

Viewshed Analysis of Betty's Hope Sugar Plantation, Antigua, West Indies

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Introduction

Betty's Hope was a sugar plantation situated on the eastern part of Antigua, British West Indies that contained 700 acres of land. Christopher Codrington acquired the plantation in 1668 and arrived on the island in 1674. He proceeded to establish the most successful sugar plantation on Antigua. The plantation operated under the same family until 1944, resulting in extensive archives that include letter books, inventories, shipment requests, invoices, and maps of the plantation. These "Codrington Papers" have guided research on the site since 2007 when excavation began at the Great House. The on-going excavation is directed by Dr. Georgia Fox and conducted by the CSU Chico field school.

New work at Betty's Hope is using digital technology to transform the archives and take archivally-based research further in key ways: digitizing the Codrington archives themselves, and using the historic maps to guide site surveys and create digital overlays. These actions not only directly aid the site and its researchers, but will also increase the accessibility of information about the site for anyone who wishes to learn about it.



Photo: Close up of Samuel Clapham's 1755 map of Betty's Hope source: Museum of Antigua and Barbuda National Archives.

Theory

This idea is often attributed to Foucault's "Discipline and Punish" and stems from a form of social control discussed in the 17th and 18th centuries. Theorists such as Foucault and social reformist Jeremy Bentham discussed the "surveillance society" as one that oppressed through visibility and control over a negotiated landscape.

In the late 1700's Bentham applied this theory of social control to create what he termed the "perfect prison" and stated that such constant and present surveillance instilled this power relations in the prisoners in such a way that whether or not they were being watched at any moment in time they were constantly recreating the power relations imposed on them, thus creating an unequal and weakened place for themselves in their own mental universe.

In this perfect prison the guard tower would rise high above the cells and placed central to them. The construction would be in such a way that at any one moment in time the guard could freely and easily observe his prisoners while being unseen.

This idea of hidden sight established an internal power relationship in the prisoners mind, reestablishing the inequality of power and superiority of the guard in his tower. Foucault uses this theory to examine how social relationships can be created and manipulated using this visibility and surveillance based society (Semple 1993:114).



The Panopticon Plantation

Archaeology of plantations has often turned to analyzing plantation layouts to better understand ideas of power, social and industrial relationships on this unique landscape. In the Caribbean, many theories of social and working relations have focused around the location of the great house and slave villages and what these locations can reveal about the lives of those present (Delle 1998; Higman 1988; Randle 2011; Singleton 2001; Upton 1988; Epperson; 2000; Armstrong 2008).

In uncovering these landscapes, the focus of the great house in relation to slave villages is often used to examine the theory of a central power, or visibility as an oppressor. This theory proposes that a plantation was designed in such a way that the central and most prominent feature on the landscape was the great house. This prominence represented power and control over the landscape. Such power was created in and perpetuated in a way that the constant visibility of all surrounding lands and opportunity or possibility for surveillance at any moment in time created a sort of prison for those working on the plantation.

Methods

- Acquiring a digital copy of historic map of Betty's Hope from the Museum of Antigua and Barbuda National Archives.
 - 1755 Map of Betty's Hope and surrounding sugarcane fields created by Sam Clapham.
 - Geometrically register map to modern landscape using Ikonos satellite imagery from Bing. Nine ground control points were identified.
- Ground Survey and collection of GPS points
 - Elevation data
 - Building locations
 - Roadways
- DEM
 - Since no DEM of the project site was readily available one was constructed using
 - GPS elevation data
 - Contour map acquired from Antigua National Parks Authority in Nelson's Dockyard
 - Convert to Meters
 - Free source ASTER DEM of Antigua
 - Convert raster data into points shapefile
- Interpolate:
 - Convert elevation point layers into a DEM using Topo to raster tool at 1 meter resolution
- Overlay
 - Historic map overlaid on satellite image
 - Map snapped to satellite image using
 - Geographic features (streams, ponds)
 - Roads
 - Acreage markers
 - Structures still standing on landscape (windmills, cisterns, Great house)
 - Map was then projected into the UTM coordinate system

Historic Map Showing Elevation Data



Methods Cont.,

- Creating an overlay of historic map onto the DEM
 - Created point features of slave quarters and historical building locations on historic map
- Viewshed Analysis
 - Conducted viewshed from great house complex:
 - Great house
 - Overseers house
 - Conducted viewshed from slave villages
 - Village/Cabin location spread throughout village locations
- Output:
 - Maps showing extent of land visible from each of the selected locations or group of locations

Visibility from Great House Complex



Results and Discussion

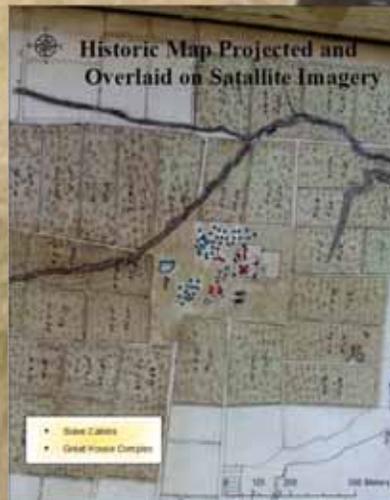
Results of the viewshed analysis show that the slave villages do fall within the line of sight of the manager's or overseer's house. They also indicate that the great house was in direct line of sight of the industrial complex at the site (the windmills and sugarworks). Viewshed analysis also indicated that only certain village locations fell within the line of sight of the actual great house. The majority of the village locations were only viewable from the manager's location. Viewshed from the slave village seems to reinforce these results. The viewshed from slave cabin locations show the line of sight falling just short of the actual great house location but in direct line of sight of the white servants and overseers locations.

These results would indicate that the panopticon theory may have some validity at Betty's Hope. The slave villages and working locations were in constant line of sight of their direct overseer and enforcer of punishment. Whether working in the sugar works or surrounding locations, imposing structures of the plantation would always be visible in privileged locations. This would appear to reinforce the idea of power relations as an artifact imprinted on the landscape.

While these results coincide with the theory of centrality of power, these results are preliminary and further research and analysis is necessary before any conclusions are drawn. It is also important to keep in mind the nature of the data consulted in this analysis. Errors in elevation data due to satellite access, collection error, and recording methods could result in a skewed or misleading elevation model. Further research and data collection include the systematic collection of elevation data based on the area of interest. Building heights and actual ground location also need to be taken into account to further improve the analysis and results.

It is also important to remember that there were other factors involved in plantation layout and building location. Areas on hills were chosen for great house and windmill locations to maximize the island breeze. Planters needed a way to cool their houses down and hilltops were an ideal location for their houses. While the data may appear to reinforce the idea of power relations on the landscape it is important to take into account factors such as those mentioned above before coming to any conclusion.

Historic Map Projected and Overlaid on Satellite Imagery



Slave Village Visibility



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