Exploring the Migration of the Roanoke Colonists

Authors: Malcom Mathis, Ronesha Lucas and Eunice Smith

Mentors: Dr. Anne Garland, Dr. Malcom LeCompte, Dr. Fransisco San Juan, Mr. Fred Willard and Dr. Lei Zhang

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ABSTRACT

Characterization of Environmental Attributes of Potential Lost Colony Archeology Sites Using satellite based optical sensors, and Synthetic Aperture RADAR, aerial LIDAR and Ground Penetrating RADAR.

Malcom Mathis
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Historical maps and records identify at least four (4) sites in North Carolina's Dare (2), Hyde (1) and Tyrell (1) Counties (just west of Roanoke Island) as locales with Contact Period Native American Habitation. There is reason to suggest one or more of these locations as providing sanctuary for refugees from the ill-fated colony established on Roanoke Island in 1587. The results of prior study of high-resolution satellite imagery of two (2) of the sites to identify environmental characteristics (factors) conducive to habitation and to search for the presence of cultural features possibly related to either Native American or European habitation were inconclusive. This effort indicated that the use of satellite or aerial multispectral imagery at visual or infrared wavelengths, and at even the highest conceivable spatial resolution would yield limited results due to the considerable vegetative canopy that obscures the ground at these sites.

In February 2000 NASA flew an Interferometric Synthetic Aperture RADAR (ISAR) aboard the Space Shuttle Endeavor to accurately map the Earth's topography. Since that time, data from the Shuttle RADAR Topography Mapping Mission (SRTM) has become publicly available providing 30 meter spatial resolution for the entire United States. The major advantage of the dual band being that obscuration by vegetative canopy would be minimized providing more reliably accurate data than by optical techniques. The primary disadvantage of this technique is that the resolution is insufficient to detect the features at the scales most likely to pertain to the search for the lost colony.

Since 2003, very high spatial resolution (approximately 1 meter) Light Detection and Ranging (LIDAR) instrument was flown to collect elevation data across the entire state of North Carolina and used to derive maps to improve flood insurance rates and assist Federal Emergency Management Agency (FEMA) planning. These data have fortuitously become publicly available within the past year as a result the North Carolina Flood Plain

Mapping Program. While this data provides improved coverage at appropriate spatial scales, and was collected during minimal leaf conditions, there is a statistical component to the data that produces invalid elevations.

It is possible to improve the accuracy of the North Carolina elevation data by combing the two data sets (SRTM and NCFPMP). Thus the use of both new data sets may provide an opportunity to determine environmental and cultural features beyond the limitations of either. Moreover, the proximate location of both sites to ECSU yields an opportunity to establish ground truth for measurements made remotely. Once elevation data has been validated, features with the requisite characteristics of habitability, arability, and defensibility will be sought to provide a focus for future in situ study.

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INTRODUCTION

There are federal guidelines for archeological investigations. Archeology and Historic Preservation; Secretary of the Interiors Standards and Guidelines (48 FR 44716-44742, September 29, 1983) provides national general regulations for researchers. Cultural, natural, and historic landscape features, artifacts, and historic background information may be used to determine archeological site boundaries. The research team, this year, focused on Phase One, Identification. Background research for the study included previous archeological research that had been performed by our mentors and others. Mr. Fred Willard had a collection of historic maps of the projected sites. In the beginning of the research program, Mr. Willard showed the research team maps, copies of deeds, and other historical documents. A conventional survey may include an archeological site inventory, cultural resource reports, residents and people with local knowledge, archeological site and structures inventory, archival map research and local county histories.

In our research, we addressed the federal guidelines for archeological investigations and used modern day technology to assist in our progression. With the technological advances that occur in the field of science everyday, we are fortunate to be able to utilize these advancements as an aide in archeological studies. The combination of archeology and technology provides us with a dynamic opportunity to delve into the depths of American history using state of the art remote sensing applications.

Detection of archaeological sites may be accomplished by several means:
1. By visual aerial reconnaissance
2. By the use of remote sensors as aerial cameras, thermal infrared scanners, multispectral scanners, and space-borne radar.
Remote sensing has proven to be useful in locating both surface and subsurface archaeological features. Much of human history can be traced through the impacts of human actions upon the environment. The use of remote sensing technology offers archeologists the opportunity to detect these impacts which are often invisible to the naked eye.

Trying to locate archaeological sites is limited by several factors:
1. It has to be small enough to be seen and comprehended from visible remains
2. It has to be visible and recognizable in spite of subsequent human activities and constructions
3. It has to be recognizable even after a long exposure to the effects of nature, such as weathering and erosion

Remote Sensing can overcome the aforementioned limitations:
1. Very large sites can only be seen in its entirety
2. Patterns of sites that may not be noticed or understood at ground level may be viewed at another perspective
3. Subtle variations in the soil color, in the density, height, or types of vegetations, or patterns of shadows may give suggestions to the underlying buried features.

The types of remote sensing imagery we used in our research consisted of the following:

LIght Detection And Ranging (LIDAR)
• Operates at Optical Wavelength

Radio Detection And Ranging
• Operates at Radio Wavelengths (1 cm - 1 m)

Ground Penetrating Radar
• Detects Inconsistencies Underground (1 ft – 30 ft)

Shuttle Radar Topography Mission
• Displays Topographic Imagery

IKONOS
• Provides Optical Imagery

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RESULTS (POWERPOINT PRESENTATION)

In the duration of our research we have tabulated outcomes displaying elevation, distance, and area measurements using locations off the Eastern Coastal Shores of North Carolina pertaining to IKONOS, LIDAR and SRTM satellite images. The chart above shows various calculations of Croatan (Dare County), Goshen Ridge (Hyde County) and Buck Ridge (Tyrrell). The figure above show a variety of elevations, distances, and areas at potential brumes. Burmes on the IKONOS elevation chart indications range from dark green and grey to a purplish grey color. LIDAR indications range from dark orange to white, and SRTM indications range from light grey to white. The following assumptions articulate the locations of North Carolina Coastal burmes along with precise elevation, distance, and area measurements.

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PHOTOS

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TEAM RESOURCES AND LINKS

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