okay. Um, in terms of rebuilding, and I suppose, cleaning up, um, was there help, more help from the communities and, uh...?
IE Yes, uh, persons helped each other. Where people had to repair their homes, people went around and helped. There were no contractors [?].
IV Okay, uh well, that's everything, thank you. Uh, just, just one last question, just to summarise it all. Um, to, what you feel the impact of the eruption was on yourself, your family and your communities?
IE Well, [laughs], well at the time of the eruption people were scared and after that people were more alert, the slightest, um, people would smell for it and anybody smell something funny would say, like something is happening up there, so we were more aware of it and what it can, what it can do. So people were always looking, listening too.
IV Hm.

IE And there was [laughs] one or two who [overtalking].
IV Great. Well thank you, that's everything.
00:02:56

Interview E11: 18/03/2016, interviewed in Chateaubelair, Male

Speaker Key:

IE Interviewee
IV1 Interviewer 1 - in Chateaubelair at the time of the eruption
IV2 Interviewer 2 (interrupted)

00:00:00
IE [Unclear] but I was out of it only on the street and then I, when I came in I recognise outside. The police station was right there? Um, [unclear]. So I follow [?] [unclear], so I follow and everybody started running and [unclear], when they had not seen people here they have to go upstairs. They got a lot of other [?] upstairs and a lot of people dead [?] out there. Then I started going on, everybody started that, getting, you know, how to get transportation. Well, it did happen so that transportation come and started [unclear] tell some of the people and boats come and that was it.

So a lot of us stayed back and didn't, didn't [unclear] go on. [Unclear]. I was like crying about [unclear]. I gave her [unclear] and she talked to people [unclear] go along with transportation and go [unclear] with them so... [Unclear] in the whole time like now, you know, boats, boat and [unclear] to go the headquarter. So that's as far as I remember. Then we are, we are allowed to get out from Chateaubelair and go to higher [?] anyway because you saw they went down.

I was in a [unclear] placement for us and I had friends [unclear] was still with my friends [unclear].
IV Okay.
00:01:46
IE After then I come back [unclear] and view the place and actually it was all right. And that, um, that was… So bit by bit everybody started to go back, you know, and save all the animals and [inaudible]. So, then after all the thing like [unclear] I [unclear] and was in the ambulance saying to the ambulance driver to take all the sick family here. [Unclear] that is as far as I [unclear] was seeing [?] you what happened here. And that's how it is with me.

So after then a lot, a lot of people came back and get the animals and so on to give them water [?] [unclear]. So they start back [unclear] from that.
IV Okay.
IE Yes, yes. That's it.
IV Okay. Do you remember how long after the eruption you waited, before you went back? Do you remember how long it was after the eruption you returned?
IE No, I don't remember really how long it was. No. A lot of people are still outside a long time before they come back to Chateaubelair .
00:03:14
IV Okay. That's fine.

IV2 [Inaudible].
IE Huh?
IV2 [Inaudible].
IE Yeah, yeah. Well there I have seen some [unclear] after in [unclear]. They found her [unclear] in a barn [?] [unclear].
IV2 Well, did ashes enter [unclear] to you the [unclear]?
IE Yes, uh, all the ash is coming on. [Unclear] fall on the houses, houses, um, [unclear] jumping all of them together. So regardless, so we get that [unclear] to clear out.
IV Okay. Do you remember what help there was from charities and the church and the government after the eruption, like to clean up sort of thing?
IE Hmm?
IV Was there much help from outside of Chateaubelair? Uh, yeah, what was the government help after the eruption?
IE They had to clean up, to clean the place up.
IV Okay. Overall, what do you feel the impact of the eruption was on you and your family? Like how did you, how did, the whole experience, how was it for you and your family?
00:04:23
IE How was [unclear]?
IV How, how was it being…?
IV2 The effect on you.
IV Yes, what effect was it being within this eruption, like being caught up in it?
IE Well I, I am, I went on, um, [unclear] but [unclear] and stayed with friends of mine [unclear] until after I've [unclear] and gone back home and clean up and so on. [Inaudible].
IV2 How did you get all the animals?
IE Yes?
IV2 Animals?
IE Oh the animals, yes?
IV2 Did you have to lead them? [Unclear] and lead the animals?
IE Yes, lead, lead the [unclear] animals. Yes.
IV Yes, it sounds like that's what happened, they were just like the animals.
00:05:11
IE [Overtalking] fast but…
IV2 Yes, because they got family around [?] them and [unclear].
IE I have a family but I still, I still [unclear] and I went for them. I didn't go back for all of them, [unclear]. Most of that was [unclear] confirmation. [Unclear] come up, coming on up the road and out of the way
IV2 When you got back to the animals, did you [unclear/inaudible]?

IE No, no, no they [unclear/inaudible].
IV Okay, thank you. That was good, thank you.
00:05:52

Interview E12: 10/05/2016, interviewed in Sandy Bay, Female

Speaker Key:

IV Interviewer
IE Interviewee - in Sandy Bay at the time of the eruption

IV To begin with, can you let me know where you were living in 1979?
IE Right here.
IV Right here, great. Um, and who were you living with at that time?
IE My children and I and my father-in-law.
IV And your father-in-law, great. Um, and how old were you then?
IE I was born in 1948.
IV I can work it out. [Laughs]
IE So, I should have been 31 in that year.
IV Yeah, yes, uh, right. So to keep things more than general, just tell me what you remember from 1979.
IE I remember everything because I was an adult, all right, so I remember since I have this activity from the time I got up in the morning until I went to the, um, evacuation camp which was in Stubbs, that's where I ended up first, all right.
00:00:55
It was good, it was a, a morning as usual, um, the sun was bright, it wasn't dark, and then all of a sudden you heard like a low crash of thunder. And because of the lowness you jumped up to see what is happening because one of the things I remember back in my years is that we hardly ever had rain on a Good Friday.
IV Very interesting, yeah.
IE Yes, I, as I, right, so because I even mentioned to my children, like, you're going to be crucified today, remember it's Crucifixion, so because of that I use it on myself, oh like, we're going to be crucified today. [Overtalking]. I had clothes outside that I have washed Thursday because you don't normally do mush chores on Good Friday.
Maybe that's why I got up and quickly got my children to help me take the clothes off. It was when my son returned in the house and he said to me, mommy, look at my shirt, and it was green.
IV Hmm, yeah.
00:02:01
IE My other daughter had gone to the bakery and she ran back and said, something black was falling because I hadn't gone outside, but as soon as I saw on his shirt, I immediately knew what it was because I grew up with an old godmother who experienced 1902.
IV All right, yeah.

IE	And she had told me a lot about the volcano and the ash and the signs, so immediately I said to him, I said, boy if this is what is on your shirt /// volcano is going to erupt

IV	Yeah.

IE	And one of them said, what do we do. I said, listen to me, all of us today, like, I could explain to them at the moment what it was. All I just said to them, if it gets us, right, and immediately I got up and woke up everybody. At that time I had six children, one was a baby, so five that could have that, and I told them, I said, we have to fill all the containers with water.

And the shop up the road was open in the morning, I sent somebody out, somebody has to, you know, go buy some biscuits because, because that's dry stuff, right, I was very alert. And then I thought, I said if we didn't get to be evacuated from the area, I look for the safest area in my house, which was this very room [?].

00:03:26

IV	Okay.

IE	All right, I said, we are to stop those holes where, actually the sulphur smell was coming, so he just pull anything and stopped the holes, brought the foodstuff and the water all here and just waited.

My father-in-law had gone on the road and he came back quickly and said a bus is going out, that's, one of his friends had a big bus, he said, [sound slip] get the children and go. That we did. We just pushed anything that came to hand in a bag and will you be surprised if I tell you what all went into that bag.

IV	No.

IE	My baby, my baby's clothes, the grocery that I had bought, my fried fish, my cassava bread, it was cold and pushed into the bag without even thinking what I was doing. I didn't put any clothes for my older children

I said to them, [inaudible] just a get piece of clothes and put it on. And each person put on two pieces of clothing and an extra shirt to protect the ash from getting [overtalking]. We walked up the road and we caught the bus, and that was it, we went out.

00:04:44

I cannot remember anything about how it looked, the place, accept that is the waves at see, how much the waves broke, it was a [overtalking]. And as the waves broke it was ash and when I looked to the area where the volcano is from Sandy Bay, the volcano is there, all you could have seen was the red clouds, nothing else. And we boarded the bus that took us as far as Georgetown.

And as we were going down we met the Government vehicles coming to evacuate people from the... Georgetown we boarded another bus that took us another four miles down and then we boarded a truck that took us to Stubbs which is close to the safest port. That's it, that's, hey.

[Overtalking.

IE	Yes, that's, that's, that's true with Sandy Bay.

IV	Yep. Okay.

IE	What do you need again, that's the home, to the evacuation centre.

IV	Great, okay. So...

IE	And we would have been there by 12 o' clock, let's say, because it's afternoon there.

IV	On the Friday?

00:06:17
IE Yes, and we were looking out, we saw the trucks passing with the people who had come from this area, but we had got an early bus, which was a private [inaudible].
IV Okay. Okay, so that's great, thank you. Um, before, since nine- did you learn anything about the volcano in school?
IE I learned in school about it.
IV And also you got your, your...
IE And I got from the woman. Let me tell you where in school, um, two years ago I got up the morning and I told my children, I said, nobody, I am seeing anything on Facebook that nobody remembers that today, the 7th May, was the eruption in 1902 and Martinique, at that eruption.
IV As well, yes.
IE Where I learnt it in school, in was from the Nelson West Indian Reader, that had the story of Martinique and St. Vincent. We knew that story inside out, that only one man was saved in his cell, was a prisoner in his cell, one man was saved.
IV Yes, yes.
00:07:21
IE If you didn't remember anything from that reading list, you remembered that sentence, that only one man...
IV Survived.
IE Was saved, a prisoner in his cell.
IV Yeah, yeah that's, that's come acro- I, I don't know, I don't know if anyone has that book, anywhere, or something like that.
IE Um, maybe some of the old book, they don't sell it anymore, but the oldsh-, there's a bookshop in Kingston, Reliance, he used to sell those All West Indian Reader, I'm not sure if they have them anymore, but you could have gone there and picked it up.
IV Okay, yeah great. So, you heard from that and obviously you were told about 1902...
IE Yes, because my godmother, she, she had the experience of that one.
IV Yeah, so, um... Um, what did, was there any, like community meetings before and during and after about the volcano, um, did you come together as a community to talk about the volcano?
00:08:19
IE Mhm-hm.
IV No?
IE Not before, I'm not aware of that.
IV Okay.
IE We knew about it, we would talk about it generally, um, because in 1979 there was an eruption, I was not living here at that time but I used to be back and forth because I was a teacher, I, I'm originally from Georgetown.
IV Right.
IE I used to teach at the school up there, that's how I came up there.
IV Okay, yeah.

IE And then I got married and had children up here, so I was back and forth and we would talk about the 1979 experience, which wasn't a big experience.
IV You mean the 1972 one, you mean?
IE No. Sorry, 1972, [laughter] 1972? [Laughter].

00:09:00
IV Yeah, 72. Were you in Georgetown at that point?
IE Yes, I was in Georgetown because, yes 72, early 70, because I had a baby that was three months, she was born in September. So it's got to be in 71, 72.
IV Yeah.
IE Yes, right.
IV Um... [Overtalking].
IE That wasn't, that wasn't anything great because, um, because... Hey? [Overtalking]. Um because, um, I was actually living there then, you know, I didn't, I do not, I would not know about the lifestyle except what I heard from some of those who went down, okay.
IV Okay. Um, what about afterwards, did the community come together afterwards to talk...?
IE Um, I think while people were, while people were at evacuation centres some of the centres, I understand, used to talk about it. So, the centres were in Government buildings, you would have found that those centres would have, had little groups, but where I was it was a evacuation centre owned by the Government but a private building, so we didn't really meet to discuss it that much.
00:10:18
IV Okay.
IE What I do know is that from the evacuation there was a camp at Cane End [?] where the folks met together and formed a group, they started a group, okay, at the Cane End...
IV Yeah, Pat was saying how she...
IE Pat was at that, she was at that one.
IV Yes, yeah she was at that one, yeah.
IE And then that group came back to the community and we functioned for many years.
IV Yes, yeah. No, she was telling about that. Um, what about the church, was it talked about in services in church?
IE After it came about, not before.
IV After, yeah. No, okay, great. Um, so you um, uh, uh, no, no, Mrs Soffie already told me. [Laughs] So, when, how long did you stay in Stubbs for?
IE I didn't stay in Stubbs very long.
00:11:14
IV Yes, okay.

IE On the first night a friend, um, my former headmaster came to visit, they came to see the situation and they took my family and I to their home at Prospect. But we were registered in the camps and you can go to the camps to get foodstuff for your family, even you were staying in a private home, right, they would give you, what we called, a ration.

IV Yes.

IE Right, okay. I stayed in that private home for about two weeks and then another evacuation centre was opened in Prospect where there is no racket [?] club, right, that and my, my children and I went to that camp.
You know, it, we were safer there because the Government was more responsible for you and that's where we stayed until, we came home in August. Some folks came back earlier, I think the folks, because of the dry river, sent home earlier. But not of the dry river, because of the sanitation of the water, we came home in August.

IV Okay. Okay, um, so...

IE Um, some folks had gone back before August, on their own, but the Government sent everybody home at the end of August.

00:12:36

IV Okay, great. Um, when you returned home what damage was done to the house and the...?

IE My house, the roof.

IV Just the roof?

IE The galvanised on my roof, the ash rot it, it took all the galvanise and this part of the house that was concrete, the ash was settle here because a lot of rain came, the weight of the ash actually cracked the roof, so we had to change it.

IV Okay, but nothing other than that, it was just mainly the ash?

IE No, that was the only thing wrong with the house.

IV Okay. Um, once everything returned back to normal, um, did you change anything in your home as a result of the eruption apart from replacing the ceiling or whatever?

IE No, I didn't.

IV No, you just, back to normal again, okay. Uh, um, and then did you return to work in September, your school, when school start again?

00:13:30

IE No, I was not teaching at that time, at that time I was working with a rural organisation that helped to rehabili- rehabilitate people by giving them...

IV What they needed.

IE Um, no, well it was agriculture, agriculture imports, so that you can get, that was the field I was in at that time.

IV Okay, so did you go back to that, like, as soon as you came home in August, did you start to help...?

IE No.

IV So, how, how long...?

IE It was, it was a couple of months after.

IV A couple of months after, okay.

00:14:01

IE Yes.
IV Um, as a result of the result of the eruption, what do you remember the Government doing, um, in terms of helping people get back on their feet?
IE When people came home an assessment was done on your homes and you were given materials because, um, I as given materials for my roof, galvanise and board, and I was able to, um, fix the roof back properly. Yeah, and we were also given, for a while, for a period, they came to give rations so that people could, until people got back to the normal.
IV Yes.
IE Yeah, we were given the rations.
IV Okay, um what help was there from, like, the community, um, the church... [Overtalking].
00:15:08

Speaker Key (2nd recording):

IV Interviewer
IE Interviewee

IV We're nearly finished, don't worry. Um, what help was there from, like, communities, any charities and the church, um, to rebuild?
IE Yes, because as I said, um, at that time I was working at a rehabilitation organisation and they came in and they gave planting materials to farmers, they distributed a few small animals to farmers, okay. That was from the Government's standpoint, and people helped one another in the community, you know, people would, one would help the other, yeah, help each other.
IV Yeah, okay. Great, so that is everything. Just to...
IE And, um, as I said, organisations from outside came, nongovernment organisations came in and they played their part as well.
IV Cool, good. Uh, so that is everything, just to end, um, what, can you summarise, um, what you feel the impact of the eruption was on you and your family and your community, just to end?
00:01:00
IE I think it made us more aware of looking for the dangers ahead because nobody talked, nobody thought about an eruption then, but since then, it has made you a lot, because just one year after there was a...
IV There as a hurricane, yes.
IE Freak storm over the mountains, exactly one year after. And boy, that morning early people were up wondering what was happening, some people went to the station to find out, police said they didn't know anything.
Um, little shops, snap-shops, got up very early in the morning, opened, so that if there was really an eruption they had stuff to sell for five weeks and so that people who couldn't really think of getting their breakfast could just go pick up stuff and more, but then nothing happened. In fact, me, and I am sure some other persons always kept the [sound slip] suitcase that just in case...
IV Just in case.
IE You could just pick and go, because people didn't have time then to think. So, people, they had to come back after to get clothing and so.

IV Okay. That's everything, thank you.

Interview E13: 10/05/2016, interviewed in Sandy Bay, Female

Speaker Key:

IV Interviewer
IE Interviewee - in Sandy Bay at the time of the eruption

IV That, you can hold that. [Laughs] Okay, so first of all, um, how old were you in 1979?
IE 16, no 17.
IV 17, okay. And where were you living?
IE Sandy Bay.
IV In Sandy Bay. Great. And who were you living with?
IE My parents.
IV Your parents.
IE Yes.
IV Okay, great. Okay to keep things general…
IE And I was a… I was a primary school teacher at that time.
IV Okay. Cool, so just to keep things cool and general, um tell me what you remember from 1979?
00:00:42
IE Okay. When I got up the morning, we usually… Because on a Good Friday people normally get up early. We got up the usual time, but what we found was that even it was like six o' clock, the outside was dark. Right?
IV Right.
IE And my neighbour, she, well she deceased now, but she was a Spiritual Baptist, right?
IV Yeah.
IE And she wash her hair tie. You know the Spiritual Baptist tie their hair.
IV Yes, yes.
IE And she came, we had a fence that was between both houses. And she wash her hair tie, it was a white hair tie. And she came and she hang it on the fence. When she hang it on the fence she realised that things falling on it, it was like rain. But she look, the hair tie start turning dark.
IV Yeah, yeah.
IE And then she call out to us and said, this is ash falling. [Traffic sounds].
00:01:44
When we know that ash was falling, you realise that the volcano is erupting. Okay?
IV Hmm. Yes.

IE So by that time another people in the community start. Everybody open door, wanted to know what to do and that kind of thing. And I could recall I, we were living in very small house. [Traffic sounds]. And my uncle had a bigger house than us. So what we tried to do was to move some stuff from our house and take it to his house, because we were living in a board house and he had a wall house. So we went to secure some things there.

IV Okay.

IE And while you were securing the things then the police came and said that trucks would be coming to carry people. I think some people were scared because if trucks fall in [?] and you're going down to the Rabacca River, where the volcano is just above there…

IV Yeah.

IE Then it may be very dangerous. And then another people start heading up to Owia. That is a community for the… A lot of people start going up to Owia and then those persons at that time, transportation was minimal. We had two elderly guys who had wooden [?] buses and one of them start moving out and a lot of people were in it, you know? Really packed.

And after they went, some people went up to Owia and a number of the persons just stay quiet. We stayed quiet until the transportation start coming to evacuate people. So the government trucks came and then families went in.

00:03:34

Some, some members of the family were… You couldn't find them when you reached to the camp. Most of the people from this community went to the Mespo area. Some was in Evesham, some was in Keenen, and then some was, some… Those that, that went after the Friday, they stayed at North Union [unclear] because there was some people who did not want to move at all.

IV [Laughs]. Oh my…

IE So then my father, he didn't move until the Saturday.

IV Oh wow.

IE That's when the helicopters start coming to pick up people, because on the Saturday there was another eruption. We went down to the camp. We were placed at Canaan, that's up Mespo.

IV Yeah.

IE And then in the afternoon, you could see over the mountains real looking like fire and things like that. And then the Saturday morning when we got up we said that we were coming back up there to get clothes and so forth. When we reach at Rabacca, the police were there and they said nobody, they're not allowing anybody to come back in. And they start telling people they have to go back.

00:04:49

So we caught a van and we went straight to Kingstown. And where we were up in market in Kingstown, there was another eruption and people start running, taking up their provision and things. And people start running [female voice in background]. Um, people start running because um, you see the ash going up in the air.

IV All the way from Kingston?

IE From Kingston you can see it from a distance when lots of people start running and then we got a van and we went back to the camp. And we met everybody there saying that there's another eruption. And people were rowing, because they said some people came up the morning, but then the police aren't allowing everybody, allow people to pass. I stayed at the Canaan government school for um, maybe a month. And then we moved to a private home.

My aunt, she is living in America, and she had a small house. And we had our grandmother who was sick. So she asked us to move in the house at Argyle. So I spent most of my time at Argyle and while I was at Argyle, I was managing the camp at Mongoop [?]. That's by the Methodist church.
IV Oh yes.
00:06:17
IE In Stubbs. That used to be a centre.
IV Okay.
IE So I used to walk at that centre going to share. Well at first, they had people coming in to cook for the people and then we got together and we had a meeting, because sometimes they would cook things that people were not eating.
IV Okay.
IE So we had a discussion and we asked them rather than cooking, was to give each family like the ration and they would cook for themselves. So that went on and the only thing we used to share was like the bread and things like that. But people start cooking for themselves until we got ready to come back.

But during that time I used to come above the [unclear]. I used to come up and then a few people used to come too and start cleaning, because a lot of ash was on the houses. Like if you go to the mountain a lot of the trees dried up and things like that. So you had people who came in before, who start coming back. They used to clean up and so and then go back until the government start bringing back people.
IV Okay. Well thank you, thank you so much. Um, so I'm going to just ask you some more questions just to say, just to pick out what you said. So, um, for it sounds like you didn't actually hear anything from the volcano.
IE The early morning you heard like thunder.
00:07:47
IV You heard… Okay. Okay, so…
IE You heard like it was thunder rolling.
IV Yes, like thunder rolling.
IE Right?
IV Yeah.
IE And when you look up at the mountain, while it was dark you see like lightning. But because again it was Good Friday, some people thought maybe it's something in Chadesan [?] that maybe might be happening.
IV [Laughs]. Okay.
IE Until you hear that it is the, that it's an eruption.
IV Yeah. And you saw the ash [unclear], well, this definitely can't be like Good Friday, yeah.
IE Yes. Exactly.
IV [Chuckles]. Okay. So before the eruption, and I know there was one in 1972 as well.
IE Hmm-mm.
00:08:26

IV	But um…
IE	In 1972 a lot of people didn’t move.
IV	That’s fine.
IE	But our family moved.
IV	Your family moved. Okay.
IE	Yes, but then a lot of people didn’t move.
IV	But did you learn anything about the volcano in school before its eruption?
IE	Um, not much.
IV	Not much, okay.
IE	Not much. Not much, but after the eruption that’s when all the education and things started.
IV	Hmm, okay.
IE	Right?
IV	Yes. Um, was there any community meetings about the volcano before…
IE	Before the eruption?
00:08:59
IV	Before and maybe during as well.
IE	No, not before. I can’t remember if we had any meetings before. Um, but one good thing that came out for this community was that because a lot of people from here, from the bigger part of the village, was placed at the Canaan Centre, that’s were we started a community group.
IV	That’s good.
IE	So the people came together and the same thing had happened where they asked the authorities to give each family the ration and that they would cook for themselves. And by people interacting and socialising and so forth, they call it The Carib Development Organisation. Because as soon as we came back from the eruption, that organisation was started.
IV	Oh, that’s good. First time I’ve heard about that, that’s a…
IE	Yes, it was, it was through that kind of thing and then the eruption and then the community group started.
IV	That’s good. Is it still going now? Is it…
IE	No.
IV	No. Ah okay.
00:10:08
IE	It had started and a lot of good things came out from it where they used to help people. A few people got to go to different um, indigenous countries and we had a… Too what we were doing, we had a connection with Dominique, with the Carib resolving Dominica. So the people from Dominica used to come here and spend some time, but we didn’t get a chance to go. Individuals went, but not as a group.
IV	All right. That’s interesting that. It’s a shame that didn’t last, it’s a shame.

IE It lasted for a couple of years and then after that was going down, we looked at the area and we were saying that when you leave Rabacca, the bridge wasn't there, it's as if we have a reserve in this area and you have the six communities, similar to Dominica. So we had um, change it from the Carib Developmental Organisation and we called it, we call it, we kind of expand on it and get other people from different, different communities to represent. So we had what we call Council for the Development of the Carib Community, CDCC.
IV Ooh okay. What is it, C…
IE D C C, Council for the Development of the Carib Community. And that also lasted for a number of years in this area and it was through organising with that, you were able to walk through National NGO where, where we had organised with other funding agencies. And in 1987 we had a big indigenous conference in St Vincent.
IV Hmm, that's good. Okay, so moving on from that, how involved was your local church group in, I don't know, bringing people together or talking about volcano?
IE Okay, when we came back from the eruption, all the churches came together and we had a big church service in the middle of the community, right?
00:12:25
All the different pastors and so from the different churches. And we had an afternoon of prayer and singing and things like that.
IV That's good. That's good. Was it like, felt like, like praying everyone together?
IE Yes.
IV Even from different communities?
IE Yes.
IV That's good. Um, so you first evacuated down to the Mesopotamia area and then to Argyle.
IE Yeah.
IV How long did you stay in Argyle until, [makes mumbling sounds], Argyle until?
IE We stayed there until we were ready to come back.
IV Okay. Was that round about school time, so September?
IE I think it was in June or July.
00:13:04
IV In June. June or July, okay.
IE June, July we came back.
IV Great, um, so did you do this like voluntarily as a family just like, okay we're going now or do you wait for the government to say something that you need to move? When you won't move into Mesopotamia area, when it first started on the Friday, did you wait for the government to say something or did you just [overtalking].
IV Well the government send, the government send the vehicles, they send the trucks to evacuated people. So we had to go with the trucks.
IV Okay, that's fair enough.
IE Right, so government took us there.

