Informing the Planning Phase of Energy Development with Probabilistic Modeling of Cultural Resources: A Southern Wyoming Example

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Introduction

For an environmental impact statement involving a proposed wind energy project, SWCA has produced a probability model designed to assist the identification of sites with potential Native American significance. In this part of Wyoming, these often include rock piles, cairns, stone circles, and alignments.

Because the project extent covers over 164,100 acres, a probability model is being used to guide a sample (Class II) survey of nearly 8,000 acres. The purpose of this model is to forecast the location of potentially sensitive sites in previously unsurveyed areas.

This sample survey is being done before the project footprint is finalized. The goal is to map cultural sites to be discussed during the consultation phase between the areas of land management and the tribes during project planning.

A full (Class III) survey of the project footprint will be conducted independently from the current sample inventory. This poster provides an overview of model development and implementation.

Model Development

The tenet of the current project is to sample the landscape for sites of potential Native American significance. In the current project area, rock piles, alignments, and circles are found to be the most common sites. Site locations are uniquely weighted to describe the magnitude of their effect on archaeological regions.

In 2006, we developed a probability model for cairns, among other site types, for a project in central Wyoming. This model was applied to the current project.

The cairn site sample was randomly split into two samples, and a model was made for each. This allows the models to be compared for estimates of accuracy and consistency.

Environmental Variables

Environmental variables that are found to significantly correlate with site locations are uniquely weighted to describe the magnitude of their effect on site placement.

The probability equation is mapped to 640 using the Master Calculator, which produces a probability grid ranging from 0 to 1 (low to high).

Stepwise Logistic Regression

The cairns site sample was randomly split into two samples, and a model was made for each. This allows the models to be compared for estimates of accuracy and consistency.

Model Testing and Selection

Calibration runs to correct/false predictions show that over 75% of combined site and non-site cells were correctly predicted.

Model gain describes the percent of sites captured by prediction. This test shows that the models are performing efficiently.

Conclusions

To reduce the influence of edge-effect and arbitrary model areas, we need to move away from identifying project boundaries and toward modeling environmental and/or archaeological regions.

Given the model design and previously recorded site density, we anticipate encountering another 41.1 potentially sensitive sites in our sample areas (0.00344 sites per acre). While fieldwork is underway, below are examples of features encountered thus far. The results of this fieldwork will support the Native American consultation in the planning phase of this project.

Examples of cairns documented during the ongoing fieldwork.