USING BLACK EARTH AND REMOTE SENSING OF INDICATOR PLANTS FOR IDENTIFICATION OF PREHISTORIC ARCHAEOLOGICAL SENSITIVITY AND POTENTIAL SITE INTEGRITY IN THE EASTERN WOODLANDS

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Background:

Native American cultural and land-use practices, including agriculture and forest management, have altered present-day soil color and the composition and structure of forest and non-forest vegetation. Mast-bearing trees such as oak, hickory, American chestnut, beech or black walnut may also have been cultivated or favored via silviculture by Native Americans, increasing their importance in present-day forests in localized areas. Amending soils with animal products, plant remains and charcoal, creating refuse middens and gathering of plant species for food resulted in concentrations of dark, richer soils and unique assemblages of plant species in the immediate vicinities of occupation areas. In addition, Native Americans used fire to encourage the establishment and growth of dietary shrubs and mast and fruit trees, to clear underbrush, maintain agricultural fields or facilitate hunting. These activities resulted in significant alteration of soils and vegetation composition and structure in intensively occupied areas. Many of these changes in soil color can be quickly detected by a simple shovel test, or in the case of indicator species, by remote sensing. The latter may include detecting differences between hardwood and softwood (e.g., pine) forests, more open-forests like oak mast orchards versus dense forests of later successional trees, old fields, meadows, or shrub lands created by Natives Americans that are now *inclusions* in a broader forest matrix.

Objective:

The objective of this project is to develop and test indices of soil color (*black earth*) and plant indicator species identified by remote sensing for location and integrity of Native American archeological sites on DoD installations in Eastern Woodland environments. The methods were applied and tested in a range of environments to further understand of the relationship between indicator species distributions and soil color and fertility and actual archeological site locations and attributes. This approach has the potential for improving the efficiency of survey strategies, streamlining the site location process, and strengthening site evaluation methods currently in place.

Summary of Approach:

Four installations within the eastern Woodland environment were chosen to pursue this study: US Army, Ft. Drum, NY, US Navy, Cheatham Annex, VA (Yorktown Naval Weapons Station) and Marine Corps Base Quantico, VA, and US Air Force, Dare County Bombing Range, NC (DCBR; Seymour Johnson Air Force Base). Remotely sensed imagery and soil records for these installations were obtained using data mining and existing resources. A series of known archeological sites were selected to compare with vegetated areas where sites appear to be absent to focus the study for each installation. Soil color and other soil attributes (texture and nutrient levels) and past and present-day remote sensing data (aerial and satellite photographs, infra-red photographs and Lidar where available) were inventoried on and off each site. The inventories were then compared for statistical variations in soil color, texture, and nutrient levels and indicator species occurrence and density. Results of these tests were then used to determine the efficacy of the model for identification of cultural resources on military lands.

Benefit:

The benefit of this work for the Department of Defense will be more efficient identification and protection of cultural resources on military lands, which supports the mission of the US military to manage archaeological sites found on DoD-managed lands. Manual excavation by archaeological teams is costly and time-consuming. With this approach, which incorporates surface features of vegetation characteristics, minimally invasive soil sampling, and the use of remotely sensed data products potential sites can be narrowed with methods that take less time and equipment.

Accomplishments:

Differences in soil color and fertility between cultural sites and control locations have been discovered. These differences are possibly the result of Native American land uses. Remote sensing was also effectively used to identify dominant vegetation types where cultural sites are located. The results of these analyses suggest that patterns are region-specific. The landscape, lifeways, and resources utilized by a specific group of people will affect how these methods should be applied across the eastern US. For example, groups may put more emphasis on resources gained from waterways in some areas, such as at MCB Quantico and the Cheatham Annex. In other areas, such as northern New York (where Ft. Drum is located), these types of resources may be less relied on, and more emphasis put on hunting terrestrial game. At the Dare County Bombing Range, our interdisciplinary approach to the identification of cultural sites has led to discoveries regarding the increasing depth of the organic peat layer in this coastal bog habitat. This deep organic layer both protects artifacts and prevents traditional archaeological testing. Using this knowledge, the DoD can more efficiently determine the cost effectiveness of traditional archaeological testing. These results suggest the combined usage of vegetation and soils as indicators would be able to predict cultural significant better than the two methods independently. The use of remote sensing to identify vegetative anomalies can further expedite the process of archaeological site identification.

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