IV Hmm, okay.
IE Right, but when we move on our own, we were by ourselves, okay?
IV Yeah.
IE And our families are taking care of us and the government had something where persons who owned private homes, they would give them like a weekly ration. So we, we were part of that.
IV Okay. Um, um, oh goodness, this is stuff you've already told me. Um, was there a reason why you wanted to return home when you did in July or was it just like, oh it's over now, we need to go back?
00:14:14
IE Well, unlike other persons, there were some persons when in [unclear] they evacuated from this area to places like Camden Park and Pavilion an Everytown. And just like 1979, a lot of people who went from this area moved on, they did not return. But we came back.
IV But you came back.
IE Because we had animals, we had lands, we had a home. So we came back. Um, I was a teacher, so I had to come back to work.
IV Yeah, okay, yeah. Well it's interesting how some just say I'll rather stay here when some people just decide to come back.
IE Well I think, I think when we came back from the eruption, when we came back the community was closely knitted. You know? It was closely knitted.
IV Yeah.
IE But I think one of the things that really keep the community apart is that thing you call politics.
IV [Laughs]. Always [laughs], yeah.
IE But after, after the politics, you know people will… It take a long time, but then they would come back together.
IV Does… I'm sure you come across this word, was it Bardot? Boudout? Bardout? Bardo? Bardon?
IE Bardout?
00:15:33
IV [Laughs]. It was a word that came up from some of the, um back in, in the shelters, that it was…
IE Budow [?].
IV Budow that's the…
IE Budow.
IV I can't pronounce it.
IE [Laughs].
IV This is my accent, I can't pronounce it…
IE That's when, that's when people bring the clothes and the blankets and so forth. They share to people.
IV Did you experience that while you were managing [overtalking].
IE I was part of managing and sharing, make sure that families get what they deserve. Because sometimes when there was sharing some of the persons who were not affected, right, they were part of sharing out these things, and they would've taken stuff for their family.

00:16:12

Right? And that's why you had a, you had a kind of corruption in the camp, because the people in the camp were saying that these things coming for them and not those persons. So I was part of, of sharing and when I…

I used to visit all the camps. And when I go and a person said to me they are sharing these, especially like the budow, and I have my little children and they didn't bring any for children. Like when I go back to my camp on days any who I can feed, we used to take it for them.

IV Okay.

IE Share it around.

IV It's a very interesting thing that I've just learned since being here. I've never come across it before. I need to learn to say it properly. [Laughs].

IE Budow.

IV Budow. Um, so when you came back to your house, what had to be done to clean up? Was it just the ash that you had to clean up?

IE Just the ash and take out the stuff from the house and clean them up properly. Yeah, to wash out the house, those white wall, I was wash them all. Some people wash out the boathouse too and try to settle back.

IV So as you were a teacher, did you return to school in September?

IE September.

00:17:29

IV Yeah. What do you think the government did as a result of the eruption? Like did they change [unclear] or was there anything that you would notice [overtalking].

IE Well I think, I think it was a wake-up call, because these things do happen in other countries and sometime we look on television and we see what happening. And then when it comes to you, when it comes to you it's a different type of um, experience. But I think with the assistance of outside, they were able to make people comfortable in the camps. Right?

IV Yeah.

IE I mean there wasn't like your bed at home, but at least they make you comfortable and you're able to eat. And I think you were able to meet different people, because a lot of people used to come and visit the camp. They would sit and talk to you, they would bring things you know? And things like that.

IV Okay. So, I suppose you answered that question. Okay, that's the end then. So that is, [unclear] ask you just to finish off, can you summarise what the impact of the eruption was on you, your family and your community as a whole?

IE Well I think um, the impact at first you were scared. Even when you come back, you wanted to know when, if it's going to happen soon again. So you always living in this fear that soon…

00:19:19

As a matter of fact, when we came back like the second week, at the second week there was a big rumour, wake up everybody, in the one night. Somebody just get up and say, the Soufrière is erupting again. And by somebody hearing somebody say that and then everybody woke up in the community.

They start making phone calls, go to the police station, the police station called Kingstown. Kingstown said they didn't know anything about it. So then people are on the alert that it might happen again and when it happen, you have a better idea of what to do.

IV All right. Okay, all right, that's everything. Thank you. Thank you so much.

IE Okay.

00:20:06

Appendix F: Chapter 1

Figure F1. A brief timeline of key cultural/social events and natural hazards that have occurred on St. Vincent.

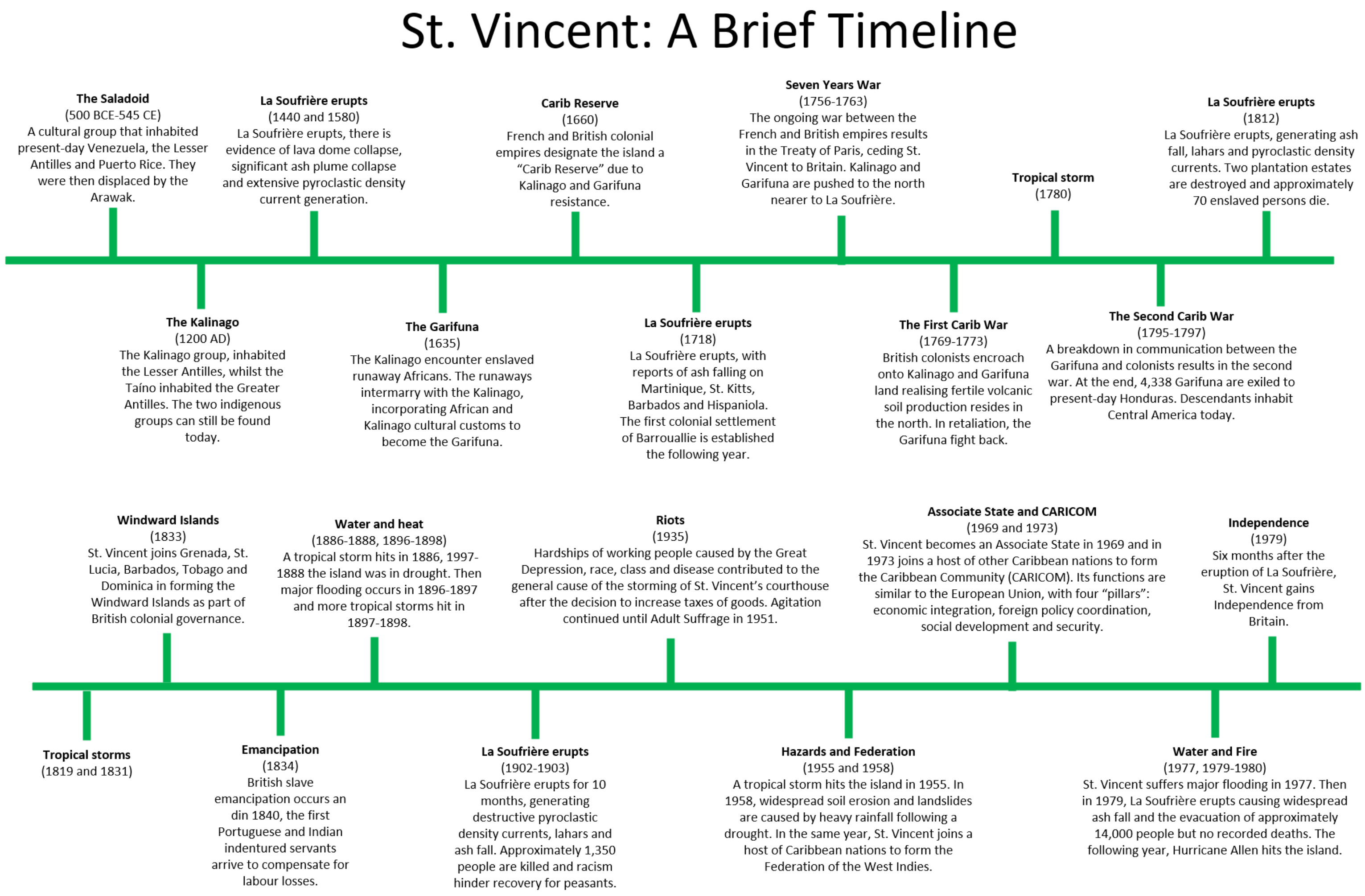


Figure F1. A brief timeline of key cultural/social events and natural hazards that have occurred on St. Vincent from 500 BCE to 1979 AD.

Appendix G: Chapter 4

Table G1: 1812 eruption datapoints

All information regarding the description, hazard phenomena, time and date (if available), location, reference and given datapoint number for the 1812 eruption are detailed below. Re-arranged in chronological order, after first being catalogued by order of being found in the archives.

Description	Phenomena	Location	Date and time of phenomena	Reference	Data point
"Just as the plantation bells rung 12 at noon, on Monday, the 27th, an abrupt and dreadful crash from the mountain, with a severe concussion of the earth, and tremulous noise in the air, alarmed all around it…This, driven before the wind towards Wallibou and Morne Ronde, darkened the air like a cataract of rain, and covered the ridges, woods, and cane-pieces with light grey-coloured ashes, resembling snow when slightly covered by dust".	Ash fall	Wallibou, Morne Ronde	27th April 1812 (12:00)	Public Ledger and Daily Advertiser, 1st July 1812	7
"About half past one, another stream of lava was seen descending to the eastward towards Rabacca" "…the estates in the immediate vicinity of the mountain were wholly destroyed; especially those of Messrs. Thesiger [Duvallie's] and Haffey".	PDC	Rabacca, Duvallie's	30th April 1812 (13:30)	Morning Chronicle, 1st July 1812 Oxford University and City Herald, 18th July	2
"Shortly after 7pm the ebullition of lava broke out on the N.W. side. This immediately after boiling over the orifice, and flowing a short way, was opposed by the acclivity of a higher point of land, over which it was impelled by the immense tide of liquefied fire that drove it on, forming the figure V in grand illumination. Sometimes, when the ebullition slackened, or was insufficient to urge it over the obstructing hull, it recoiled back, and then again rushed forward, impelled by fresh supplies, and scaling every obstacles, carrying ricks and woods together, in its course down the slope of the mountain, until it precipitated itself down a vast ravine."	PDC	Morne Ronde, Larikai River (Anderson & Flett, 1902)	30th April 1812 (19:00)	Morning Chronicle, 1st July 1812 Oxford University and City Herald, 18th July 1812	1

"…boiling lava was seen to pour over the NW side of the crater, and flow in a stream of liquid fire towards the sea, which it reach in about four hours, and driving the waves with irresistible fury before it, formed a considerable promontory in the vicinity of the port at Morne Ronde".					
"At this time [PDC data point 8] the first earthquake was felt: this was followed by showers of cinders, that fell with the hissing noise of hail during two hours"	Earthquake	Kingstown?	30th April 1812	Morning Chronicle, 1st July 1812	1
"Earthquake followed earthquake almost momentarily"	Earthquake	Kingstown?	30th April 1812	Morning Chronicle, 1st July 1812	2
"…in the afternoon, the noise was incessant, and resembled the approach of thunder still nearer and nearer, with a vibration that affected the feelings and hearing…The Charraibs, settled at Morne Ronde, at the foot of the Souffrier, abandoned their houses, with their livestock, and everything they possessed, and fled precipitately towards town [Kingstown]"	Earthquake	Morne Ronde	30th April 1812	Public Ledger and Daily Advertiser, 1st July 1812	3
"…especially those of Messrs…Haffey." Based on the assumption that PDC's reached as far south as Wallibou on the Leeward (western) side.	Ash fall	Mt Alexander	30th April 1812	Oxford University and City Herald, 18th July	6
"In a short time the lava poured out on the northwest side, it was opposed there by the acclivity of a higher point of land, but being driven on by fresh accessions, it ascended and surmounted the obstacle, forming the figure V in a torrent of fire, plunged over the	PDC	Morne Ronde	30th April 1812	BL: X.808/9862	8

cliff carrying down rocks and woods in its course, and finally precipitating itself into a vast ravine at the foot of Morne Ronde”					
Ash fell “over and beyond Barbadoes [Barbados], falling as a shower”	Ash fall	Barbados	30th April/1st May 1812	Leicester Chronicle, 19th June 1812	1
“Ashes fell on the decks of vessels so far to the eastward as to be six hundred miles from the volcano”	Ash fall	East of St Vincent	30th April/1st May 1812	Leicester Chronicle, 19th June 1812	2
“The armed ship Emma arrived [at Barbados] this day at noon, informs that when 30 miles to the eastward of Point Saline, Martinique, early yesterday morning, a dreadful explosion was heard, and the vessel was shortly after completely enveloped in clouds of the same matter [sandy particles] as above stated; and this was also experienced by the schooner Peggy, from Dominica, which also states that total darkness had prevailed from two o’clock yesterday morning until three in the afternoon.”	Ash fall	Martinique, Dominica	30th April-1st May 1812 (02:00-15:00, 12:00)	Perthshire Courier, 25th June 1812	4
“Letters from Barbadoes [Barbados] of May 2, state, that at 4 o’clock on the preceding morning, the atmosphere was perfectly clear and light; but at six, thick clouds had covered the horizon, whence issued, in torrents like rain, and particles finer than sand, volcanic matter; and at eight, it was as totally dark as they ever recollect to have seen in the most stormy night”.	Ash fall	Barbados	1st May 1812 (16:00-18:00)	Worcester Journal, 25th June 1812	3
“…the next day…Barbados, St Lucia, and Grenada are covered over with ashes…the ship Line, upwards of 250 miles to windward of Barbados having felt its effects, and had her decks and rigging covered with a sort of grey coloured ashes”.	Ash fall	Barbados, St Lucia, Grenada, east of Barbados	1st May 1812	Perthshire Courier, 3rd December 1812	8

"Accounts from the posts at Owin [Owia], have just reached town, they report that that part of the island presents nothing but objects of desolation" "The yellow Charaibs settled at Owia, have had their provision grounds totally destroyed".	Ash fall	Fancy-Owia	2nd May 1812 -	Perthshire Courier, 2nd July 1812; Robertson (pers. Comm) NDAS-SVG: AA4.1.1.	11
"We were in [Barbados] utter darkness from half-past six in the morning, till half past twelve in the afternoon, during which time, and the remainder of the day, a great quantity of dust was showered upon us from the Heavens, which has covered the island at least one inch thick"	Ash fall	Barbados	5th May 1812	Belfast Commercial, 29th June 1812	5
"…continued to be agitated up to the 7th, but had since shewn scarcely any signs of commotion. By the eruption, the large rivers of Rabacca and Wallibou were dried up, and in their places was a wide expanse of barren land."	PDC	Rabacca, Wallibou	7th May 1812	Suffolk Chronicle, 18th July	3
"The melted minerals (lava we presume), which were washed into the sea had formed a promontory which jutted out some distance from the main land, at Morne Ronde".	Lahar	Morne Ronde	7th May 1812	Suffolk Chronicle, 18th July	1
"A new crater was formed on the northeast of the original one, and the face of the mountain entirely changed many of the adjoining ravines were filled up, particularly Wallibo and Duvallé's, in the former [Wallibou] the river was absorbed for some years, but the gradual accumulation of water burst through the sandy barrier and carried away many blacks houses in its progress".	Lahar	Wallibou	1813 or 1814	Shepherd (1971)	3

"The manager's house on Grand Sable Estate…was thrown down by the weight of matter that fell upon it, consisting of stones and sand."	Ash fall	Grand Sable	-	NDAS-SVG: AA4.1.1	9
"From Grand Sable to Turema [Tourama] was covered with 6-10 inches of ash"	Ash fall	From Tourama to Grand Sable	-	Anderson and Flett (1902)	10
"The boiling house on one of these estates [along the Rabacca River] was thrown down by an earthquake"	Earthquake	Rabacca River Valley area	-	NDAS-SVG: AA4.1.1.	4
"…The Rebecca [Rabacca] River, which turned the mills on my estate, with that of Messrs. Sutherland, Cumming, Cruikshanks and Smith, is completely dried up in consequence of the lava, which has descended into the bed of the river."	PDC	Turama, Waterloo, Rabacca, Lot No. 14, Langley Park	-	NDAS-SVG: AA4.1.1.	4
"The lava is fifty to sixty feet, and in some, eighty feet above the bed of the [Rabacca] River".	PDC	Rabacca	-	NDAS-SVG: AA4.1.1	5
"…lava is about one hundred and thirty feet, covering completely a fall in the Walleboa [Wallibou] River, which has seventy feet high, not only to the top, but fifty or sixty feet above the top of it".	PDC	Wallibou	-	NDAS-SVG: AA4.1.1	6
"An estate belonging to Messrs. Grants, very much injured. Waleboo completely dried up".	PDC	Wallibou	-	NDAS-SVG: AA4.1.1	7
"…shortly after another stream descended eastward toward Rabacca"	PDC	Rabacca	-	BL: X.808/9862	9
"The crop this year was destroyed by the eruption of the Souffriere mountain".	PDC	Thomas Fraser (Fraser village in 1902)	-	BL: MFR/8397	10

Based on the assumption that PDCs occurred at Wallibou estate, the Wallibou River; Morne Ronde village; Morne Ronde River; Larikai River.					
"The lava welled over the edge of the crater, one stream flowing down to the northwest – probably from the new crater" "The cliff [at the mouth of the Larikai] consisted of a material so exactly similar to the ash that overlay it that, if it had not been for the old burnt soil, it would have been hardly possible to find a line of demarcation between the two deposits…we came to the conclusion that here was the evidence of a dust avalanche eruption previous to that of this year [1902]"	PDC	Larikai	-	Anderson and Flett (1902)	11
"Duvallie's entirely covered with the matter thrown out by the volcano; the sugar works totally covered…." "from the position of the new crater that its emissions were directed principally towards the north side of the hill, and that the black cloud which descended there was even more destructive than in the present year [1902]"	PDC	Duvallie's (Windsor Forest in 1902)	-	BL: MFR/8397; Shepherd (1971); Anderson and Flett (1902)	12
"…mud beds that have covered the Wallibou Valley…after 45 minutes the mud being soft and very much inclined to slip"	Lahar	Wallibou	-	NDAS-SVG: Volcanoes VI	2
"In the stream sections [of the Rabacca] it too often shows a well-marked bedding, and it contains many rounded blocks of lava, which certainly appeared to be water-worn boulders…everything pointed rather to its having been a great mud lava, which had swept down the upper pars of the river's course with a high velocity, and had	Lahar	Rabacca	-	Anderson and Flett (1902)	4

caught up and incorporated the gravel and boulders over which it passed. Then, when it reached the flat country at the lower end of the valley, it had been unable to flow further, and had come to rest”					
“Massive, poorly sorted ash and breccia deposits of this eruption still partly fill the Tourama River Valley, and remnants of small deltas made of similar materials are preserved in valley mouths of the Tourama River and several nearby streams…Tuff-breccia in the Tourama River Valley may be a mudflow deposit”	Lahar	Tourama River	-	Hay (1959)	5

Table G2: 1902-1903 eruption datapoints

All information regarding the description, hazard phenomena, time and date (if available), location, reference and given datapoint number for the 1902-1903 eruption are detailed below. Re-arranged in chronological order, after first being catalogued by order of being found in the archives.

Description	Phenomena	Location	Date and time of phenomena	Data source	Data point
"…in February 1901, when earth tremors were felt on the northern part of the island. Earthquakes continued to occur, especially in the vicinity of the volcano".	Earthquake	Vicinity of the volcano	February 1901-May 6th 1902	Roobol and Smith (1975)	17
"At Owia, on the 13th April, at 12:20pm, there was a sharp shock, and about that time as many as eight tremors were sometimes experienced there in 24 hours, all slight and of short duration.	Earthquake	Owia	13th April 1902, 12:20	Anderson & Flett (1902)	5
"On Monday April 29th, three well marked shocks were experienced at Windsor Forest and Campobello, while at Morne Ronde about this time eighteen earthquakes were counted in one day."	Earthquake	Windsor Forest, Campobello, Morne Ronde	29th April 1902	Anderson & Flett (1902)	6
"In Chateaubelair the convulsions preceding the eruption of May 7 were almost continuous. In Kingstown and Georgetown sixty shocks were felt in four hours."	Earthquake	Chateaubelair, Kingstown, Georgetown	Before 7th May 1902	Whitney (1902), pg. 250	7
"Were any earthquakes or shakings observed during the last few months?" "Yes in April"	Earthquake	Chateaubelair	April 1902	Royal Commission on the eruptions in the West Indies: Chateaubelair	12
"For months previous to the eruption 6th May" "The most severe of which was on April 13th at 12.20 pm. Sometimes as many as 8 tremors would be felt in 24 hours but	Earthquake	Owia	April-May 1902	Royal Commission on the eruptions in the West Indies: Owia	13

they were all of about duration probably not lasting more than 3 seconds. Until the night of the 6th May I treated these tremors with indifference so to speak – for they were all very slight. But between 9.30 pm and 10 pm on the 6th I felt 3 tremors each lasting from 7 to 8 seconds and though most severe they were unusually long. After these I felt no more, though these may have been the night of May 7th and during the eruption there were innumerable slight shocks and tremors, lasting in a couple of instance to fully 20 seconds. Before the eruption the tremor [sic] to be without any direction and the vibrations lateral but after the eruption the movement was indulating and in the direction of N.E. by N. to SW. by S."					
"During the afternoon [of the 6th May] it was reported by telegraph that the Soufriere was in full eruption and that pebbles and ashes were falling in Kingstown, St Vincent" "By 5pm Barbados was shrouded in the darkness of night and a rain of coarse gritty dust had began to fall"	Ash fall	Kingstown, Barbados	6th May 1902, Afternoon; 17:00-22:00 (Barbados)	TNA: CO 28/257, Governor Sir F.M. Hodgson (Barbados)	15
"Was there any fall of ashes or of stones at this locality?" "Yes of both" "Thickness and coarseness of deposit?" "Ashes above 12 inches thick, of a very fine character, at first the ashes were black [sic] [sic] granules as seen on a white cloth, about 3 pm, the ashes were replaced by mud. The stones had the appearance as per specimen".	Ash fall	Chateaubelair	6th-7th May & 9th May 1902	Royal Society Commission on the eruptions in the West Indies: Chateaubelair	36
"Slight earthquakes have been of frequent occurrence to the north of St Vincent for the last week."	Earthquake	North of St Vincent	3rd May 1902	Western Times, 10th May 1902	1

"So terrible were the earthquake shocks as to give the impression that he end of the world had come"	Earthquake	Georgetown	6th May 1902	Morris (1902), pg. 134	8
"Mr Dun, of Owia, reports that he heard noises at 10.15 am, 12.30 pm, and 12.45 pm…they were accompanied by earthquakes"	Earthquake	Owia	7th May 1902 (10:15, 12:30, 12:45)	Anderson and Flett (1902)	22
"Simultaneously there were earthquakes, severe rumbling noises and flashes of lightning"	Earthquake	Fancy	7th May 1902 (11:00)	BGS: A1902-F68	10
"By 1100 hours on May 7th, hot water was observed in the Wallibu Dry River"	Lahar	Wallibou Dry River	7th May 1902 (11:00)	Roobol and Smith (1975)	12
"…about 11 o'clock a little rain fell containing fine particles of ash"	Ash fall	Owia	7th May 1902 (11:00)	Anderson and Flett (1902)	64
"Simultaneously there were earthquakes, severe rumbling noises, and flashes of lightning"	Earthquake	Fancy	7th May 1902 (11:00)	Anderson and Flett (1902)	23
"Small stones began to fall in the boat. Then he was enveloped in dense darkness and ash fell…By this time they were several miles out from the shore. Another boat was quite near him…it was never seen again…he thinks it was filled with sand and sunk"	Ash fall	Windsor Forest	7th May 1902 (after 13:00)	Anderson and Flett (1902)	65
"Was there any fall of ashes or of stones at this locality?" "Ashes"	Ash fall	St Philip, Barbados	May 7th 1902 (13:28 and 14:43) July 9th 1902 (20:43)	Royal Society Commission on the eruptions in the West Indies. Barbados	30
"His party left at 1 o'clock, and a little later they passed Windsor Forest…a few minutes later he heard the sound of a	PDC	Wallibou River ('2 to 3 miles over the	7th May 1902 (after 13:00)	Anderson and Flett (1902)	37

great explosion and saw a huge black mass pouring out of the Wallibou and Larikai Valleys…but at Baleine another similar cloud was rushing down the ravines on the mountain side to the north”		sea'), Larikai River, Baleine, Windsor Forest			
“At half-past one…a second stream of red hot lava was observed descending towards Lot 14 and Rabacca”	PDC	Lot 14, Rabacca	7th may 1902 (13:30)	Huggins (1902)	32
“At about 1.45pm a huge dark curtain of vapour of reddish hue, interlaced with electric flashes, was observed advancing along the coast up towards Chateaubelair…the frightful cloud which appeared to engulf everyting ast it approached. Those of the fliers nearest as they scoured away were nearly suffocated with the heat and could hardly breathe”	PDC	Near Chateaubelair	7th may 1902 (13:45)	Huggins (1902)	33
[Mr McDonald] “1.55…a terrific huge reddish and purplish curtain advancing up to and over Richmond Estate” “…its southern margin was over the headland on the south side of the mouth of the Richmond River” “The boat [of the group of black and coloured men] had just rounded the point south of Richmond River, and was on the north side of Chaeaubelair Bay. The cloud struck them like a strong breeze…it came over the water with a strong ripple and a hissing sound, due to the hot sand falling into the sea and making it steam”	PDC	Richmond, headland of Richmond River, Chateaubelair Bay	7th May 1902 (13:55)	Anderson and Flett (1902)	36

"One boat was near Richmond at the time the blast swept down. The heat is described as fearful".	PDC	Richmond	7th May 1902 (14:00)	Knowledge, December 1902	29
"By 1400 hours the crater must have been empited of water as by then a large vertical explosion, directed to the windward side of the volcano, produced numerous pyroclastic flows which descenced the Wallibu [Wallibou], Wallibu Dry River, Rozeau Dry River, Larikai, Grand Baleine and Rabaka [Rabacca] valleys"	PDC	Wallibou, Wallibou Dry River, Rozeau River, Larikai, Grand Baleine, Rabacca Valley	7th May 1902 (14:00)	Roobol and Smith (1975)	34
"…the huge black cloud rolling down the mountain in globular, surging masses…At Lot 14 the manager and his wife and family had shut themselves up in the rum cellar below the house, and firmly closed all doors and windows…At Rabaka many who were prevented from fleeing Georgetown by the floods of hot water in the river…they felt the heat most intense. It was quite dry, and there was a very strong and irritating odour of sulphur" "At Turema [Tourama] the fatal cloud did its deadly work quite as effectively" "In Overland village the loss of life was terrible; hundreds were killed" "Langley Park stands half-a-mile to the north of Mount Bentinck, and many were killed there….it is clear that the black	PDC	Lot 14, Rabacca Estate, Tourama, Overland, Langley Park	7th May 1902 (14:00)	Anderson and Flett (1902)	38

cloud passed over Langley Park, and that the fatalities which took place there are to be ascribed to its action"					
"Stones 6 inches, and perhaps more, in diameter fell in Georgetown"	Ash fall	Georgetown	7th May 1902 (14:00 onwards)	The New York Times, Edmund Hovey, 6th June 1902	18
"Stones began to fall increasing severity and proximity"	Ash fall/ballistics	Fancy	7th May 1902 (14:00-00:00)	BGS: A1902-F68	32
"A black rain began to fall, followed by another rain of favilla, lapilli and scorae"	Ash fall	Cumberland Bay	7th May 1902 (minutes after 14:25)	The New York Times, C.B. Graves, 23rd May 1902	23
"At 2:25 we had reached Cumberland Bay, about eight miles away from the volcano, when suddenly a tremendous cloud of black smoke like a great promontory, thick with volcanic ash, stones, and scorae, came down the mountain side into the sea"	PDC	Cumberland Bay (Perhaps observing further north)	7th May 1902 (14:25)	The New York Times, C.B. Graves, 23rd May 1902	4
"…the inhabitants of Kingstown were greatly alarmed owing to the falling of grey pebbles of various sizes, and of mud in rounded drops, which continued for quarter of an hour, and were succeeded by clouds of ashes which darkened the air. This shower of ashes and dust continued through the night, the heavier particles falling first and finally the finest impalpable dust. The mud, however, which fell at an earlier hour consisted entirely of similar matter which, together, covered the whole island with a ghastly coasting of greyish white"	Ash fall	Kingstown	7th May 1902 (14:30)	Huggins (1902)	52

"About half past 2 o'clock grey pebbles of a pumiceous character began to fall…some of the stones were almost the size of a hen's egg"	Ash fall	Kingstown	7th May 1902 (14:30)	Anderson and Flett (1902)	67
"…along with earthquakes, rumbling noises…"	Earthquake	Fancy	7th May 1902 (15:00-00:00)	BGS: A1902-F68	11
"Any earthquakes?" "At 5pm and 9pm on 7th May sharp shock of earthquake was felt, between 3-5 seconds"	Earthquake	Kingstown	7th May 1902 (15:00 & 21:00)	Royal Commission on the eruptions in the West Indies: Kingstown	14
"Was there any fall of ashes or of stones at this locality?" "Yes"	Ash fall	Bequia, Grenadines	7th May 1902 (15:03)	Royal Commission on the eruptions in the West Indies: Bequia	39
"The British steamship 'Coya' had an eighth of an inch of volcanic dust from this volcano fall on her deck when she was two hundred seventy-five miles east-southeast of St Vincent"	Ash fall	275 miles ESE of St Vincent	7th May 1902 (22:30)	Hovey (1902a)	62
"Soon afterwards, the Rivers Wallibu [Wallibou] and Rabaca [Rabacca] on this side were seen rushing down in raging floods of boiling water…poured down the valleys as a tremendous rush of boiling water to the sea"	Lahar	Wallibou River, Rabacca River	7th May 1902	Knowledge, December 1902	10
"The water from the crater lake was discharged at the beginning of the eruption down the Rabaka and Wallibu Rivers"	Lahar	Rabacca, Wallibou	7th May 1902	Anderson (1908)	13
"A large amount of material, too, was brought down by the Rabaka Dry River an hour in advance of the great outburst of May 7, which seems to have been due to the bodily discharge of a portion, at least, of the old crater lake into the headwaters	Lahar	Rabacca River	7th May 1902	Hovey (1902a)	18

of that stream. Survivors who attemped to cross the Rabaka Dry River toward noon of that day report that they were prevented by a torrent of 'boiling hot' water and mud rushing down the valley and that a wall of water and mud fifty or more feet high (they compared it with the height of a factory chimney) came out of the upper reaches of the river and swept out to sea"					
"Many tried to escape to Georgetown, but when they got to Rabaka they found the Dry River there pouring down in heavy flood, and the water was so hot it was impossible to wade across. There is no bridge over this river, so most of these refugees gathered at Rabaka House, but some returned to their own dwellings"	Lahar	Rabacca River	7th May 1902	Anderson and Flett (1902)	19
"…in Wallabou [Wallibou] it is related that nineteen shocks occurred within half an hour"	Earthquake	Wallibou	7th May 1902	The New York Times, C.B. Graves, 23rd May 1902	4
"On the leeward side the absence of stones, especially near the crater, is remarkable, but we found some as large as one's head in the debris covering Richmond village, four miles southwest of the crater."	Ash fall	Richmond	7th May 1902	The New York Times, Edmund Hovey, 6th June 1902	19
"This little town [Georgetown] was without the death zone by but a few hundred yards, and lies under eighteen inches of cinders and ashes"	Ash fall	Georgetown	7th May 1902	The New York Times, C.B. Graves, 23rd May 1902	22
"Along the Leeward coast from Layou downwards great numbers of the friable stones of large size fell some seen at Layou were the size of a youth's head and many round about Chateaubelair were over ten inches dia."	Ash fall	Layou, Chateaubelair, Kingstown	7th May 1902	Huggins (1902)	53

"At that time the land and bay were completely hidden by absolute blackness. It still lacked over an hour and a half to sundown but night had settled, and a fine fall of volcanic sand had begun to cover the ship"	Ash fall	Between Carlisle Bay (Barbados) and Trinidad	7th May 1902	Nottingham Evening, 30th June 1902	8
"The Chateaubelair district was covered two feet deep with ashes"	Ash fall	Chateaubelair	7th May 1902	Nottingham Evening, 13th May 1902	4
"Was there any fall of ashes or of stones at this locality?" "Both"	Ash fall	Botanical Garden, Kingstown	7th -8th May 1902 (15:00-morning)	Royal Commission on the eruptions in the West Indies: Kingstown	40
"Yes, ashes. 3:17 pm was few grains. 4.40 pm until 5 pm and intermittents; continuous from 5pm until 6.10 am, May 8th. ¼ inch depth. The ashes that fell until 6pm was considerably coarse and drier than which fell afterward".	Ash fall	Bridgetown, Barbados	7th-8th May 1902 (15:17-06:10)	Royal Commission on the eruptions in the West Indies: Bridgetown, Barbados	43
"The spectacle there was terrifying. It became so dark at 4pm on Wednesday that the lamps had to be lit in all the houses. All though that night the volcano roared, and the dust continued to fall until the morning of the 8th"	Ash fall.	Kingstown	7th May 1902 (16:00) - 8th May 1902	Aberdeen Journal, 12th May 1902	2
"There was a fall of dust. Noticed first about 5 pm on 7th May. Fall continued from 5 pm on the 7th till about noon on 8th…a deposit of about ¼ inch fell a bottom layer of ash coloured dust of coarseness of ordinary beach sand. A top layer lighter in colour as fine sand."	Ash fall	St Philips, Barbados	7th -8th May 1902 (17:00-12:00)	Royal Commission on the eruptions in the West Indies: St Philip Parish, Barbados	42
"Was there any fall of ashes or of stones at this locality?" "Yes"	Ash fall	Bridgetown, Barbados	7th-8th May 1902 (17:15-05:00)	Royal Commission on the eruptions in the	38

				West Indies: Barbados	
"The streets [in Kingstown] were covered two inches deep with ashes and stones that had fallen during the night." "Kingstown…had been covered with three inches of ashes and showers of stones on Thursday"	Ash fall	Kingstown	7th-9th May 1902	Morris (1902), pg. 117, 122	28
7th May: "at 11 am dust and water fell lasting an hour increasing in quantity momentary. At noon small pebbles began to fall, these too increasing in number and size as time went on, and by 1 pm large blocks of scoria and pumice were falling and continued without intermission until 5 pm (4 hours). At about 1.30 pm there was a heavy fall of hot mud (1 ½ deep) this lasted from 15 minutes to 20 minutes. At 7 pm there was another shower of heavy stones (not as severe as the first) which lasted to 9.15 pm. At midnight there was a slight fall of ash". 9th May: "a slight fall of stones at about 8.30 am followed by a heavy fall of ash and sand which lasted for three hours – say to 12 noon".	Ash fall	Owia	7th and 9th May 1902	Royal Commission on the eruptions in the West Indies: Owia	37
"Georgetown, which is nine miles from Soufriere, has been badly damaged by the rain of stone and ashes…" "…streets were covered to a depth of three feet"	Ash fall	Georgetown	8th May 1902	Whitney (1902), pg. 243 Morris (1902), pg. 139	26

"On Tuesday and Wednesday…Near Belair the ashes were three feet deep"	Ash fall	Chateaubelair	8-9th May 1902	Whitney (1902), pg. 180	25
"…a stream of boiling mud or lava was seen rushing downwards through the valley of the Waliibu to sea"	Lahar	Wallibou	9th May 1902 (07:00)	Anderson and Flett (1902)	20
"In Georgetown the sound of the eruption was also heard, and there was a shower of small stones, followed by fine ashes. From Kingstown…there was a slight fall of fine dust…at Fancy…stones and sand continued to fall for nearly two hours"	Ash fall	Georgetown, Kingstown, Fancy	9th May 1902 (07:00-09:00)	Anderson and Flett (1902)	68
"Kingstown, the capital, is covered with ashes, and is being bombarded with stones from the craters"	Ash fall	Kingstown	9th May 1902	Gloucester Citizen, 12th May 1902	3
"Fine dust fell several times…9th May 1902, during night and following day…6th June 1902, lasted three days."	Ash fall	St Lucia	9th-10th May 1902; 6th June 1902	Royal Commission on the eruptions in the West Indies: St Lucia	41
[Thomas Huckerby] "…earthquakes were noticed at the Botanical Gardens on July 17th and 21st…at Chateaubelair on the 9th, 19th, 20th, 23rd, 30th and 31st"	Earthquake	Kingstown, Chateaubelair	9th, 19th, 20th, 23rd, 30th, 31st May 17th, 1902 (09:45), 21st (01:10) July 1902	Anderson (1908)	18
"Soufriere, St Vincent, erupted violently yesterday. Loud reports resembling artillery heard Barbados three o'clock in afternoon. At five o'clock in afternoon darkness and thunder, accompanied by steady downpour of dust, continued till night time. Barbados covered inches thick"	Ash fall	Barbados	10th May 1902, 17:00-00:00	Western Gazette, 16th May 1902	5

"The Soufriere volcano at St Vincent is still in full eruption, and is raining pebbles and lava, stones, and dust on Kingston, in the south of the island"	Ash fall	Kingstown	11th May 1902	Aberdeen Journal, 12th May 1902	1
"I communicated with Fancy and Owia Bay…for four days had not been able to communicate with Georgetown, in consequence of a lava stream"	PDC	Rabacca	11th May 1902	TNA: CO 321/214, 17th May 1902	3
"There was a slight rain of small pebbles at Richmond Vale"	Ash fall	Richmond Vale	14th May 1902	Anderson and Flett (1902)	69
"At Chateaubelair the ashes are two feet deep in the streets; in Kingston [Kingstown] they are fully an inch deep" "… and at four in the afternoon the darkness was that of midnight"	Ash fall	Chateaubelair, Kingstown, Georgetown	15th May 1902 (16:00, Georgetown)	Western Gazette, 16th May 1902	6
"In the parish of Georgetown the earth shook violently"	Earthquake	Georgetown	15th May 1902	Western Gazette, 16th May 1902	2
"Sunday evening, May 18, and the eruption was so violent that there was a heavy shower of stones in Kingstown"	Ash fall	Kingstown	18th May 1902 (Evening)	The New York Times, Edmund Hovey, 6th June 1902	20
"Throughout yesterday the adjoining districts trembled, and some of the shocks were felt here"	Earthquake	Kingstown	18th May 1902	The New York Times, 19th May 1902	3
"Ashes fell [on Kingstown] from ten o'clock until midnight"	Ash fall	Kingstown	19th May 1902	Whitney (1902), pg. 341	27
"While the residents of the village of Morne Ronde were leaving that place by boat, a man who had declined to leave was seen running up and down the shore, screaming for help,	Lahar	Morne Ronde	24th May 1902	The New York Times, 26th May 1902	23

and saying that he ground was hot, that the water was boiling, and that lava was coming down the mountain. It was impossible to rescue him, and he died a horrible death."					
"…a severe thunderstorm, accompanied by a heavy rainfall, broke over St Vincent and continued until today, causing the mud streams in the windward district of Georgetown to become flooded"	Lahar	Georgetown district (Rabacca)	24th May 1902	The New York Times, 26th May 1902	5
"In the case of Richmond Vale…it suffers more and more from each eruption, and as mentioned in my letter of the 9th, a forth of the roof of the sugar works collapsed on Sept 3rd under the weight of stones and ashes"	Ash fall	Richmond Vale	3rd September 1902	TNA: CO 321/214, Duncan MacDonald, 27th October 1902	17
[Thomas Huckerby] "…at 3.55am an earthquake was noticed at Chateaubelair, and also at the Botanical Gardens"	Earthquake	Chateaubelair	3rd Sept 1902 (03:55)	Anderson (1908)	19
[Thomas Huckerby] "Beginning as a thin layer at Barualli (Barrouallie), it gradually increased to five to nine inches at Chateaubelair, where several buildings were injured by the heavy fall, which consisted of dust, lapilli, and black stones…at Rosebank…the thickness of the deposit was about three inches"	Ash fall	Barrouallie to Chateaubelair, Rosebank	3rd September 1902	Anderson (1908)	54
"It was noticed during the eruption that material like mud flowed from the crater down the Larikai valley"	Lahar	Larikai River	3rd September 1902	Anderson (1908)	14
"The Rabacca river is even now a stream of fire, a quarter of a mile or more wide. Mimic eruptions are in progress everywhere along the river bed, and columns and dense clouds of steam, mud, and pebbles are being thrown up continuously. The land has spread further seaward, and the appearance of the district changed considerably since the eruption of the 3rd	Lahar	Rabacca	6th September 1902	Lancashire Evening, 9th September 1902	1

inst. This is probably due to the ejecta flowing down the slopes of the volcano and filling up the sea around the coast"					
"At 12.30 am, what appeared to be a ball of fire presented itself over the crater, followed by a flow of red-hot matter down the Larikai side of the mountain"	PDC	Larikai	14th October 1902 (00:30)	Anderson (1908)	35
[Thomas Huckerby] "At five minutes to two, stones began to fall in Chateaubelair and continued for about two hours…mud began to fall at 2 o'clock" "At Kingston [Kingstown] there was from 1/8 to ¼ inch of ash…at Gregs [Greiggs] and Union Estates 2 inches were measured, and at Park Hill 3 to 4 inches, while at Georgetown and Mount Bentinck the depth was 6 to 8 inches"	Ash fall	Chateaubelair Kingstown, Greiggs, North and South Union, Park Hill, Georgetown, Mt Bentinck	14th October 1902 (01:55)	Anderson (1908)	55
[Thomas Huckerby] "I noticed four earthquake shocks, the two at 3.22am and 4am, respectively, being the heaviest and most prolonged"	Earthquake	Chateaubelair	14th October 1902 (03:22, 04:00)	Anderson (1908)	20
"Coarse gritty sand, or small stones, seems to have fallen as far south as Argyle Estate"	Ash fall	From Soufriere to Argyle	15th-16th October 1902	Western Times, 19th November 1902	10
"…peasants settled on the acquired estates of New Adelphi and Park Hill have had all their ground provisions nearly ready for reaping, destroyed"	Ash fall	New Adelphi, Park Hill	15th-16th October 1902	Western Times, 19th November 1902	11
"Even the Mesopotamia Valley, an ideal garden of tropical vegetation, although twelve miles from the volcano's crater, is burdened with sand, in some places six inches deep"	Ash fall	Mesopotamia Valley	15th-16th October 1902	The New York Times, 18th October 1902	21

"The eruption of the 15th and 16th inst. Has completely ruined all vegetation on the whole of the north and eastern coast of the island, and the mountain lands in the vicinity, including Park Hill, Byera, Perseverance and other settlements, have been obliterated by the vast quantity of volcanic matter that fell during the awful disturbance…from Grand Sable Estate to the north point of the island, including Fancy, all cultivated is buried in sand varying in depths of 4 inches on level lands to two feet and more, in valleys". "It may seem strange to some that the fall of an inch of sand is said to have completely destroyed cultivation…wail of the people even so far southward as the Marriaqua Valley and Belair is on account of the provisions in the ground being burnt by the extreme heat of the sand"	Ash fall	Park Hill, Byera, Perseverance, Grand Sable to Fancy Marriaqua Valley, Belair	15th-16th October 1902	The Barbados Advocate, 27th October 1902	47
"At Chateaubelair three very severe earth tremors were experienced between 3.25 and 4.20 this morning. In Kingstown they were only slightly felt".	Earthquake	Chateaubelair	16th October 1902 (03:25, 04:20)	The Agricultural Reporter, 27th October 1902	15
"The rate of fall was as follows: October 16th total from 9am to 3pm at the rate of 3.92 tons per acre…I also collected 2 samples at Rosebank, Hastings…from 8.45am to 4pm at the rate of 4.59 tons per acre, and from 4pm to 7am (17th) at the rate of 0.20 tons per acre"	Ash fall	Bridgetown, Rosebank, Hastings, Barbados	16th-17th October 1902 (09:00-15:00, 16:00-07:00)	The Agricultural reporter, 20th October 1902	48
"Sand fell in Georgetown it is said between 6 and 9 inches; and in the Mesopotamia Valley, 12 inches, covering the vegetation of the valley."	Ash fall	Georgetown, Mesopotamia Valley	16th October 1902	The Agricultural reporter, 27th October 1902	45

"The roof of liquor loft on the Taurama [Tourama] estate collapsed under the weight of ashes"	Ash fall	Tourama	20th October 1902	Cornishman, 30th October 1902	9
"The dry river course of the Rabacca, near Georgetown, has been sending up volumes of vapour, having evidently been converted into a stream of hot water"	Lahar	Rabacca River	20th October 1902	Cornishman, 30th October 1902	2
"At 2.10 sand began to fall in Kingstown"	Ash fall	Kingstown	October 1902	BGS: JF-Oct 1902	31
"3.23 – A slight shock of earthquake felt by my wife"	Earthquake	Kingstown	October 1902	BGS: JF-Oct 1902	9
[Thomas Huckerby] "…there was a minor eruption and a small quantity of ash and lapilli fell at Georgetown and Chateaubelair"	Ash fall	Georgetown, Chateaubelair	24th November 1902	Anderson (1908)	56
"On Wednesday, November 26, 1902, there was a considerable flow of mud down the Rabaka River. The ash avalanches of the May eruptions had completely blocked its bed, and the ejecta of the subsequent eruptions had doubtless contributed their quota…two raging steaming torrents decended the valley. One of these detroyed the remains of the Rabaka sugar works"	Lahar	Rabacca River	24th November 1902	Anderson (1908)	15
"Dust fell in Georgetown, and up to Cumberland in the Leeward district"	Ash fall	Georgetown, Cumberland	26th November 1902 (04:18)	The Times, 27th November 1902	46
"Heavy and continous rains fell in the Carib country, and the works of Rabacca Estate were damaged by a rush of water which is supposed to have come from a lake formed at the head of the Rabacca Dry River, since May last"	Lahar	Rabacca Estate	26th November 1902	The Times, 27th November 1902	9
"The day before I arrived there was a genuine outburst of boiling water from the crater which completed the destruction of Porter's remaining estate at Rabacca"	Lahar	Rabacca Estate	1st January 1903	TNA: CO 321/214, John R. Dasent, 2nd January 1903	3

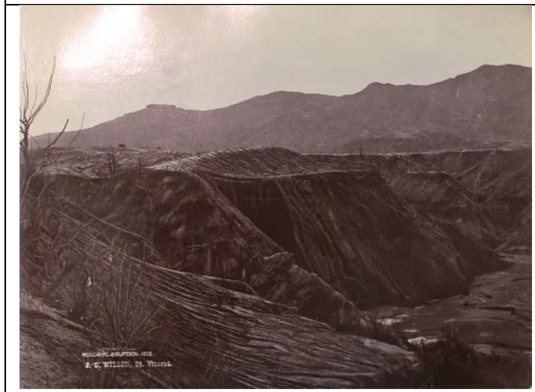
"He [Alfred Lacroix] saw from his boat, when off the mouth of the Richmond River, an explosion of hot mud take place from the crater of the Soufriere, and he observed the sudden descent of a torrent of mud in the high Rozeau valley…"	Lahar	Rozeau River	3rd March 1903	Anderson (1908)	16
[Thomas Huckerby] "There were three earthquakes between 7 and 8 in the morning, and one at 9 o'clock"	Earthquake	Chateaubelair	21st March 1903	Anderson (1908)	21
"Sudden darkness increasing until 11:15 am [in Barbados], when quite dark, and dust began to fall slightly and lamps had to be lighted in churches and places in general". "There was a slight fall of dust in Kingstown yesterday evening. Many glass windows in Georgetown broken, and 3 persons slightly wounded by falling stones. Distant rumblings heard all night. There was another eruption this morning from 8 to 10, not as severe as yesterday's. Some dust fell in Chateaubelair, none in Georgetown. Strong winds drifted cloud northwards" "Soufriere in violent eruption since 7am [22nd] accompanied with roaring and flashes of lightning. Kingstown covered by dense black cloud completely obsured sun. Chateaubelair reports dark sand falling there…2pm: the dark cloud which overhung Kingstown, drifted away slowly leaving a clear sky. No dust fell in Kingstown. Georgetown reports the fall there of 3 inches of sand, and a fairly heavy fall of small stones. People left the town much scared. Chateaubelair reports fall of sand and pebbles".	Ash fall	Barbados, Kingstown, Chateaubelair, Georgetown	22nd-23rd March 1903 (08:00-10:00 (23rd)	BGS: JF-050 (newspaper cut-out with no name)	44

"The dust was carried by the wind to Barbados…Dust began to fall about 11.15 and it continued to do so more or less heavily up to about 1 o'clock, after which it slackened and ceased altogether at 5 o'clock"	Ash fall	Barbados	24th March 1903 (11:15-17:00)	Anderson (1908)	60
"…ashes averaging 18 inches in depth, and varying from a thin layer at Kingstown to 24 inches or more at Georgetown. The streets of Georgetown are encumbered with heaps of ashes like snowdrifts, and several roofs have fallen in from the weight of the deposits upon them"	Ash fall	Kingstown to Georgetown	-	Gloucester Citizen, 17th May 1902	7
 "Hospital in Georgetown, Saint Vincent with 200 dying people"	Ash fall	Georgetown	-	TNA: CO 1069/388, J.C. Wilson	12
	Ash fall	Georgetown	-	TNA: CO 1069/388, J.C. Wilson	13

“Street in Georgetown, Saint Vincent”					
“It is estimated that 3 million tons of dust in connection with St Vincent eruption fell on Barbados”	Ash fall	Barbados	-	TNA: 28/257, Governor Sir F.M. Hodgson (Barbados) to Mr Chamberlain (Administrator) 13th May 1902	14
“In Georgetown itself there was no loss of life but the whole town has about 6 in. of ashes over it and most of the windows broken. From Georgetown on, the ashes get less and less and practically there is no damage done to the south of it.”	Ash fall	Georgetown	-	TNA: CO 321/214, Captain F.L. Campbell, 17th May 1902	16
“Wallabou [Wallibou], Chateaubelair, and the others were buried in ashes many feet in depth…”	Ash fall	Wallibou, Chateaubelair	-	The New York Times, C.B. Graves, 23rd May 1902	24
 “Cleaning hotel yard, Georgetown”	Ash fall	Georgetown	-	Anderson T. (1902) YM:101	29
“The ash fell fell at Fancy was [sic] and thick like cement…”	Ash fall	Fancy	-	BGS: A1902-F68	33

“Was there any fall of ashes or of stones at this locality?” “Oh yes” Considerable”	Ash fall	Chateaubelair, Warrawarrou arrowroot estate	-	Royal Society Commission on the eruptions in the West Indies: Belair	34
“Was there any fall of ashes or of stones at this locality?” “Yes, considerable”	Ash fall	Georgetown	-	Royal Society Commission on the eruptions in the West Indies: Georgetown	35
“At Fancy…the ashes had stopped the water supply”	Ash fall	Fancy	-	The Barbados Diocesan Magazine and West Indian Guardian, June 1902	49
“At Owia…though stones and sand fell in large quantities not much damage was done”	Ash fall	Owia	-	The Barbados Diocesan Magazine and West Indian Guardian, June 1902	50
“Around Langley Park, Mount Bentinck etc., there are a few huts standing, and those which have been destroyed do not appear to have been burnt so much as broken down by stones and ashes”	Ash fall	Langley Park to Mt Bentinck	-	The Barbados Diocesan Magazine and West Indian Guardian, June 1902	51
[Thomas Huckerby] “At Morne Ronde there was a depth of 4 inches of new grey dust. At the opening of the Larikai valley there was a fall of 6 ¾ inches”	Ash fall	Morne Ronde, Larikai River	-	Anderson (1908)	57
[Thomas Huckerby] “The pumice, which I had picked up at Owia, has the appearance of a pink sponge”	Ash fall	Owia	-	Anderson (1908)	58

"Mr Powell reports, on March 24, that the depth of black dust was about half an inch at Park Hill. At Three Rivers and Mount William it was about three-quarters of an inch deep and coarser in grain. It contained many considerable pieces of an inch and upwards in size. The cocoa trees were here a good deal damaged. At the experiment station, near Georgetown, it was coarser still, more cinder-like, and pieces of 3 inches or more in diameter were common. The sugar-canes and other plants were much injured. At Dickson's Village…the ash was 2 to 3 inches deep and larger cinders more abundant still…At Turema [Tourama] about 5 inches of dust were measured"	Ash fall	Park Hill, Three Rivers, Mt William, Georgetown, Dickson's, Tourama	-	Anderson (1908)	59
"Although a few bombs, some of which were twelve to fifteen inches across, were found on the leeward side as far away from the crater as the site of Richmond village…bombs fifteen to eighteen inches in diameter being common in the bed of the Rabaka Dry River"	Ash fall (ballistics)	Richmond, Rabacca River	-	Hovey (1902a)	61
"…the dust, especially that covering the Richmond estate…"	Ash fall	Richmond	-	Hovey (1902a)	63
"…Mount Bentinck, and here also no lives were lost, though the fields were buried in ashes" "…the case in Fancy, where on the morning of Wednesday it was seen that the walls of the houses were plastered over to a depth of half-an-inch with fine wet ashes"	Ash fall	Mt Bentinck, Fancy	-	Anderson and Flett (1902)	66
"The eruption was accompanied by earthquakes…the shores for a considerable space inland along the coast at Wallibo [Wallibou] and Morne Ronde sank under the sea to a great depth and boats now travel over the site of Wallibo Village. At	Earthquake	Between Wallibou and Morne Ronde	-	Huggins (1902)	16

a spot 50 feet outwards from the present beach, and where land formerly existed 20 feet above sea level, the water is now 7 ½ fathoms deep, and at 100 feet outward from the same point on the beach it is 18 fathoms. This subsidence appears to be strictly defined with its southern limit at the mouth of the Wallibo river”					
 “Windward. Top of Dry River [Rabacca], once forest, near the [sic]. Jets of steam rising after rain from the heated grounds”	PDC	Top of Rabacca	-	TNA: CO 1069/388, J.C. Wilson	1
	PDC	Between Lot 14 and Orange Hill	-	TNA: CO 1069/388, J.C. Wilson	2

"Windward. Between Lot 14 and Orange Hill. Smoke coming from crater (which is shaped like a fort)"					
"The country on the coast between Robin Rock and Georgetown (a stretch of about three miles on the coast) was apparently struck and devastated in a similar manner to St Pierre"	PDC	Between Robin Rock and Georgetown	-	Whitney (1902), pg. 203	5
"The bed of lava in the windward district is still hot. The abyss, 500 feet deep and 200 feet wide, which existed between Langly [Langley] Park and Habbacci [Rabacca], is filled with lava"	PDC	Between Langley Park and Rabacca	-	The New York Times, 17th May 1902; Whitney (1902), pg. 250	6
 "St Vincent. Dust-covered ridge of Bunker's Hill, Richmond Estate. 30 May 1902"	PDC	Bunker's Hill, Richmond	-	Anderson T. (1902) YM:025	7

 “St Vincent. 30 May 1902. Wallibou River from Bunkers Hill. Part formed by steam action.”	PDC	Wallibou River, from Bunker’s Hill	-	Anderson T. (1902) YM:010	8
 “St Vincent. Wallibou Valley from 130m on Bunkers Hill.”	PDC	Wallibou River, from Bunker’s Hill	-	Anderson T. (1902) YM:013	9
	PDC	Lot 14	-	Anderson T. (1902) YM:102	10

“Lot 14. Devastated plantation.”					
	PDC	Orange Hill	-	Anderson T. (1902) YM:123	11
5 photos of various parts of the Rabacca River, 1 photo of part of the Rabacca Estate (18) 	PDC	Rabacca River/Estate	-	Anderson T. (1902) YM:016, 077, 079, 081, 085, 087, 090	12-18

	PDC	Richmond	-	Anderson T. (1902) YM:014	19
 "St Vincent. Southeastern crest of Soufriere from seaside Rozeau River"	PDC	Rozeau River	-	Anderson T. (1902) YM:018	20
 "South lip crater Soufriere"	PDC	South lip of crater	-	Anderson T. (1902) YM:192	21

	PDC	Trespé Valley, adjacent to Wallibou River	-	Anderson T. (1902) YM:233	22
2 photos of Wallibou estate (23-24) & 4 photos of various parts of Wallibou Valley    	PDC	Wallibou Estate/Valley	-	Anderson T. (1902) YM:037, 042, 011, 033, 047, 028	23-28

 					
"This thriving and thickly populated village [Overland] is entirely wiped out…Tourama, Orange Hill, Lot 14, Waterloo, Rabacca – these were entirely destroyed; the majority killed outright, and all cattle etc. destroyed."	PDC	Overland, Tourama, Orange Hill, Lot 14, Waterloo, Rabacca	-	The Barbados Diocesan Magazine and West Indian Guardian, June 1902	30
"The flowing lava on the Leeward side of the mountain has buried up the Wallibou and Richmond villages and estates, while on the Windward side of the mountain the estates of Lot Fourteen and Rabacca have been desrtoyed, and parts of Overland, Orange Hill, Tourama, Mount Bentinck and Langely Park have been obliterated"	PDC	Wallibou, Richmond, Lot 14, Rabacca, Overland, Orange Hill, Tourama, ~~Mt Bentinck~~ [see AF66], Langley Park	-	BL: JF-106	31

	PDC	Richmond Estate	-	J.C. Wilson (RGS/S0001852)	39
"An interesting feature of the action of this stream was that it was overloaded with sediment from its loose banks, so that it could not flow continuously. It was necessary for the water to come down in pulsations of variable interval in order to overcome the drag of its load."	Lahar	Wallibou	-	The New York Times, Edmund Hovey, 6th June 1902	4
 "Rabacca, upper part"	Lahar	Upper Rabacca River	-	Anderson T. (1902) YM:087	6

 "Crossing river of boiling mud"	Lahar	Rozeau River	-	Anderson T. (1902) YM:098	7
 "Mouth of Wallibou, boiling mud"	Lahar	Wallibou	-	Anderson T. (1902) YM:034	8
"…small lake was formed by the volcanic ejecta damming the bed of a watercourse above Duvalle [Windsor Forest] so that the water gradually accumulated, but a few months later this lake or dam burst its barriers and swept several persons into eternity and burying the estate"	Lahar	Windsor Forest	-	Huggins (1902)	11
"…the windward shoreline from Black Point…to Chibarabou Point…has been pushed out by the vast quantities of fresh	Lahar	Rivers/streams between Black Point	-	Hovey (1902a)	17

lapilli which have been brought down from the slopes of the volcano by the rivers and the heavy rains…”		and Chibarabou Point			
“The Rabaka Dry River was dry for several days after the great eruption, and when it began to flow intermittently after very heavy showers the water came down perfectly black and boiling hot”	Lahar	Rabacca River	-	Anderson and Flett (1902)	21
“…there is a stretch of rising ground which overlooks the fields of the Grand Sable estate in bluffs a couple of hundred feet high or less. Currents of mud flowed down upon the arrowroot fields which lie below, and covered them with fans of debris. They even swept across the public road into that part of the village which is known as Browne’s Town”	Lahar	Grand Sable to Browne’s Town	-	Anderson and Flett (1902)	22

Table G3: 1979 eruption datapoints

All information regarding the description, hazard phenomena, time and date (if available), location, reference and given datapoint number for the 1979 eruption are detailed below. Re-arranged in chronological order, after first being catalogued by order of being found in the archives.

Description	**Phenomena**	**Location**	**Date and time of phenomena**	**Data source**	**Data point**
“In the city of Kingstown, most stores and offices closed, because the ash was blown about by the strong winds which were experienced on Thursday morning”	Ash fall	Kingstown	13th-14th April 1979	The Star, 28th April 1979	8

"A visit has been made to the mouth of the Larikai river and it has been confirmed that material that descended this valley at noon on Saturday was a hot avalanche deposit. The Americans [Dr Fiske & Dr Sigurdsson] in the area of Georgetown have identified a similar type of deposit in the upper part of the Rabacca river"	PDC	Larikai River, Upper Rabacca River	14th April 1979 (12:00)	Report to the nation by Premier Cato, 16th April 1979	9
"A hot blowing avalanche was obsered to descend the Larikai River Valley at 12.09 on 14th April, and to continue beyond the mouth of this river for several kilometres out sea. The deposit at the mouth is 1.5 m thick, about 80 m wide and contains scoria blocks up to 60 cm in diameter in a matrix of ash and lapilli. The deposit was dry, and well about 100°C at its surface when inspected on the site 28 hours after emplacement" "A similar looking deposits was obsered from the air in the upper 2.5km of the Rabacca River to the southeast"	PDC	Larikai River, Upper Rabacca River	14th April 1979 (12:09)	Anon., 17th April 1979	8
"There were heavy deposits of mud and silt dug out of the mountain sides and what appeared to be lava was still trickling slowly down the Rabacca River"	Lahar	Rabacca River	16th April 1979	Report to the nation by Premier Cato, 16th April 1979	6
"During the afternoon of 16 April, activity continued at the level of around 30 clearly identifiable earthquakes per hour. These earthquakes were mostly of explosion type. From about 00.00 hours local time on 17 April, the character of the earthquakes changed and the majority had the signature of fracture type events"	Earthquake	La Soufriere	16th-17th April 1979 (afternoon-00:00)	The Star, 28th April 1979	6
"…17 April until 1657 hours when the seventh violently explosive phase of the eruption began. This was preceded by 70 minutes of low-amplitude tremor which emerged gradually but only built up to high amplitude over the last 15 seconds prior to the onset of the explosive blast. The initial	Earthquake	La Soufriere, Belmont (Observatory)	17th April 1979 (14:50-16:57)	The Star, 28th April 1979	7

blast was accompanied by a rumble clearly heard at the Belmont observatory, 9km from the crater”					
“Three minutes after the explosive phase began, pyroclastic flows were seen to descend the Larikai River valley, and continue almost as far as the coast at a distance of 3km from the crater. This pyroclast flow covered the first 2 kilometres towards the coast in about 2 minutes, and then decelerated”	PDC	Larikai River Valley	17th April 1979 (17:00)	The Star, 28th April 1979	3
“By 17.10 hours, ash was falling at sea to the west of the volcano. By 17.17 hours, lapilli up to 1cm in diameter were falling at the observatory”	Ash fall	La Soufriere western flank ~Richmond to Larikai, Belmont (Observatory)	17th April 1979 (17:10, 17:17)	The Star, 28th April 1979	9
“At 17.19 hours, the volcano tremor on the seismographs declined, apparently marking the end of the explosive phase”.	Earthquake	La Soufriere	17th April 1979 (17:19)	The Star, 28th April 1979	8
“This morning seismologists who are here monitoring La Soufriere’s activity, reported that its shocks had changed around 8pm last night resembling shocks from fractured earthquakes”	Earthquake	La Soufriere	17th April 1979 (20:00)	The Advocate, 18th April 1979	2
“…only a single period of about 20 minutes of intermittent, low amplitude tremor during the night of 17-18 April. From 08.00 hours onward on the morning of 18 April, earthquake activity began to develop again, with continuous background tremor and brief, stronger explosion-type earthquakes of short duration superimposed on this background…” “By 1.00 on 18 April, earthquakes of explosion type were occurring at about 50 clearly distinguishable events per hours on the observatory seismograph”.	Earthquake	La Soufriere	17th-18th April 1979 (night of 17th-08:00 onwards, 13:00)	The Star, 28th April 1979	9

"Tremors were felt in this capital, Kingstown…"	Earthquake	Kingstown	18th April 1979 (Afternoon)	The Advocate, 18th April 1979	1
"…from 6pm to 11.53pm seismic activity continued as it had throughout the day. Only a very small number of seismic events were recorded but all seismographs showed weak continuing volcanic tremor". "At 11.56 an eruption cloud illuminated from beneath by incandescent material emerged from the crater and a deep rumble was heard at Belmont…The strong tremor and ejection of material had stopped by 12.00 midnight".	Earthquake	La Soufriere, Belmont (Observatory)	18th-19th April 1979 (18:00-00:00)	The Advocate, 29th April 1979	10
"Stones, small pebbles and ash fell for 15 minutes at Union. Ash also fell in Kingstown and Arnos Vale. The thickness of the depoist was about 2 mm and was light and powdery mixed with grains of sand….ash falls were also recorded on the islands of Bequia and Mustique"	Ash fall	Union, Kingstown, Arnos Vale, Bequia, Mustique	18th April 1979	Anon. report, April 1979	17
"…ash deposits to be seen on Orange Hill, Fancy, Owia and Georgetown. The ash appeared to have covered the island in a line drawn from Colonaire north, through the eastern side of the crater with the exception of a small area around Prospect".	Ash fall	Orange Hill, Fancy, Owia, Georgetown, Colonarie, Prospect	18th April 1979	Anon. report, April 1979	18
"Yesterday's blast was the first since Saturday and was followed for 15 minutes by some thunder-like intermittent rumblings".	Earthquake	La Soufriere	18th April 1979	The Advocate, 19th April 1979	3
"As the evening wore on there was a strong recommencement of tremor at all stations close to the volcano and at 11.53 pm a major eruption commenced"	Earthquake	La Soufriere, Belmont (Observatory)	18th April 1979	Anon. report, April 1979	13

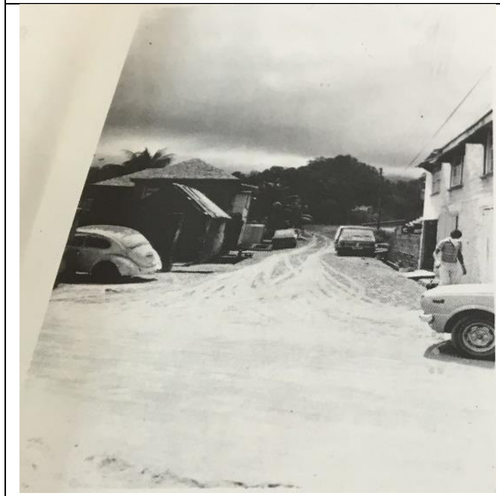
"The explosions, at intervals of only a few minutes, threw a small amount of ash and steam into the air north of the Larikai Valley…"	Ash fall	North of Larikai River Valley	19th April 1979 (12:00)	The Advocate, 19th April 1979	2
"…Larikai Valley where lava poured down the volcano's sides yesterday after the eighth violent eruption in five days".	PDC	Larikai River Valley	19th April 1979 (12:00)	The Advocate, 19th April 1979	1
"The ash fall at Rabacca was now ¾ thick"	Ash fall	Rabacca	19th April 1979	Anon. report, April 1979	14
"…today's column shooting from the volcano was white in colour and largely steam, but a fine haze of ash developed over the western flank, indicating that the column also contained volcanic ash"	Ash fall	La Soufriere western flank ~Richmond to Larikai	22nd April 1979	The Advocate, 22nd April 1979	5
"They [Duncan Richardson, Martin Barnard, Toney Sardine & Bobby Brisbane] saw a small pyroclast flow in a valley north of the Larikai. The deposits had now been eroded by the sea and a cliff ten feet in height could be seen".	PDC	Unnamed River north of Larikai River	24th April 1979	Anon. report, April 1979	7
"Kingstown experienced its heaviest fallout of volcanic ash following the Wednesday eruption. deposit of ash on the city was about four millimetres (one and a half inches) thick, paving the streets, covering vehicles and buildings, forcing residents to wear guards over their noses and mouths against wind-blown ash, and resulting in the closure of most stores and offices".	Ash fall	Kingstown	25th April 1979	The Advocate, 30th April 1979	10
"During the night there had been heavy rains and these caused the Rabacca River to flood…later that morning Duncan [Richardson] and Martin [Barnard] were told that the water running in the Rabacca was hot…the water was not hot but was above normal temperature"	Lahar	Rabacca River	27th April 1979	Anon. report, April 1979	5

"Volcanic tremor at La Soufriere had ceased by noon yesterday…six o'clock local time yesterday evening to noon and said "volcanic tremor continued to decline after 0pm (local time) and has now ceased entirely…" "…small volcanic earthquakes originating close to the crater began again late in the afternoon and had increased steadily but slowly up to noon when they were occurring at the rate of 30 per hour".	Earthquake	La Soufriere	28th April 1979 (18:00-00:00)	The Advocate, 29th April 1979	11
"Only a very small number of seismic events were recorded but all seismographs showed weak continuous volcanic tremor. At 11.53 the tremor suddenly increased strongly and flashes were observed in the crater…The strong tremor…had stopped by 12.00 midnight"	Earthquake	La Soufriere	28th April 1979 (23:53-00:00)	The Star, 28th April 1979	4
"…in contrast to previous explosions when the cloud mass drifted to the west, drifted in a southerly direction. For this reason ash fall was heavier in the southern part of the island than in previous explosions. Total thickness of ash at Belmont was 3mm".	Ash fall	Belmont (Observatory)	28th April 1979	The Star, 28th April 1979	7
"Since midnight seismic activity has been characterised by strong bursts of volcanic tremor superimposed upon a background of weak tremor".	Earthquake	La Soufriere	29th April 1979 (00:00 onwards)	The Star, 28th April 1979	5
"…since last night, the earthquake like tremors which occurred every two or three minutes yesterday, had subsided and there was now almost complete quiet"	Earthquake	La Soufriere	29th-30th April 1979	The Advocate, 30th April 1979	12
"They confirmed [Dr Smith & Dr Tomblin] the presence of a glowing avalanche deposit in the Roseau Valley as well as that in the Larakai"	PDC	Rozeau River, Larikai River	30th April 1979	Premier Cato, report forwarded by the Belmont Observatory	6

				team, 30th April 1979	
	Lava dome	La Soufriere	3rd May 1979	Anon. photographer, donated by Lance Peters	1
"The lava dome which growing in the crater continues to increase in size. It grew to height of about 6 feet in a two days period and appears to be also increasing in width".	Lava dome	La Soufriere	19th May 1979	The Star, 19th May 1979	2
"…the lava dome is nearly circular with a diameter of some 16,000 feet and varying in height of between 250 and 285 feet above the floor of the crater…The dome itself is about 12 million cubic yards in volume".	Lava dome	La Soufriere	29th May 1979	The Advocate, 29th May 1979	3
"The weekend rains caused flash floods in the Roseau and Wallibou valleys…resulting in mudflows down the lower parts of both rivers"	Lahar	Rozeau River, Wallibou River	2nd-3rd June 1979	The Advocate, 3rd June 1979	1
"The volume of the dome has increased by about 12 per cent and the scientists calculate the rate of lava emission to be about 500,000 cubic metres per day"	Lava dome	La Soufriere	3rd June 1979	The Advocate, 3rd June 1979	4

"The dome of lava now growing within St Vincent's La Soufriere volcano is continuing to spread at its base…had advanced by 27 feet towards the south wall of the crater while the height remained at the same 300 feet as on June 18 when the last measurements were taken".	Lava dome	La Soufriere	25th June 1979	The Nation, 28th June 1979	5
"There has been large scale erosion of the ash and cinder deposits…during the early part of the rainy season in late May and June, involved mud flows which removed a great volume of material from the upper slopes of the volcano and deposited much of it in the lower parts of the river valleys. The second stage began about the beginning of July, when the dense mud flows…ceased to occur and fast flowing water containing fewer solids in suspension has eroded deeply into the mud flow and (where present) underlying pyroclast deposits in the lower reaches of the river valleys"	Lahar	Lower Larikai River, Rozeau River	Late May-July 1979	Report from the Belmont Observatory Team (Tomblin), 3rd July-13th August 1979	4
"This island received its rain and dust later in the day and at night and the abrasive, sulphurous talc, insinuated itself into every crevice of our homes, blanketed our roofs, plants, trees, offices and beaches and swirled in choking eye-irritating clouds whenever the wind blew or vehicles whisked by"	Ash fall	Barbados	-	Sunday Advocate News, 6th May 1979	1
"Five minutes' drive away from the swirling dust of the small airport at Arnos Vale a crowd was packed into the Immigration Office in Kingstown spilling onto the sidewalk"	Ash fall	Arnos Vale to Kingstown	-	The Advocate, 21st April 1979	3
"Houses in the danger area are intact, but covered with a uniform of grey ash".	Ash fall	10 mile radius around La Soufriere	-	The Advocate, 21st April 1979	4
"Georgetown was initially considered relatively safe until the first shower of stones forced people to think otherwise".	Ash fall	Georgetown	-	The Star, 28th April 1979	6

	Ash fall	Unidentified location	-	Da Silva A. (1979), donated by Lance Peters	11
	Ash fall	Georgetown	-	Anon. photographer, donated by Lance Peters	12
"They [Duncan Richardson & Martin Barnard] found the canals and balancing tanks heavily silted up with ash…"	Ash fall	Orange Hill	-	Anon. report, April 1979	13
"On flying over Orange Hill they saw that several roofs had collapsed with the weight of the ash"	Ash fall	Orange Hill	-	Anon. report, April 1979	15
"Winston [Crozier] later showed them a stone 4" x 3" which had fallen in front of his car at Byera Hill. It was a basaltic rock weight several pounds"	Ash fall	Byera Hill	-	Anon. report, April 1979	16

"There were huge volcanic bomb craters and some of the pyroclast deposits still smoked…All of the old land marks had disappeared leaving a luna landscape effect"	Ash fall (bombs)	Windward trail (starting from Lot 14 up summit)	-	Anon. report, April 1979	19
	Ash fall	Georgetown	-	Governmental Information Services, St Vincent, 1979	20
	Ash fall	Rabacca	-	Governmental Information Services, St Vincent, 1979	21
"Fresh, vesicular scoria up to a maximum diameter of 7 cm fell on Georgetown"	Ash fall	Georgetown	-	Anon., 17th April 1979	22

"We retracted our flight and flew over the villages of Fancy, Owia, Sandy Bay, Overland and Orange Hill and onto Georgetown. There was no sign of life at Fancy and Owia, though at Sandy Bay there were two trucks, one which appeared to be completely covered with ash…Georgetown and Colonarie had taken on a ghost-like appearance and were still covered with ash"	Ash fall	Fancy, Owia, Sandy Bay, Overland, Orange Hill, Georgetown, Colonarie	-	Report to the nation by Premier Cato, 16th April 1979	23
Accompanied by the scientific team [Premier Cato & Prime Minister Adams of B'dos], they observed the effects of the glowing avalanche deposit in the Roseau Valley"	PDC	Rozeau River Valley	-	The Star, 12th May 1979	4
	PDC	Unidentified location	-	Da Silva A. (1979), donated by Lance Peters	5
"The continual flashes of lightening, the intense heat and the visible appearance of a glowing avalanche cascading down the mountain side toward the Rabacca River drove terror in the hearts of the friendly Georgetown residents and precipitated a stampede unparalleled in our history"	PDC	Rabacca River	-	The Star, 28th April 1979	2
"Accompanied by the scientific team [Premier Cato & Prime Minister Adams of B'dos], they observed the effects of the mud flow deposit in the Roseau Valley"	Lahar	Rozeau River Valley	-	The Star, 12th May 1979	2

“Measurement to check for swelling of the flanks of the volcano in the upper Rabacca area could not be made because the survey marks had been buried beneath the mud flow”	Lahar	Upper Rabacca River	-	Report from the Belmont Observatory Team (Tomblin), 10th May 1979	3

Figure G1: Base map used for the 1812 eruption

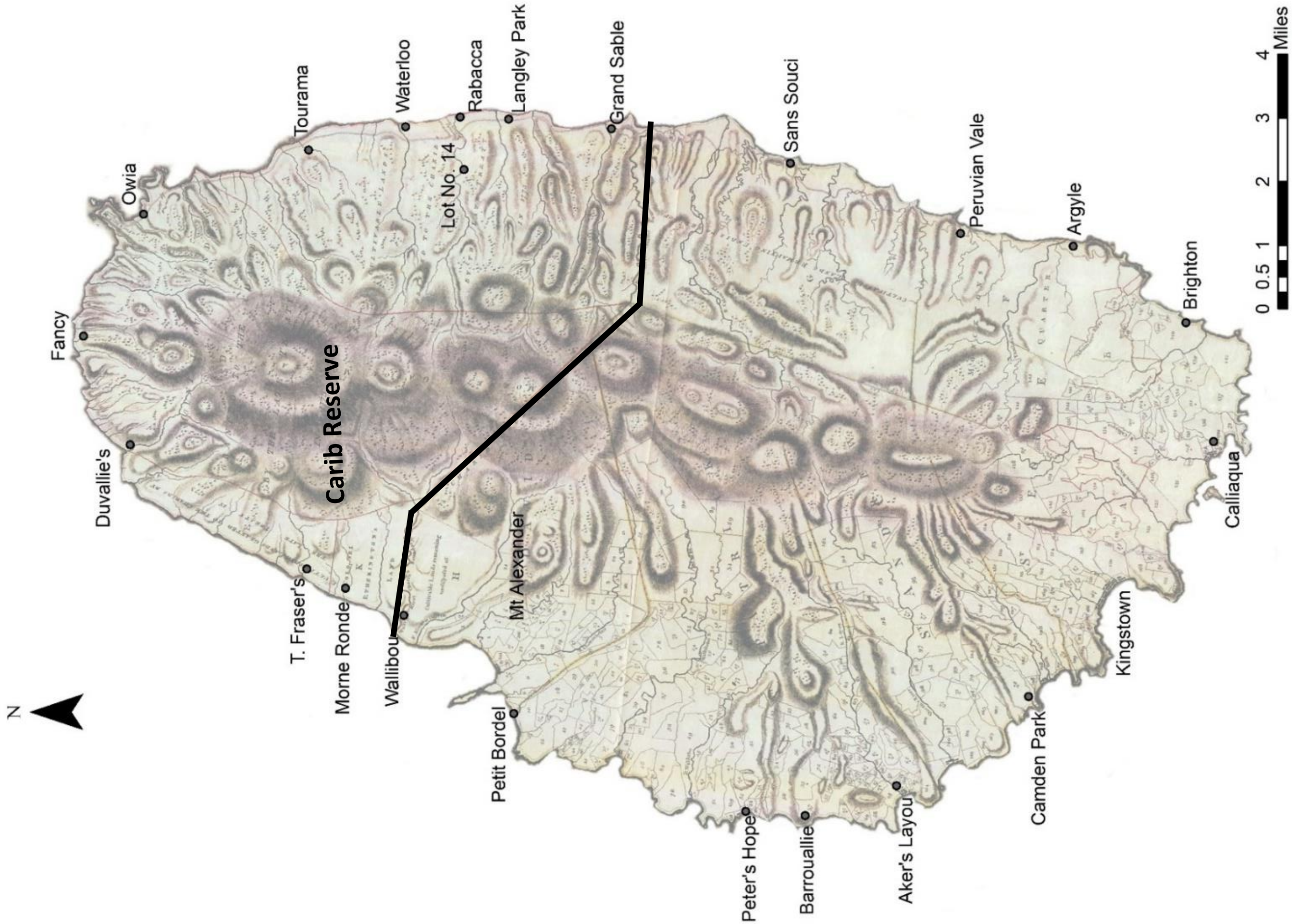


Figure G1. Plan of the island of St. Vincent drawn by Mr. J. Byres in 1774 and held at The National Archives (CO 700/SaintVincent9). The black indicates where the Kalinago and Garifuna territory boundary was drawn. Locations represented were impacted by the 1812 eruption's volcanic hazardous phenomena identified in the archival record and other key estates or settlements on the island at the time.

Figure G2: Base map used for the 1902-1903 eruption

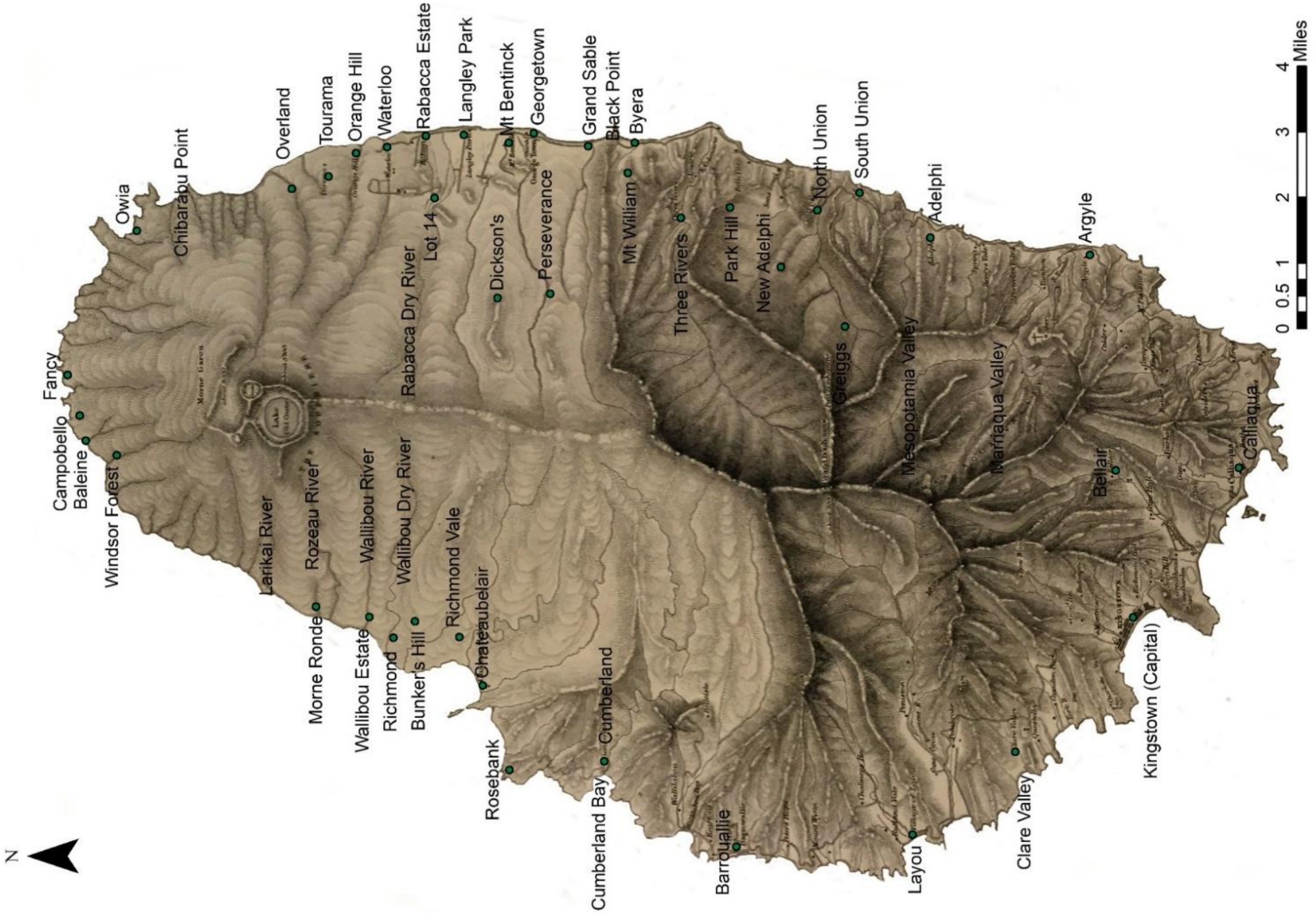


Figure 0.1b. Map of St. Vincent drawn by Parson et al. (1893) and held at the British Library (Maps SEC.8.791). Locations impacted by the 1902-1903 eruption's volcanic hazardous phenomena identified in the archival record and geological research and other settlements on the island are shown.

Figure G3: Base map used for the 1979 eruption

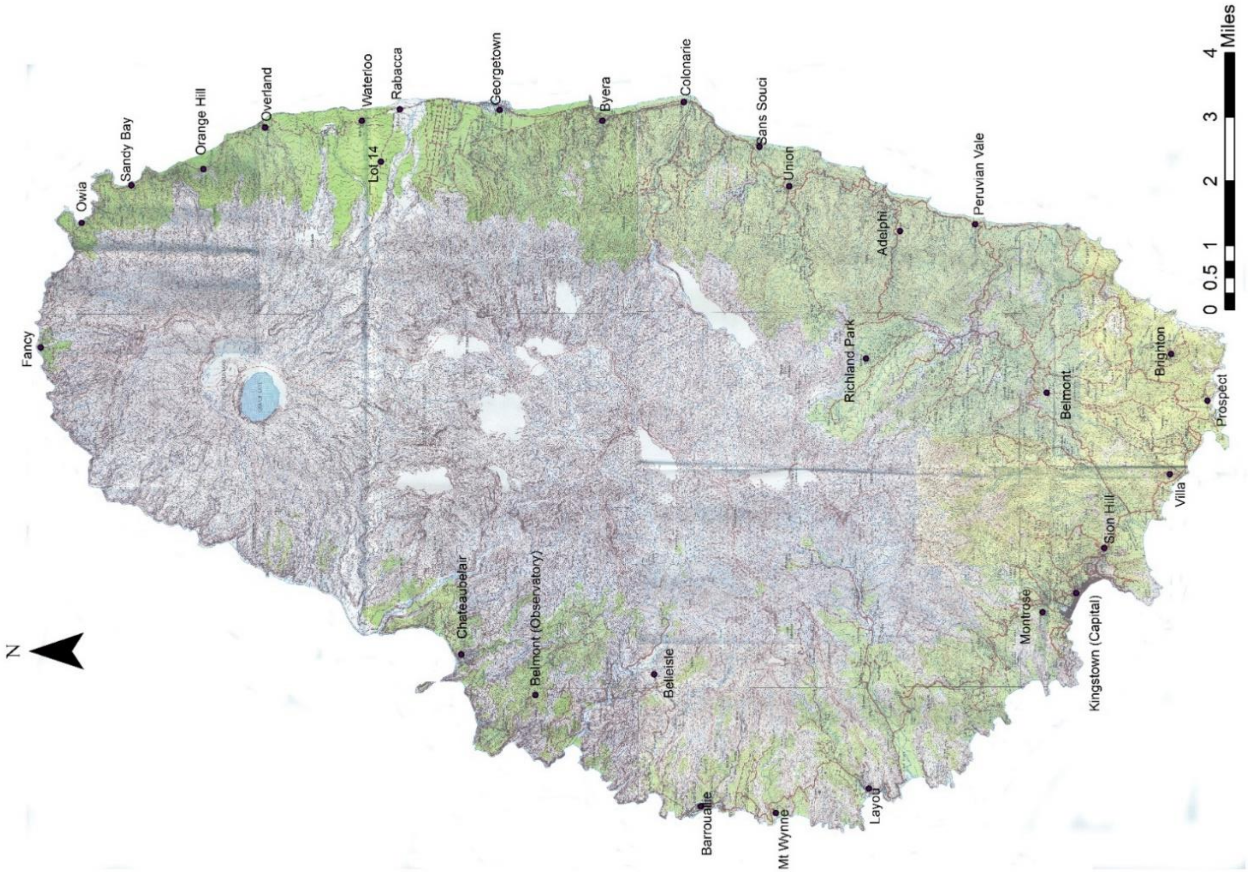


Figure 0.1c. Map of St. Vincent drawn by the Directorate of Overseas Surveys.[1] Locations shown are referred to within the chronological narrative of the 1979 eruption and other settlements on the island during this time. This map was a paper based copy split in two, and therefore the individual files needed to be stitched together. Topography may have changed in the 200 years after subsequent eruptions, hurricanes and flooding.

[1] Directorate of Overseas Surveys (1956) Saint Vincent, 1st Edition. Windward Islands/South Sheet, 1:25,000. D.O.S 317 (Series E845). Surrey, England: Directorate of Overseas Surveys

Figure G4: 1812 eruption lahar timeseries map

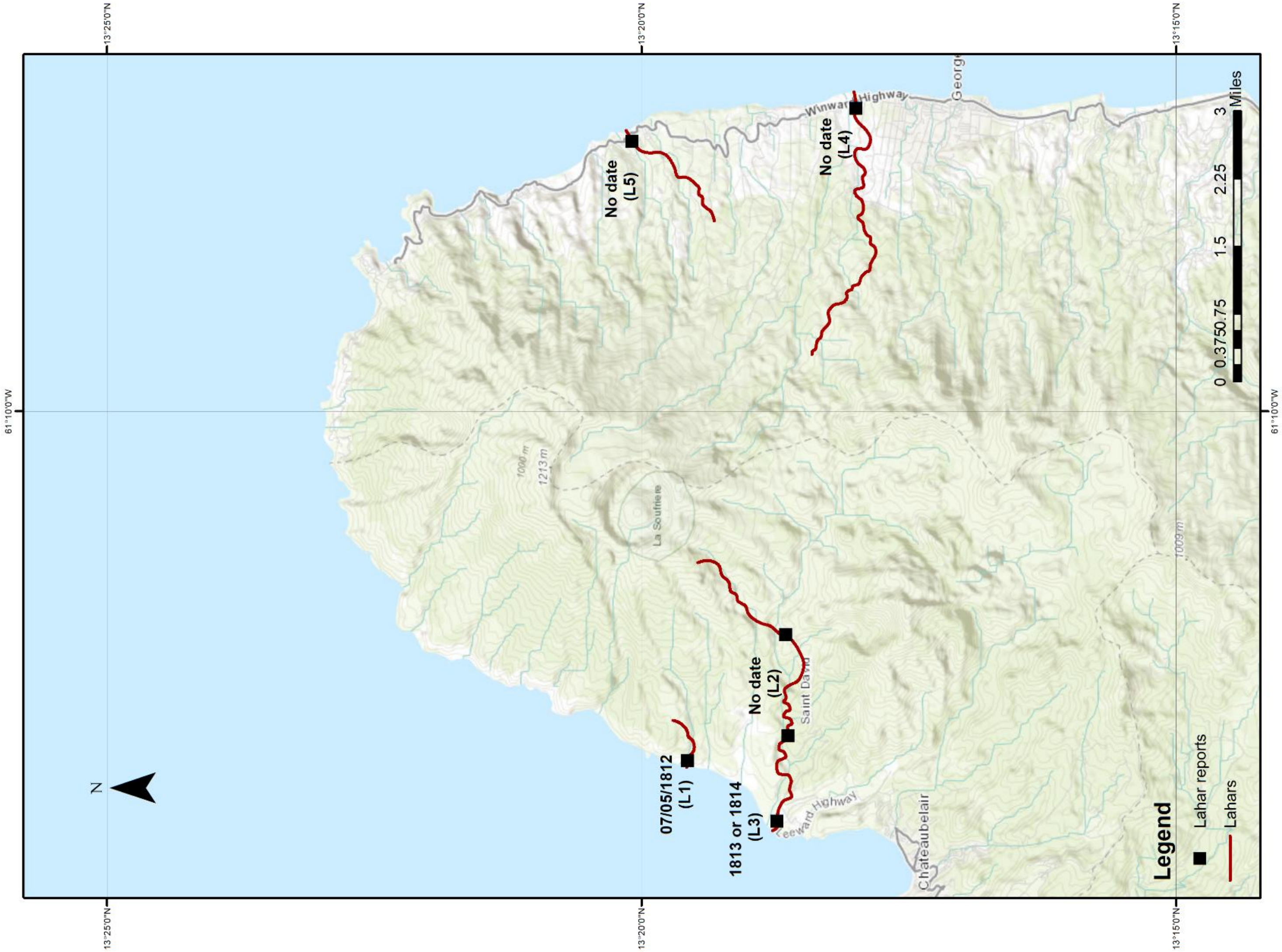


Figure G4. 1812 eruption lahar timeseries map. “L1”and so corresponds to the datapoints in Table G1.

Figure G5: 1812 eruption PDC timeseries map

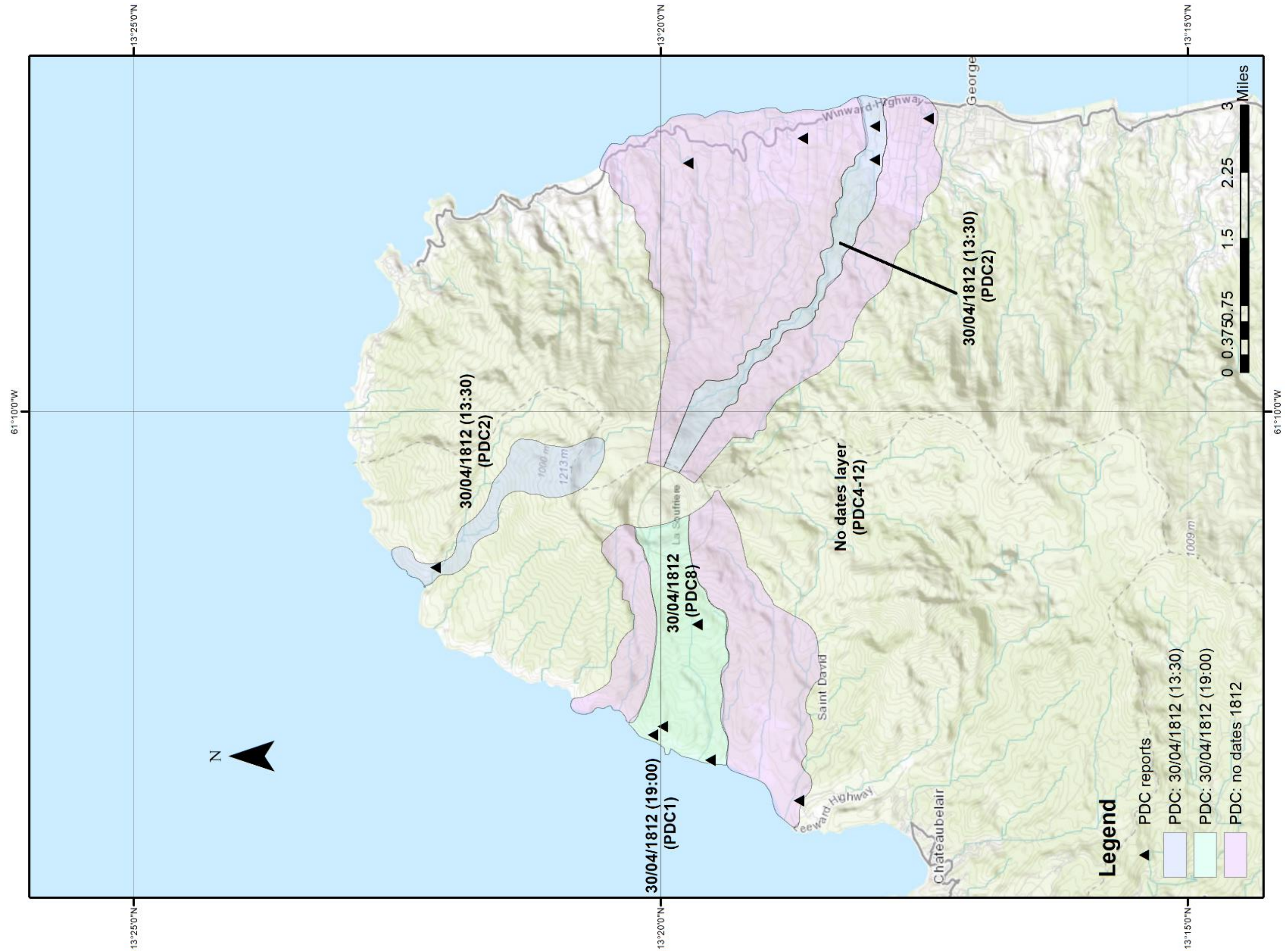


Figure G5. 1812 eruption PDC timeseries map. "PDC1" and so on corresponds to the datapoints in Table G1.

Figure G6: 1902 eruption ash isopach maps

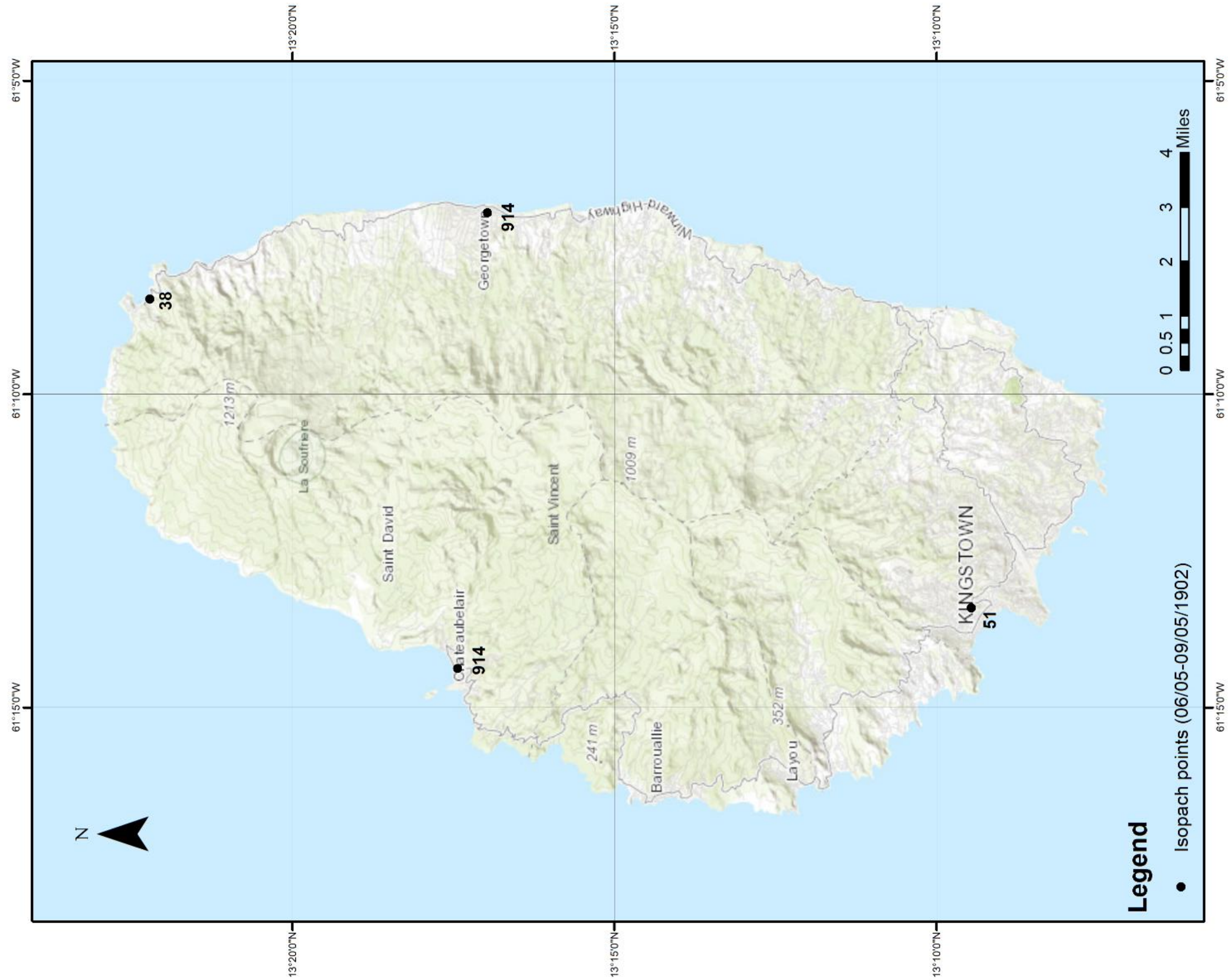


Figure G6. Ash isopach map for 06/05-09/05/1902 that could not be completed due to limited ash thickness data. Measurements were originally reported as inches or feet and were converted into millimetres. Points correspond to AF4, AF22, AF25, AF26, AF28, AF36 and AF37 in Table G2.

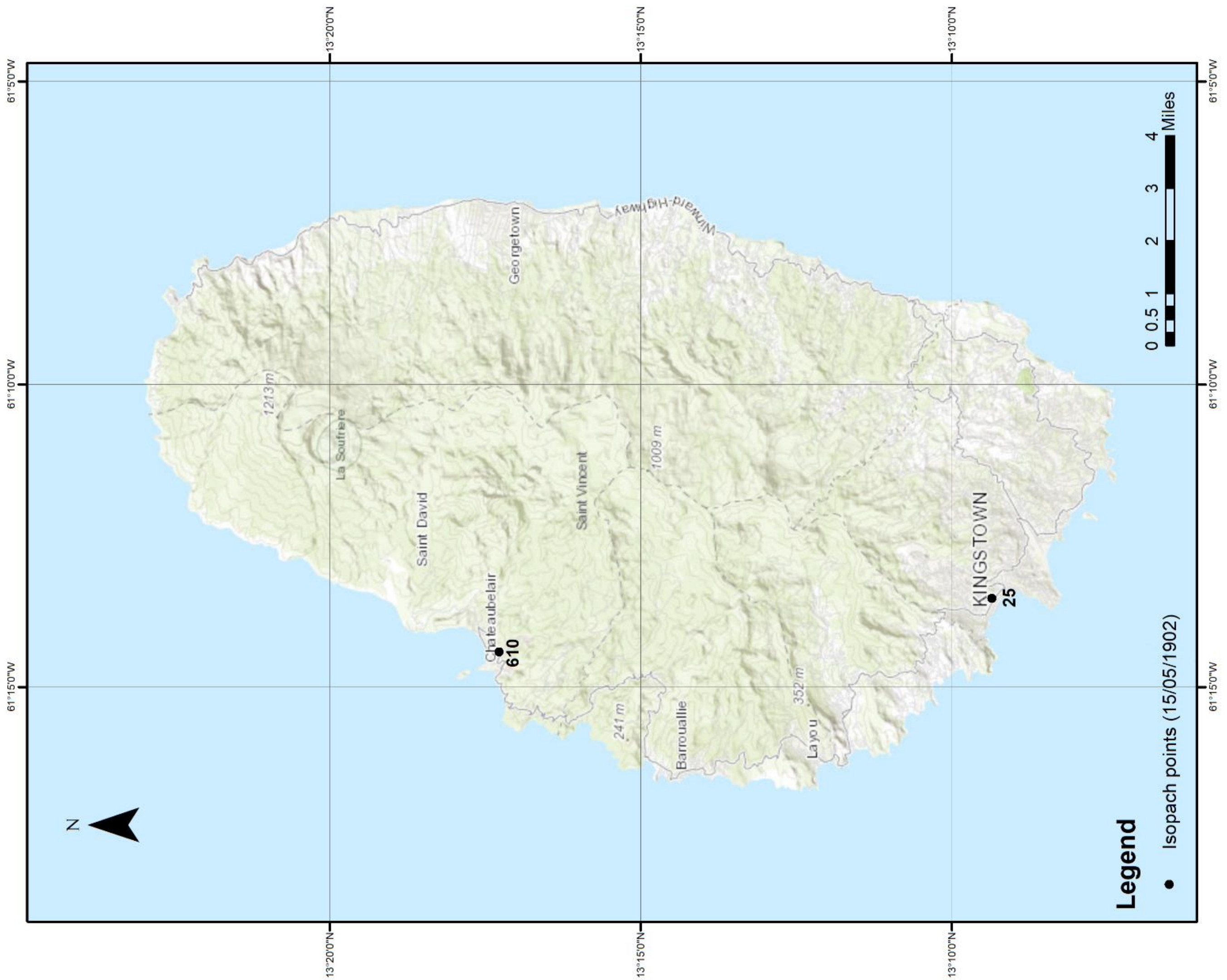


Figure G7. Ash isopach map for 15/05/1902 that could not be completed due to limited ash thickness data. Measurements were originally reported as feet and were converted into millimetres. Points correspond to AF6 in Table G2.

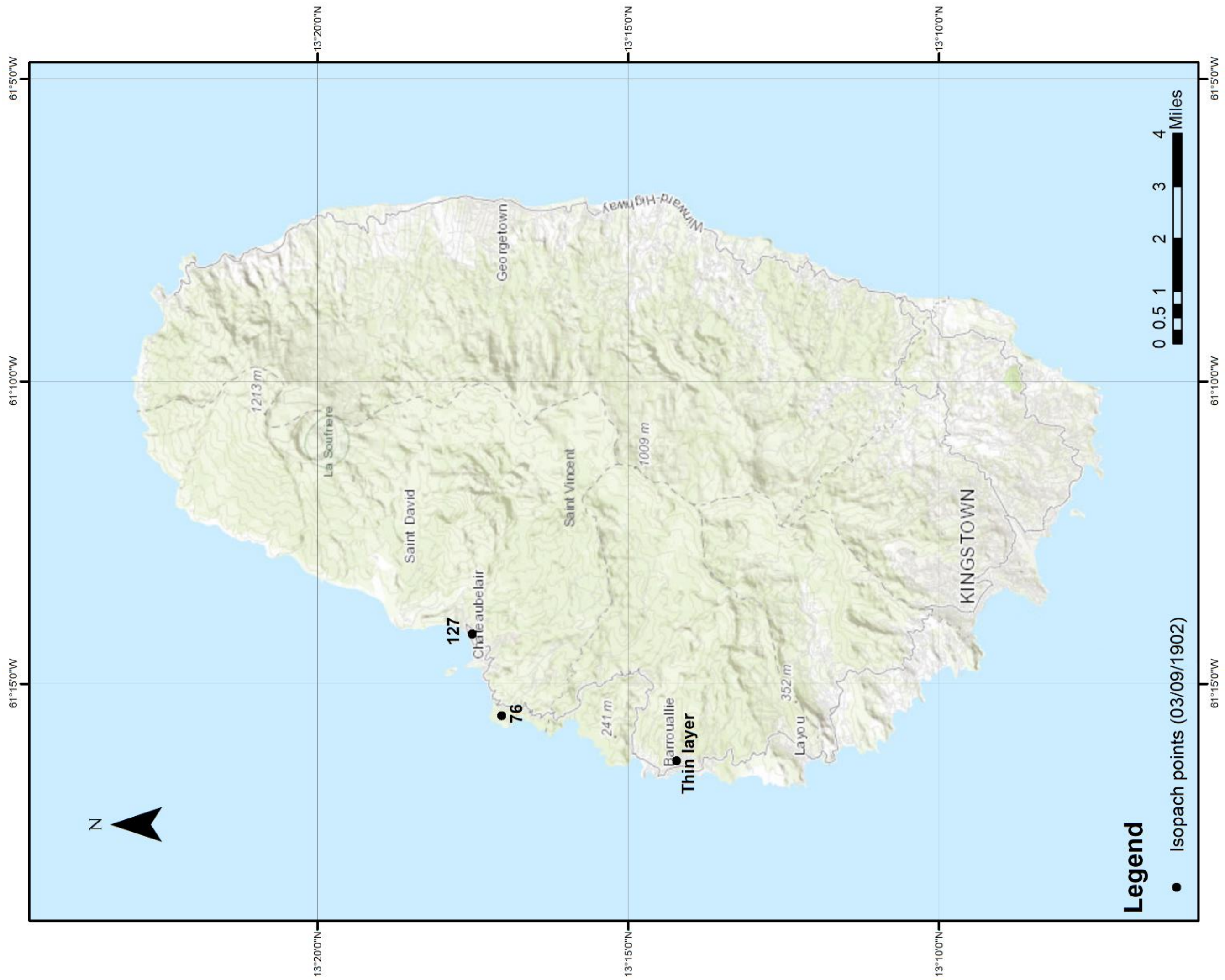


Figure G8. Ash isopach map for 03/09/1902 that could not be completed due to limited ash thickness data. Measurements were originally reported as inches or feet and were converted into millimetres. Points correspond to AF54 in Table G2.

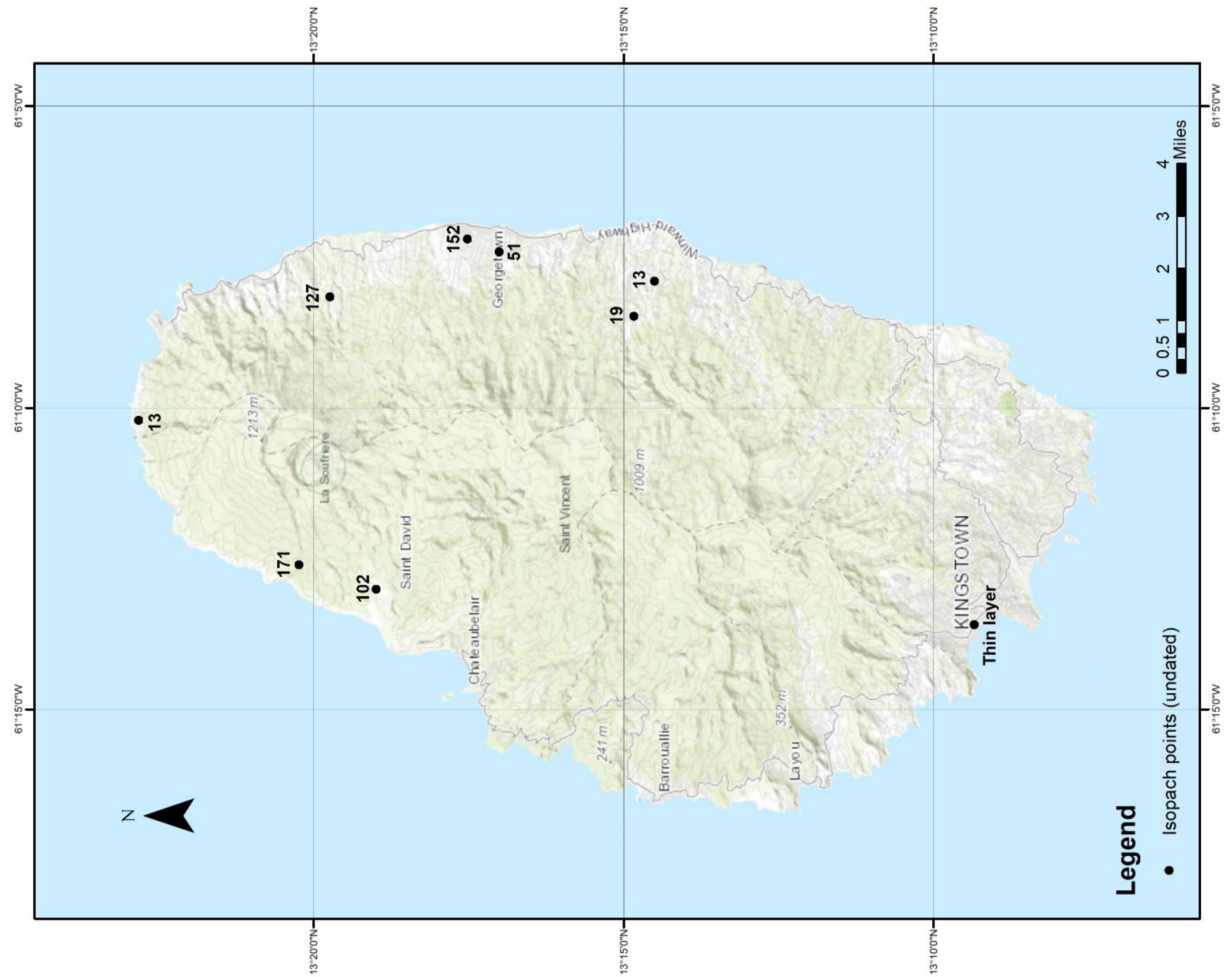


Figure G9. Ash isopach map for descriptions that went undated that could not be completed due to limited ash thickness data. Measurements were originally reported as inches or feet and were converted into millimetres. Points correspond to AF7, AF16, AF24, AF44, AF57, AF59, AF61 and AF66 in Table G2.

Figure G7: 1902 eruption ash isopleth maps

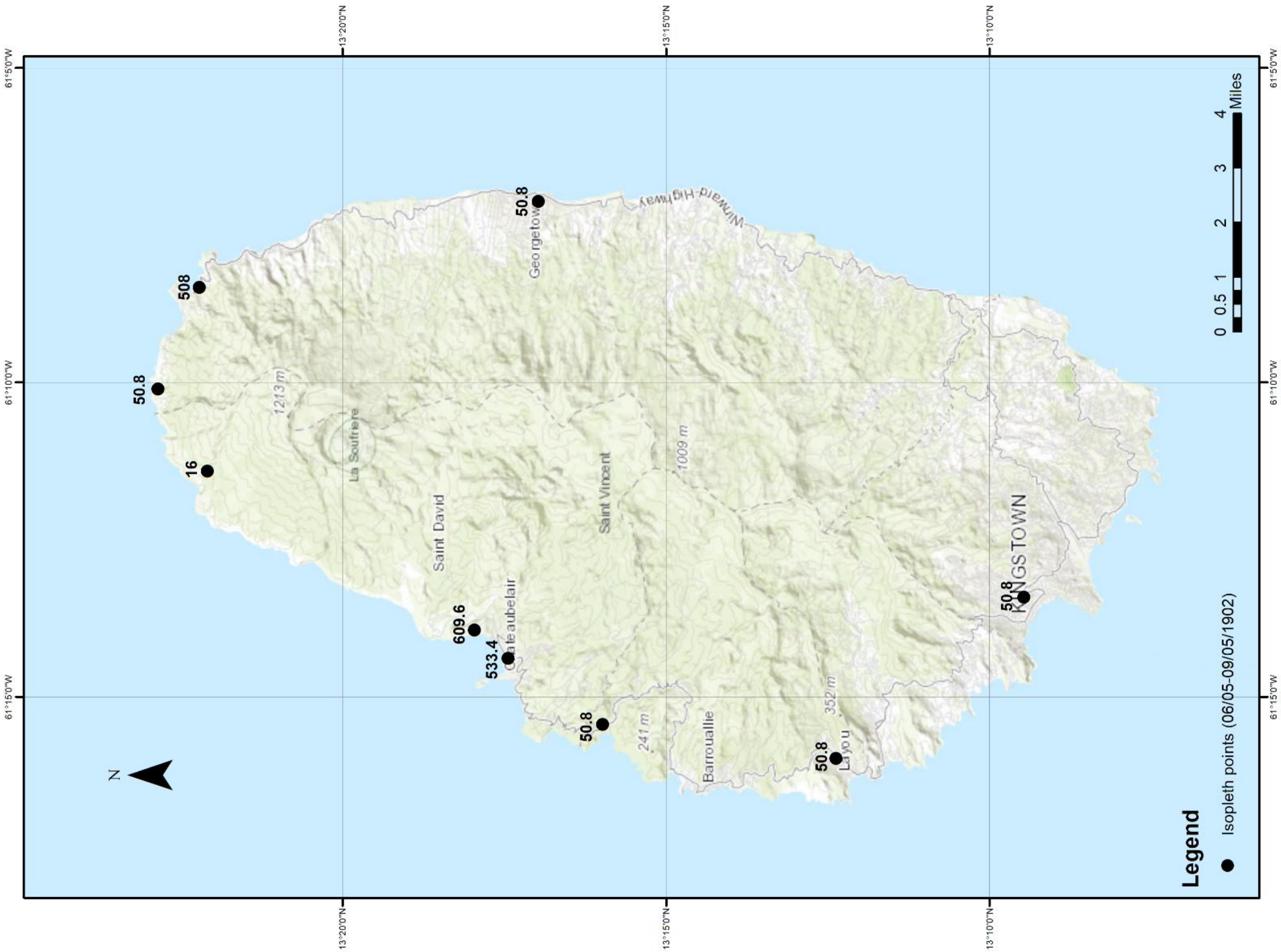


Figure G7a. Ash isopleth map for the 6th-9th May 1902 however, the map is incomplete due to the limited descriptions of clast size. Measurements were originally reported as descriptions (e.g. "fine ash granules", "stones", "pebbles"), therefore the maximum size in millimetres was adapted from White and Houghton (2006). Points correspond to AF15, AF36, AF64, AF65, AF18, AF32, AF23, AF52, AF67, AF19, AF53, AF2, AF28, AF37, AF26 and AF68 in Table G2. This was done to match Figure ( ).

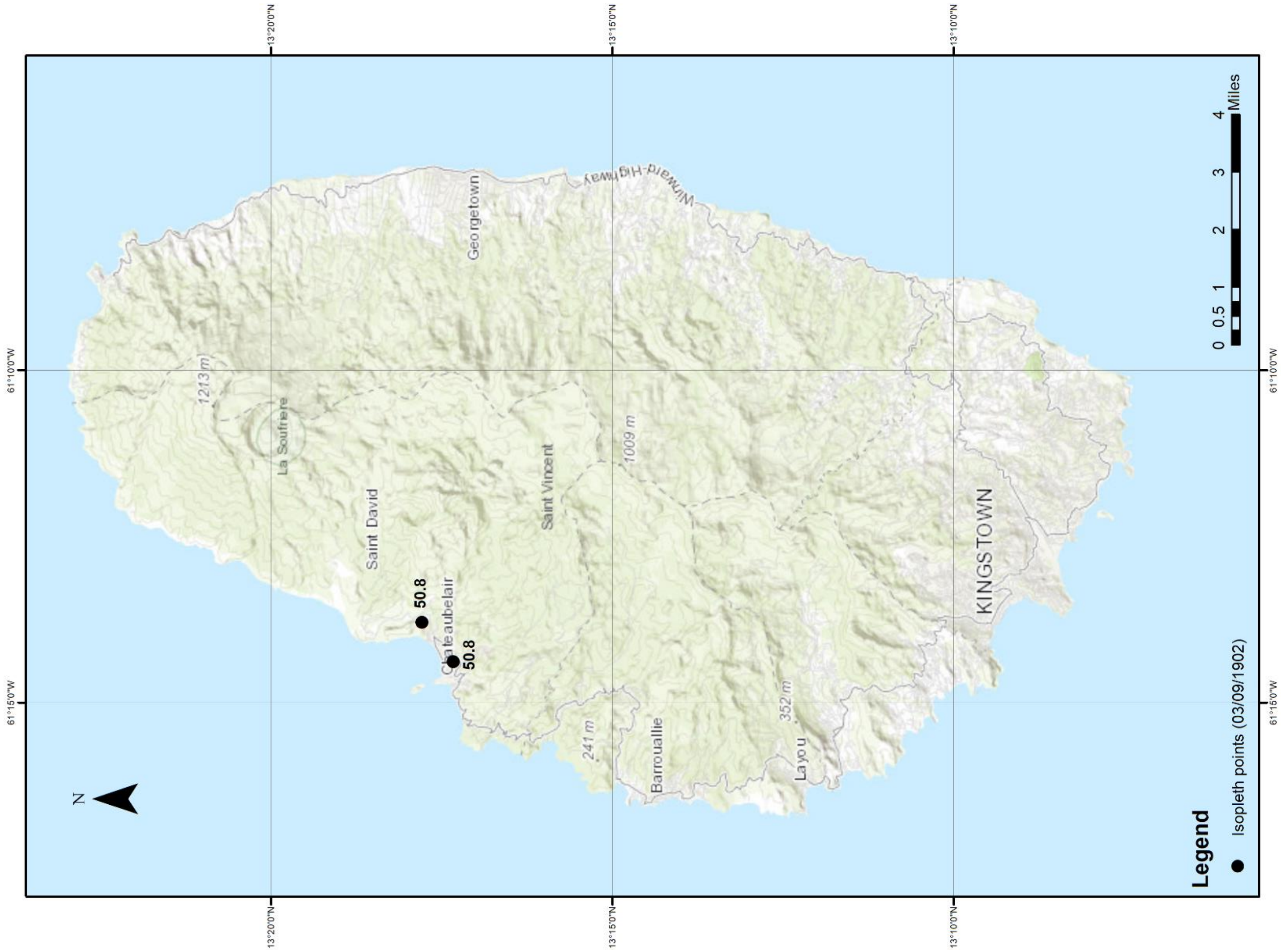


Figure G7b. Ash isopleth map for the 3rd September 1902 however, the map is incomplete due to the limited descriptions of clast size. Measurements were originally reported as descriptions (e.g. "fine ash granules", "stones", "pebbles"), therefore the maximum size in millimetres was adapted from White and Houghton (2006). Points correspond to AF17 and AF54 in Table G2. This map was done to match Figure ( ).

Figure G8: 1902-1903 eruption lahar timeseries map

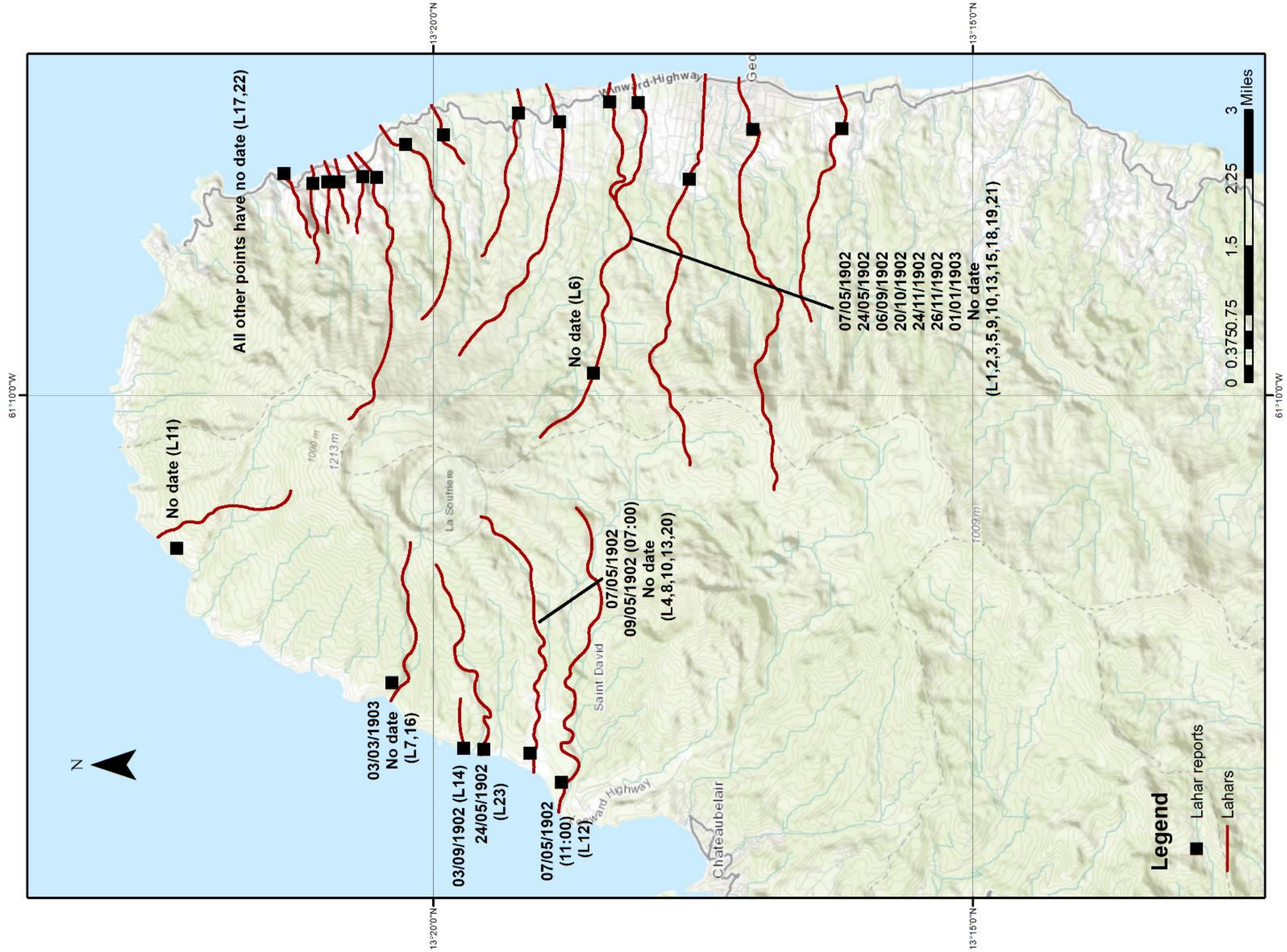


Figure G8. 1902-1903 eruption lahar timeseries. All data points (e.g. L12) corresponds to the datapoints in Table G2.

Figure G9: 1902 eruption PDC timeseries map

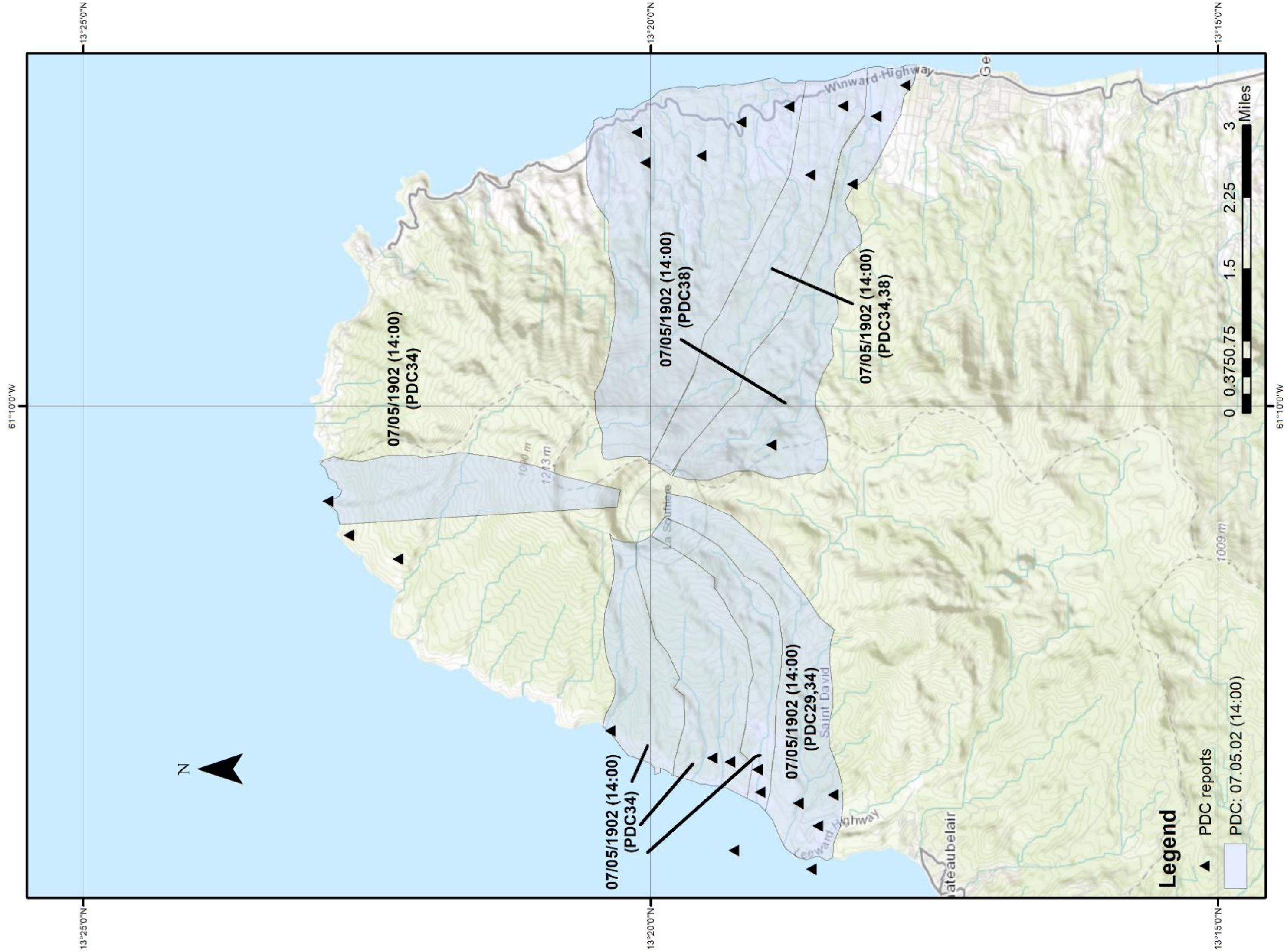


Figure G9a. 1902 eruption PDC timeseries. All datapoints (e.g. PDC34) corresponds to the datapoints in Table G2.

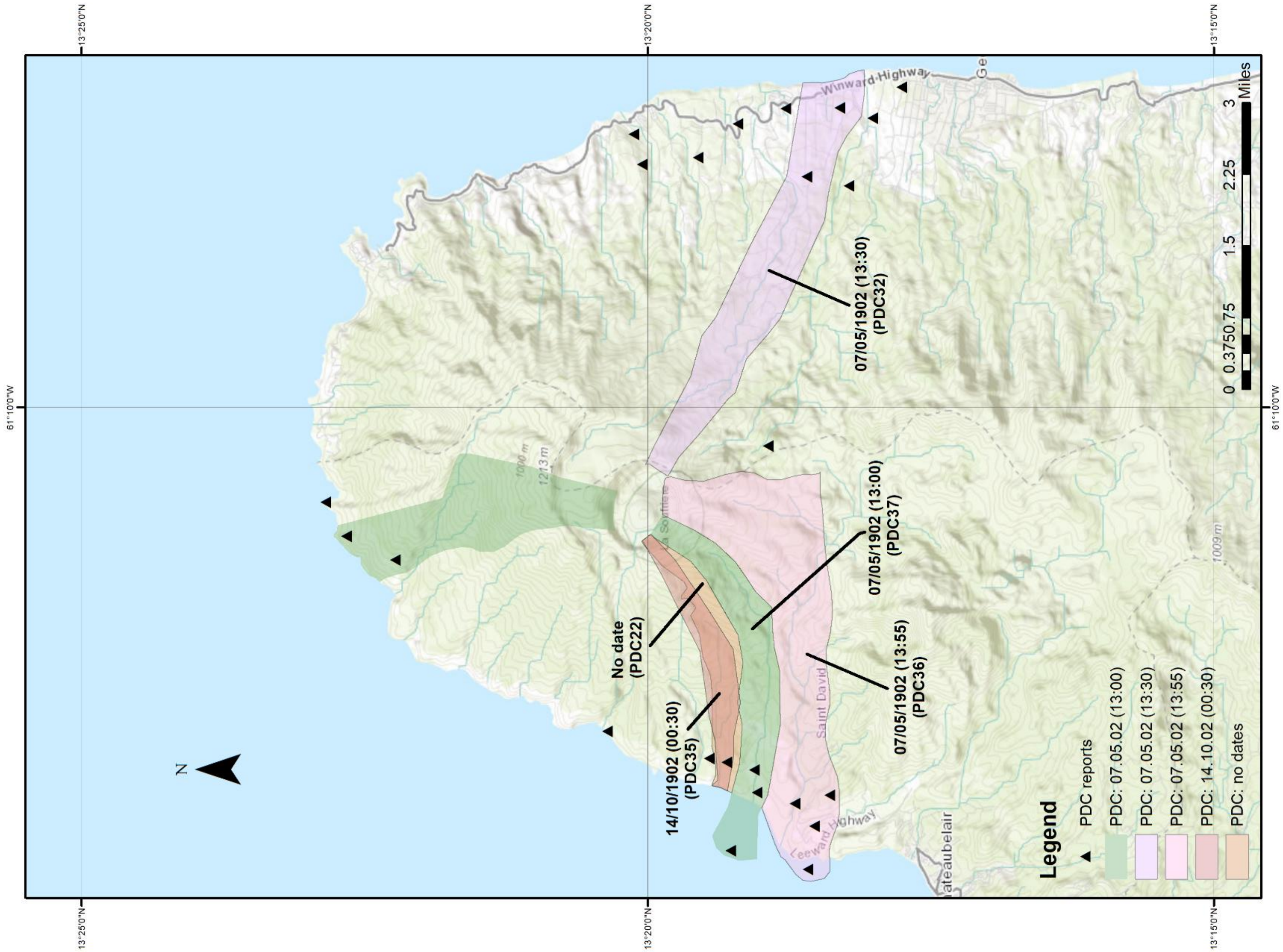


Figure G9b. 1902 eruption PDC timeseries. All datapoints (e.g. PDC37) corresponds to the datapoints in Table G2. PDC4 for Cumberland Bay (07/05/1902, 14:25) and PDC33 for "Near Chateaubelair" (07/05/1902, 13:45) could not be determined for certain where the PDCs originated and therefore excluded from the timeseries.

Figure G10: 1979 eruption lahar timeseries

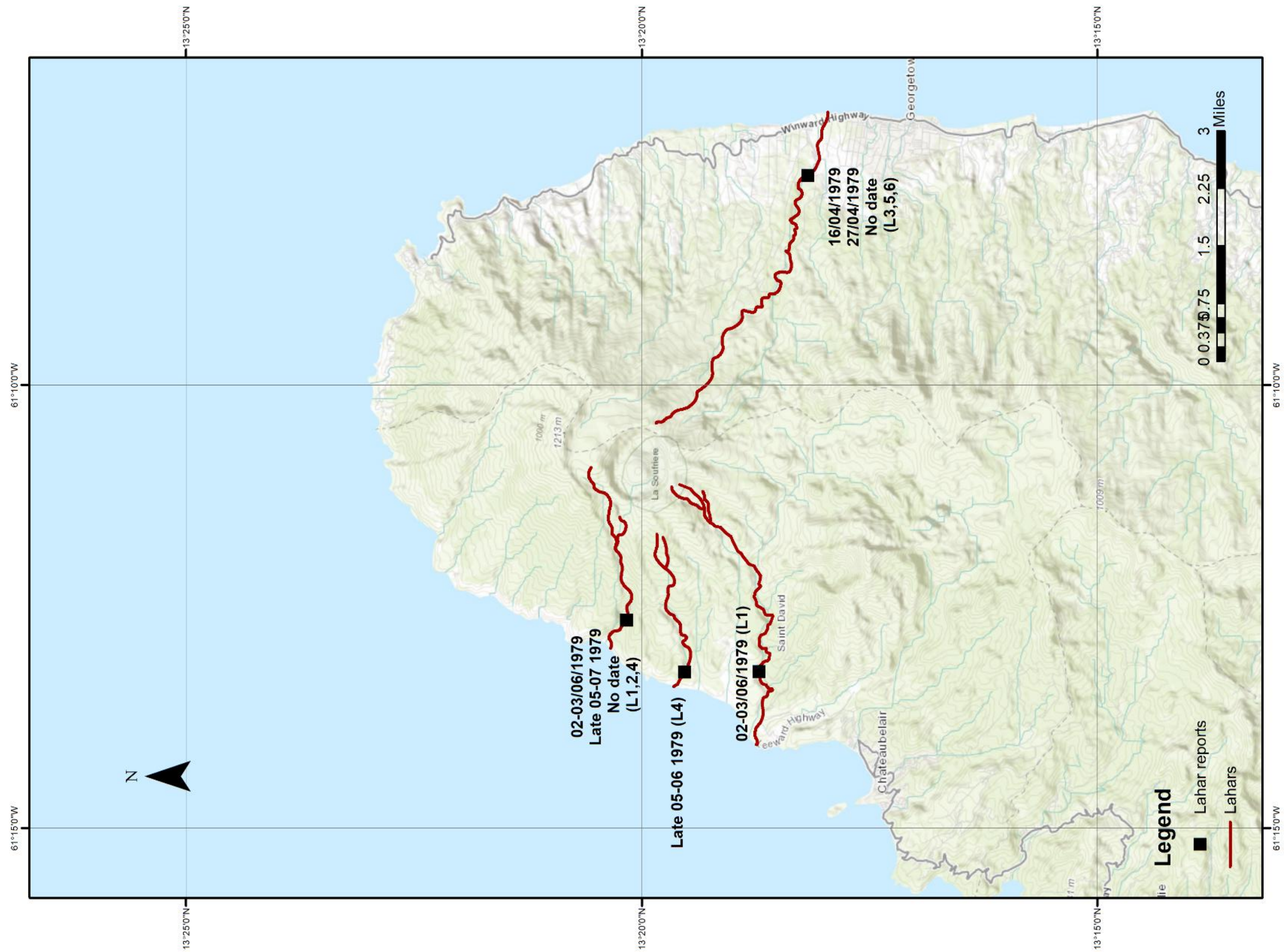


Figure G10. 1979 eruption lahar timeseries. “L12” corresponds to the datapoints in Table G3.

Figure G11: 1979 eruption PDC timeseries (14th April 1979, 12:00)

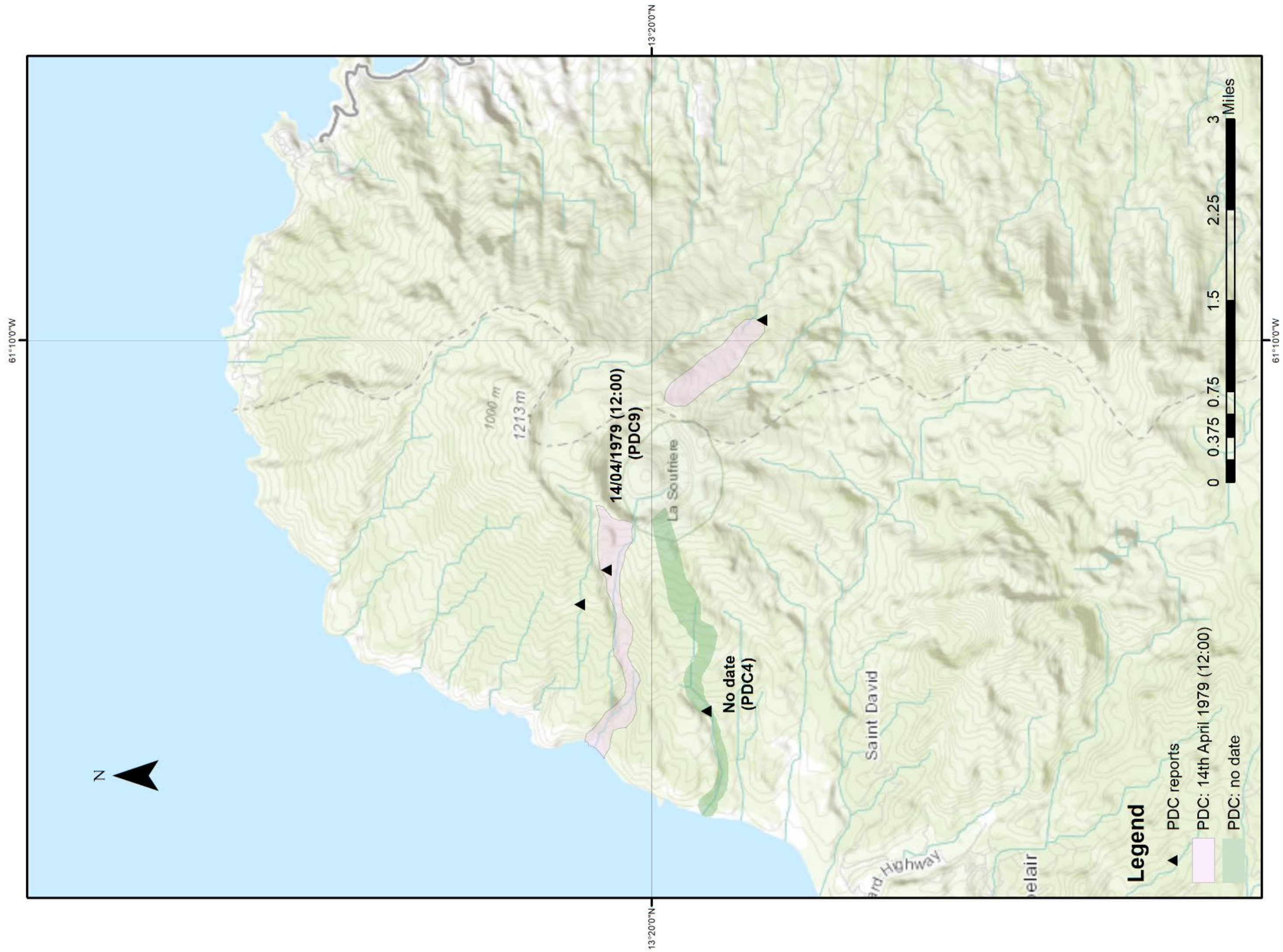


Figure G11. 1979 eruption PDC timeseries. PDC4 and PDC9 corresponds to the datapoints in Table G3.

Figure G12. 1979 eruption PDC timeseries (14th April 1979, 12:09)

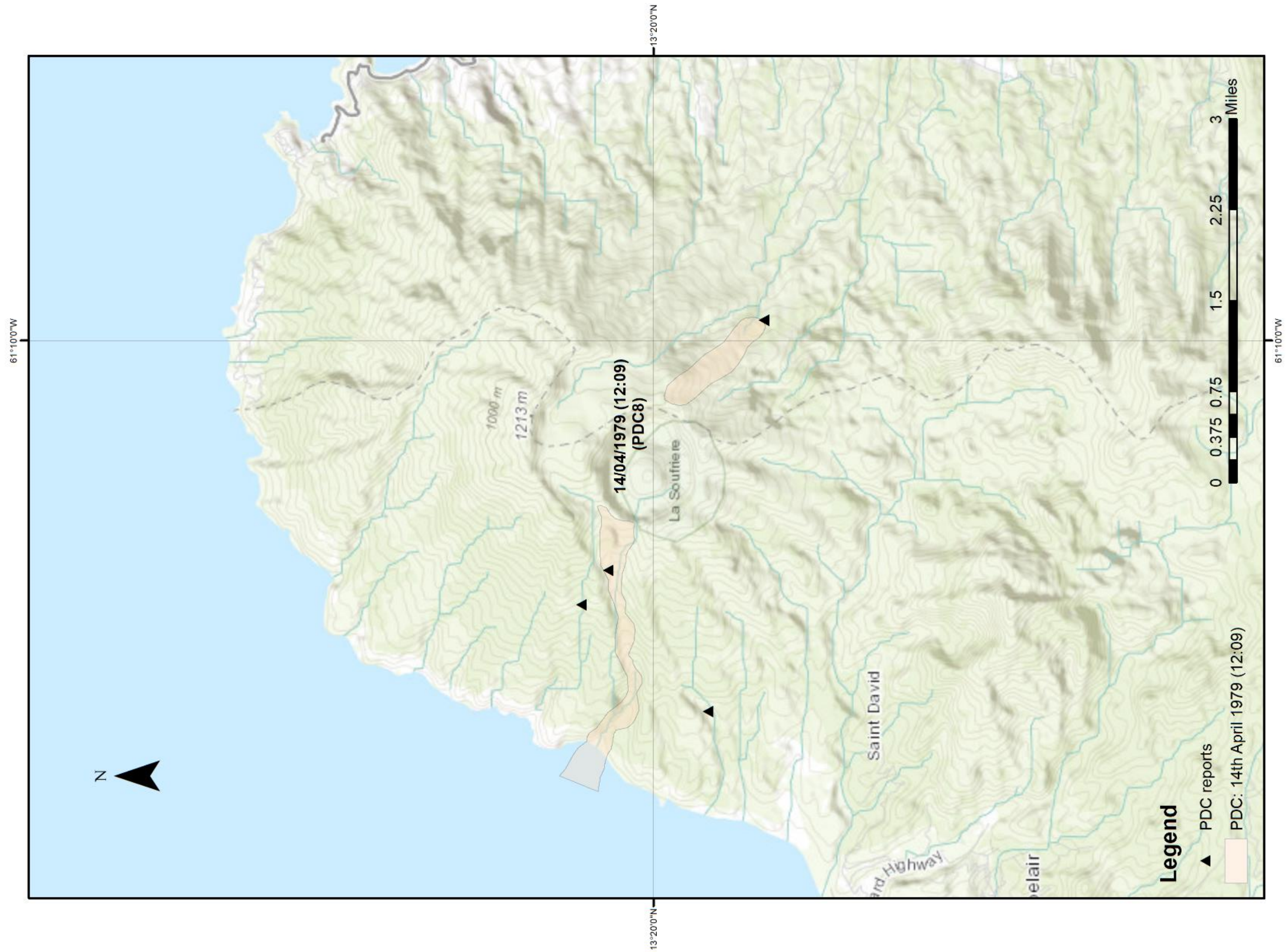


Figure G12. 1979 eruption PDC timeseries. “PDC8” corresponds to the datapoints in Table G3.

Figure G13. 1979 eruption PDC timeseries (17th April 1979)

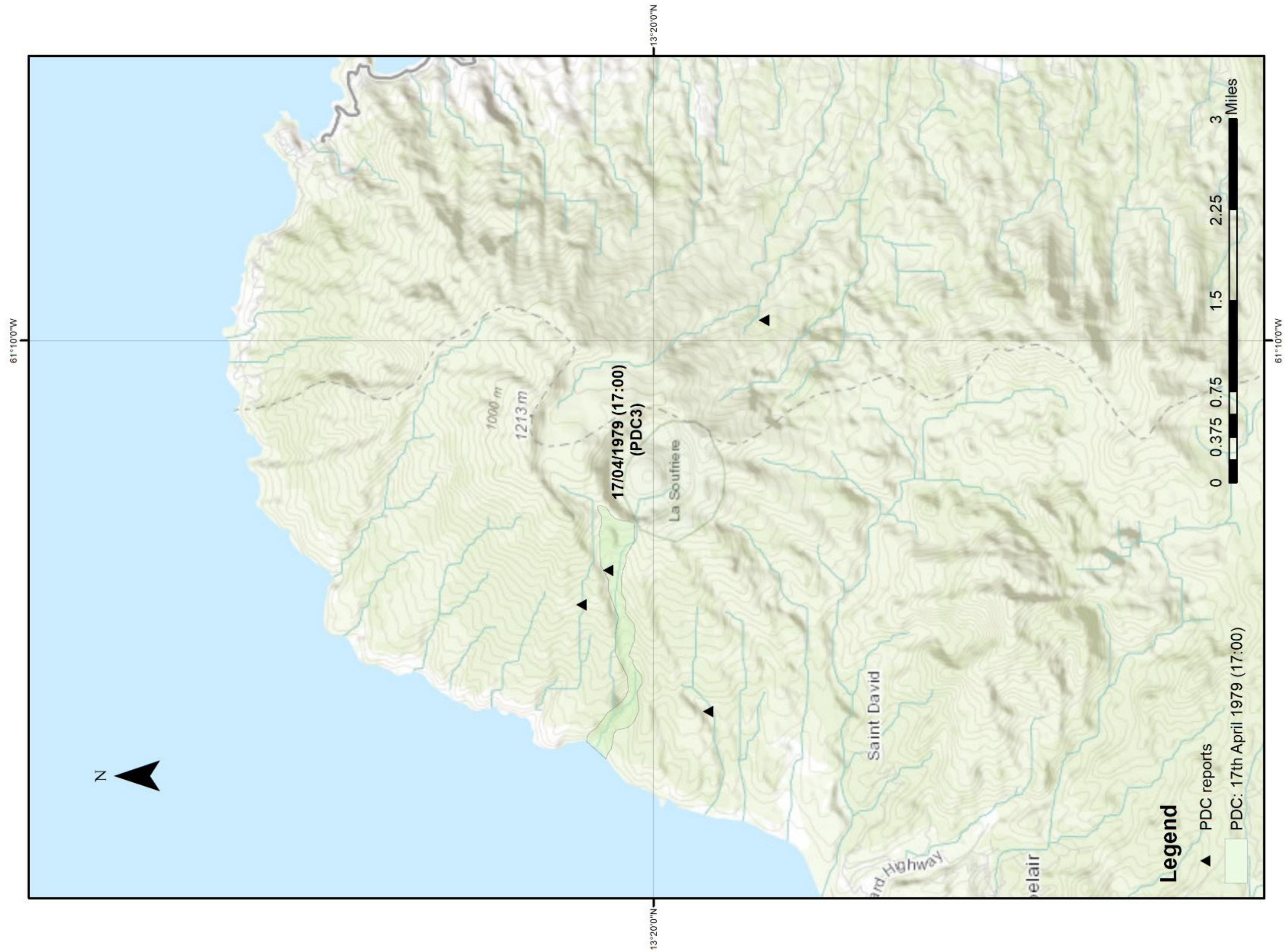


Figure G13. 1979 eruption PDC timeseries. "PDC3" corresponds to the datapoints in Table G3.

Figure G14. 1979 eruption PDC timeseries (19th and 24th April 1979)

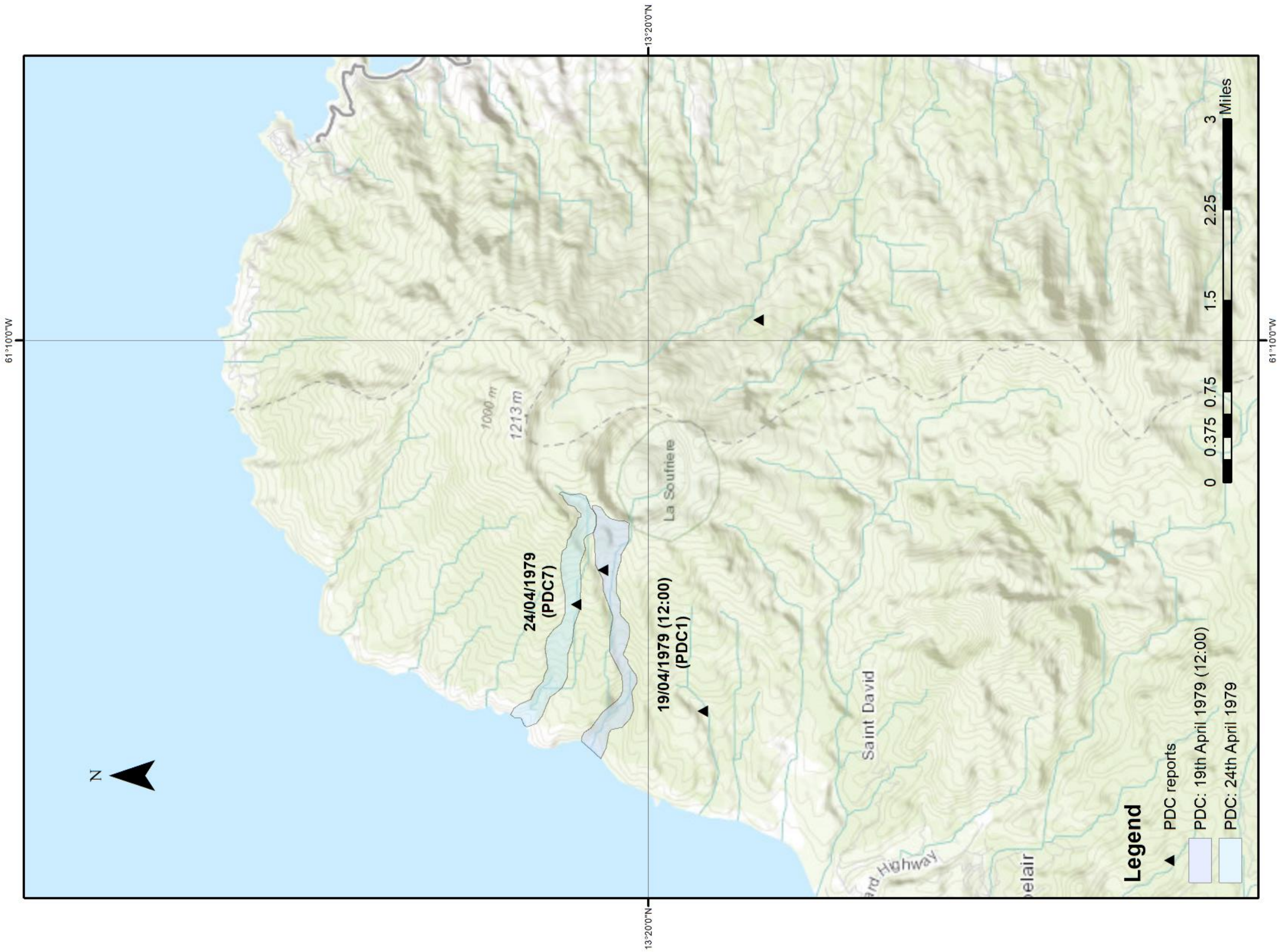


Figure G14. 1979 eruption PDC timeseries. "PDC1" corresponds to the datapoints in Table G3.

Appendix H: Chapter 5

Figure H1. Map of the Charlotte parish

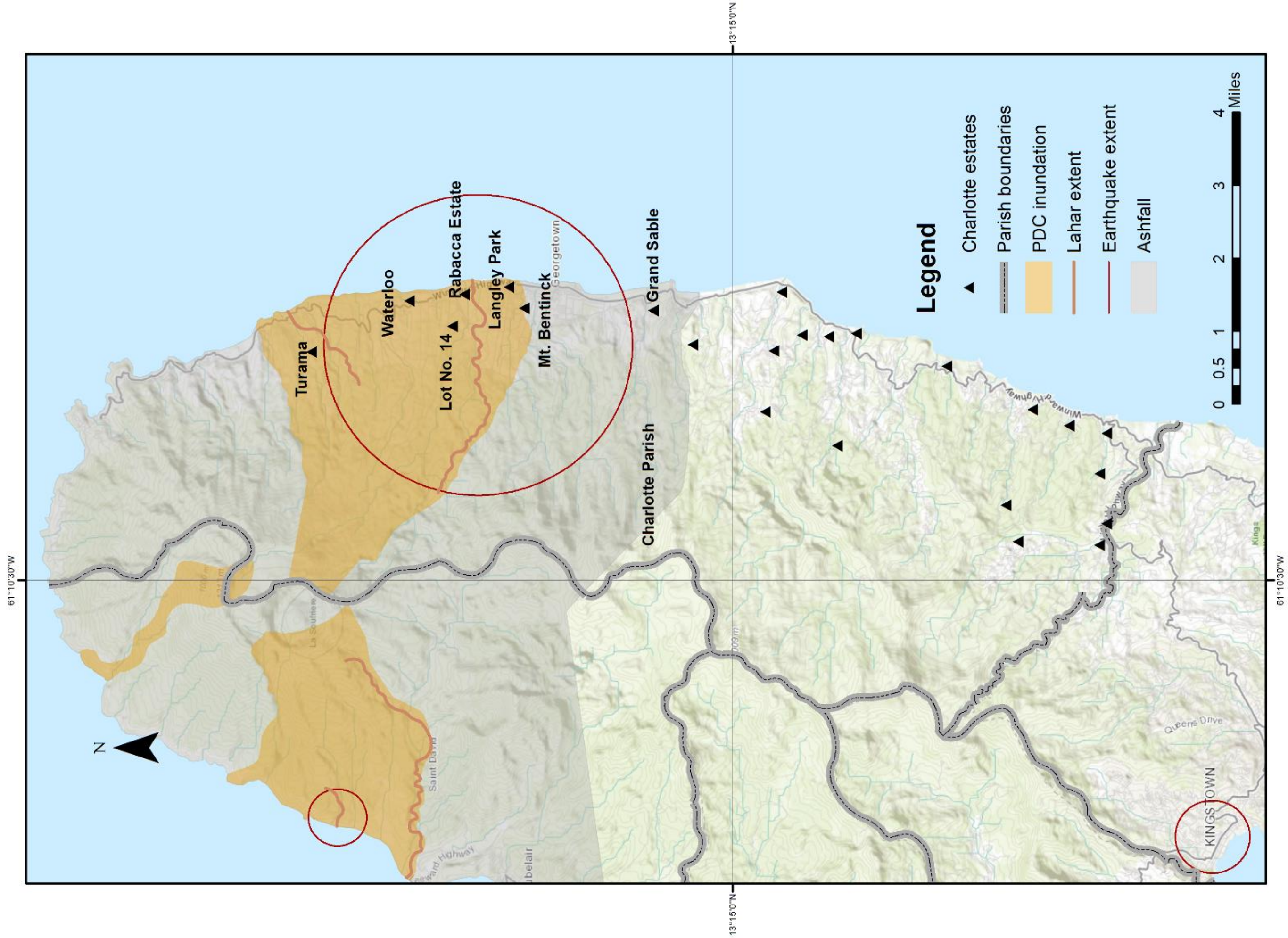


Figure H1. Map of the location of sugar plantations and volcanic hazards for 1812 in the Charlotte parish. Name locations are referenced within the main text.

Figure H2. Map of the St. David parish

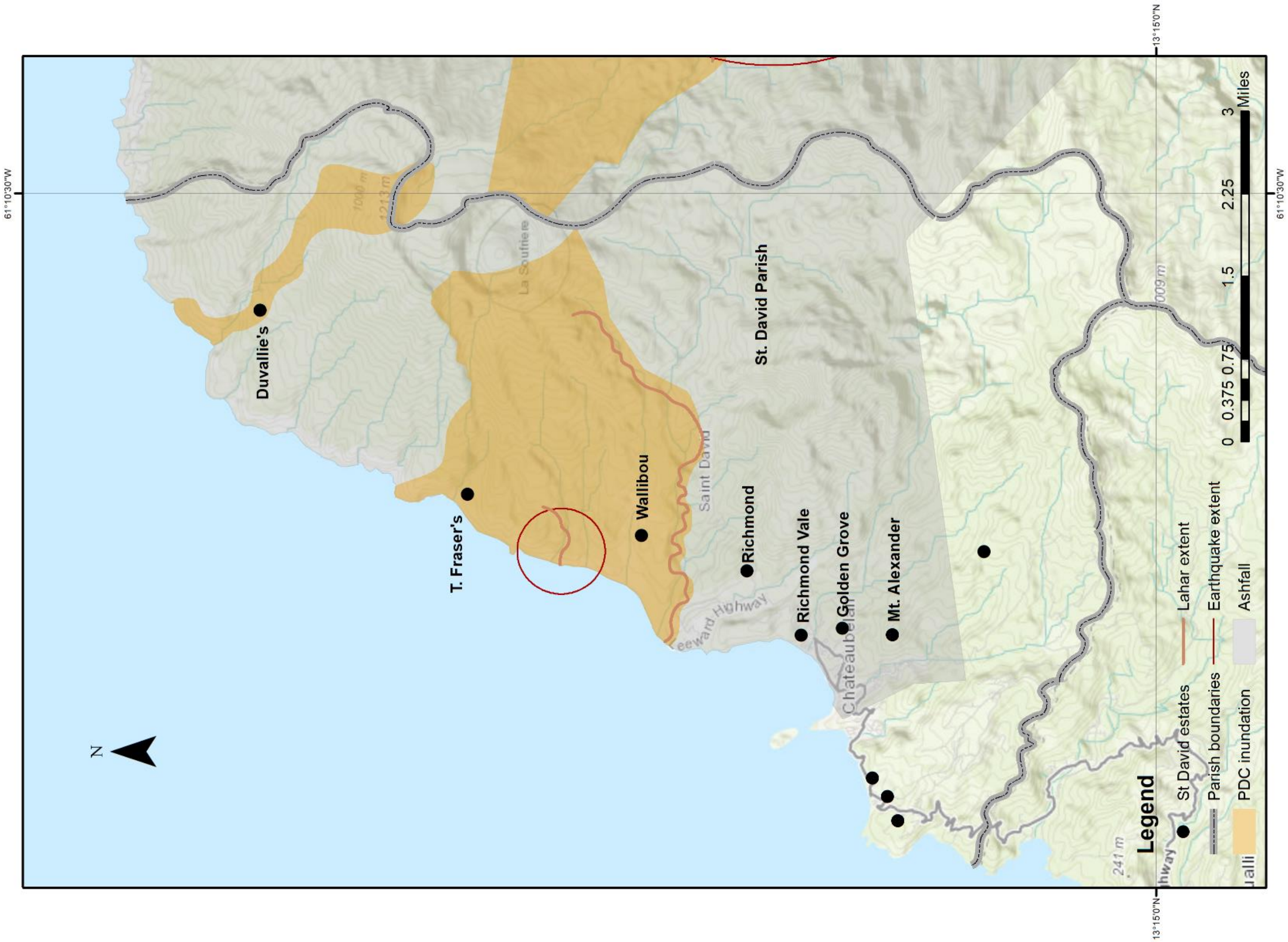


Figure H2. Map of the location of sugar plantations and volcanic hazards for 1812 in the St. David parish. Name locations are referenced within the main text.

Figure H3. Map of the St. Patrick parish

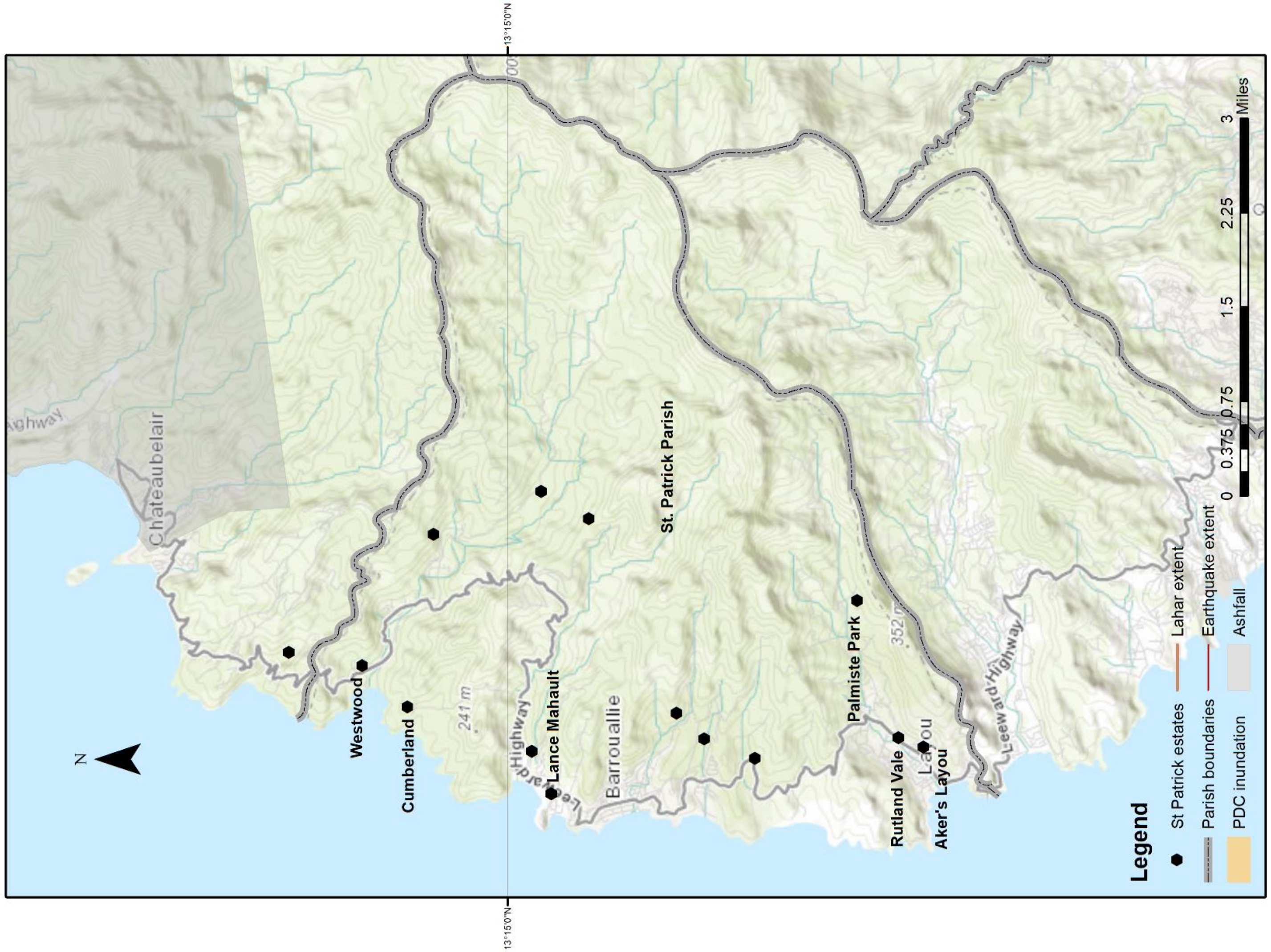


Figure H3. Map of the location of sugar plantations and volcanic hazards for 1812 in the St. Patrick parish. Name locations are referenced within the main text.

Figure H4. Map of the St. Andrew parish

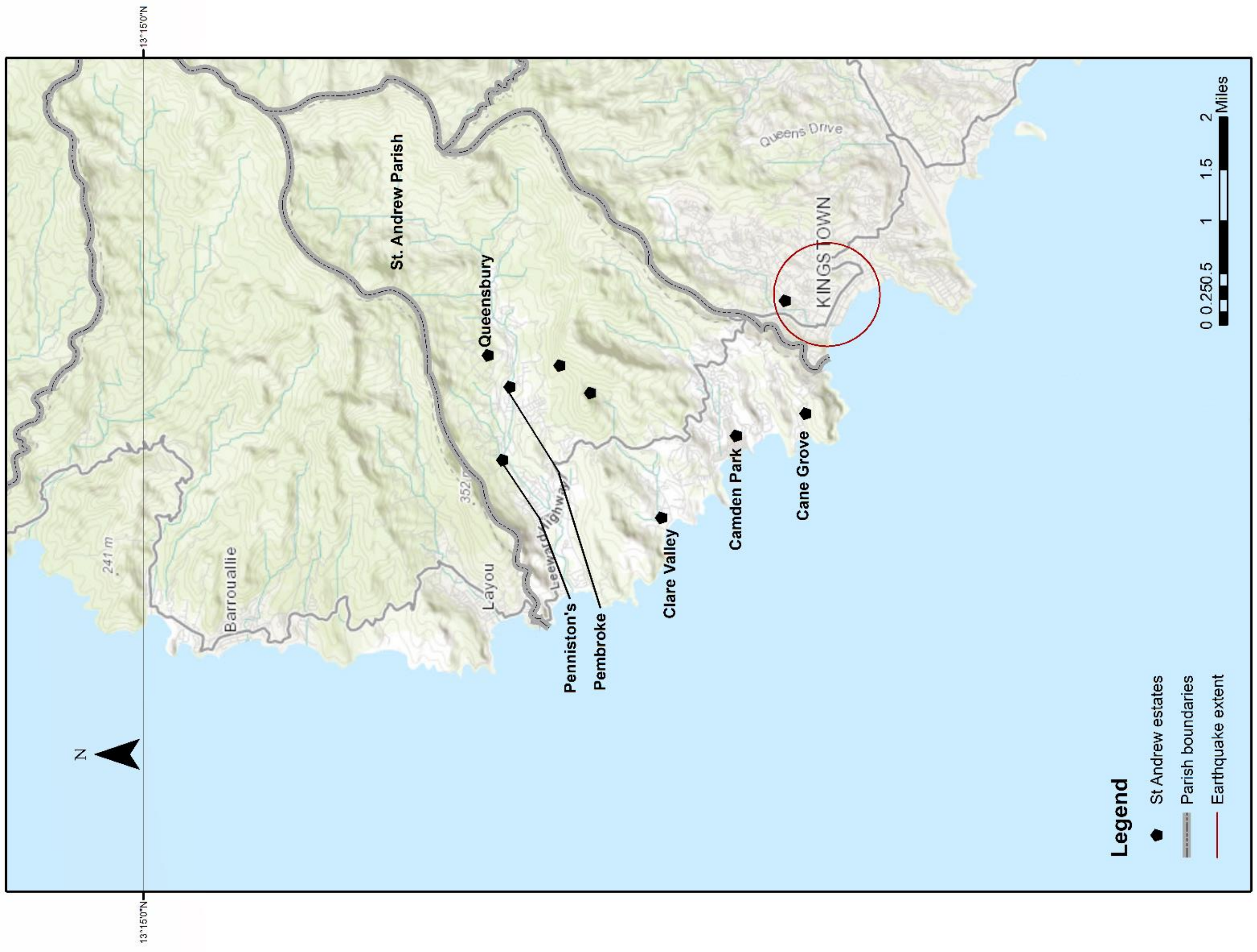


Figure H4. Map of the location of sugar plantations and volcanic hazards for 1812 in the St. Andrew parish. Name locations are referenced within the main text.

Figure H5. Map of St. George parish

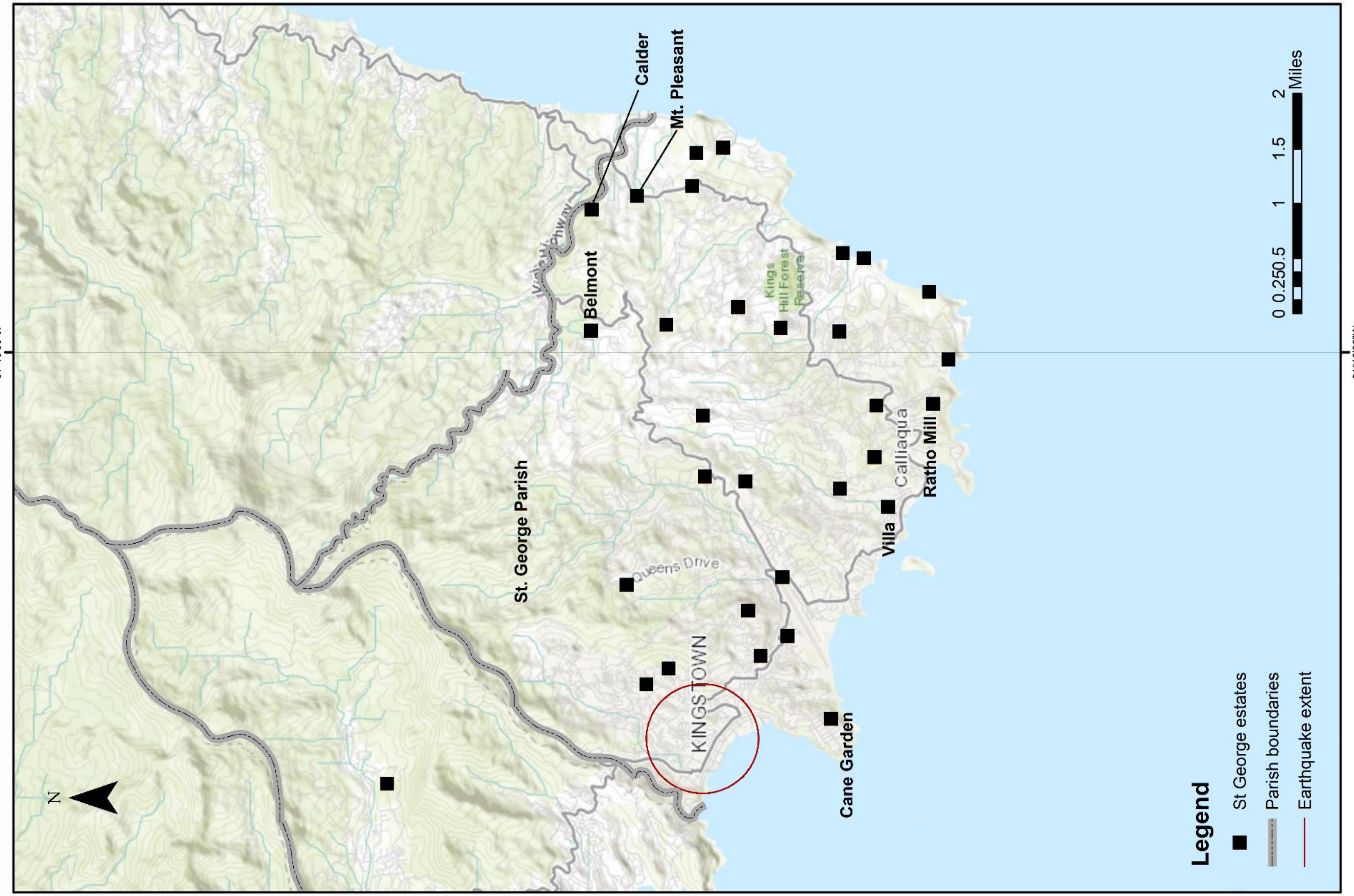


Figure H5. Map of the location of sugar plantations and volcanic hazards for 1812 in the St. George parish. Name locations are referenced within the main text.

Table H1. Calculations of 1801-1824 estimated land values

Table H1. Estimated land values for estates in Charlotte, St. David, St. Patrick, St. Andrew and St. George investigated in Section 5.4.1. The average price per acre was calculated, then the figure was multiplied by the number of acres for each estate. As is evident, the purchasing price figures used are estates sold under the West Indian Encumbered Estates Act of 1854, adapted from Spinelli (1973) and estates in the second half of the table sold ranged from 1858 to 1878. The aim of the act was to allow creditors and other interested parties to apply for the sale of estates in the British West Indies that were in decline. The decline in British West Indies estates was the result of the abolition of slavery in 1833 and would have been similar across the board. No estimated purchase price or average purchase price for estates were available within the archives or literature related to St. Vincent and the Grenadines between 1801-1824, therefore using prices from 1858 to 1878 are estimates for 1812. *Waterloo, Richmond Vale and Golden Vale sold prices found by Spinelli (1973) were included in the calculations for Charlotte and St. David's parish.

Estate	**Acreage**	**Purchase price (£)**	**Average price/acre (£)**			
Estates in Figures 5.4-5.8 not in Spinelli (1973), estimated from average price per acre						
	Average acres for 1801-1824					
Duvallie's	123	964.58	7.84			
T.Fraser	186	1458.63	7.84			
Wallibou	493	3866.16	7.84		**Avg. purchase price**	£ 3,414.32
Richmond	522	4093.58	7.84			
Mt. Alexander	321	2517.32	7.84	St. David		
Turama	600	4705.26	7.84			
Lot No. 14	433	3395.63	7.84			
Rabacca	404	3168.21	7.84		**Avg. purchase price**	£ 4,222.92
Langley Park	600	4705.26	7.84			
Mt. Bentinck	550	4313.16	7.84	Charlotte		
Career	502	3936.74	7.84			
Calder	390	3058.42	7.84			
Mt. Pleasant	306	2399.68	7.84		**Avg. purchase price**	£ 2,628.41
Belmont	240	1882.11	7.84			
Villa	307	2407.53	7.84			
Ratho Mill	266	2086.00	7.84	St. George		

Cane Garden	83	650.89	7.84			
Cane Grove	580	4548.42	7.84			
Camden Park	330	2587.89	7.84		**Avg. purchase price**	£ 18,319.16
Clare Valley	443	3474.05	7.84			
Pembroke	485	3803.42	7.84			
Queensbury	415	3254.47	7.84	St. Andrew		
Aker's Layou	164	1286.11	7.84			
Rutland Vale	522	4093.58	7.84			
Lance Mahault	179	1403.74	7.84		**Avg. purchase price**	£ 2,171.14
Cumberland	211	1654.68	7.84			
Westwood	262	2054.63	7.84			
Palmiste Park	185	1450.79	7.84	St. Patrick		
Estates in Spinelli (1973)						
Arnos Vale	454			10,050	22	
Prospect	282			1,800	6	
Rose Bank	285			860	3	
Kearton's	128			510	4	
Park Hill	326			1,520	5	
Henry's Vale	301			700	2	
Yambou Vale	287			1,050	4	
Peruvian Vale	332			700	2	
Sans Souci (1/2)	315			3,700	12	
Waterloo*	430			5,050	12	
Mt. Greenan	366			4,100	11	
Orange Hill	430			4,010	9	
Escape	200			2,000	10	
Penniston's	208			1,520	7	
Kingstown Park	138			1,200	9	
Richmond Vale/Golden Grove*	634			5,500	9	

Sans Souci (1/2)	315	2,500	8	
Grand Sable	1,484	4,300	3	
Sion Hill	266	3,000	11	7.8421053
Totals	**7181**	**54,070**	**149**	439.5935

Table H2. Data used and calculation for sugar production increases compared to 1812

Total production of sugar figures[2] is focused on the estates in parishes Charlotte, St. David, St. Patrick, St. Andrew and St. George investigated in Section 5.4.1. The calculation to find the percentage change between the selected year and 1812 was: the 1815 total sugar value subtracted by the 1812 total sugar value, divided by the 1812 value total sugar value =(1815 value-1812 value)/1812 value. Data included is six years before (1806-1811) and six years after (1813-1818) the 1812 eruption for consistency.

Year	Total sugar production in pounds (lbs) for selected estates in the parishes of Charlotte, St. David, St. Patrick, St. Andrew and St. George	Percentage change between years compared to 1812 (%)
1806	7,790,368	8
1807	8,147,263	13
1808	8,183,372	14
1809	8,910,546	24
1810	7,667,551	6
1811	8,110,637	13
1812	7,200,035	0
1813	7,725,948	7
1814	9,216,278	28
1815	9,778,577	36
1816	10,200,367	42
1817	9,802,365	36
1818	10,145,934	41

[2] Originating from The Gazette (1801-1824) "An account of the number of slaves employed, and quantity of produce grown, on the several estates in the Island of Saint Vincent and its dependencies", BL: Document supply MFR/8397