A Predictive Model for Grazing Effects on Cultural Resources for the Bridgeport Ranger District, Humboldt Toiyabe National Forest
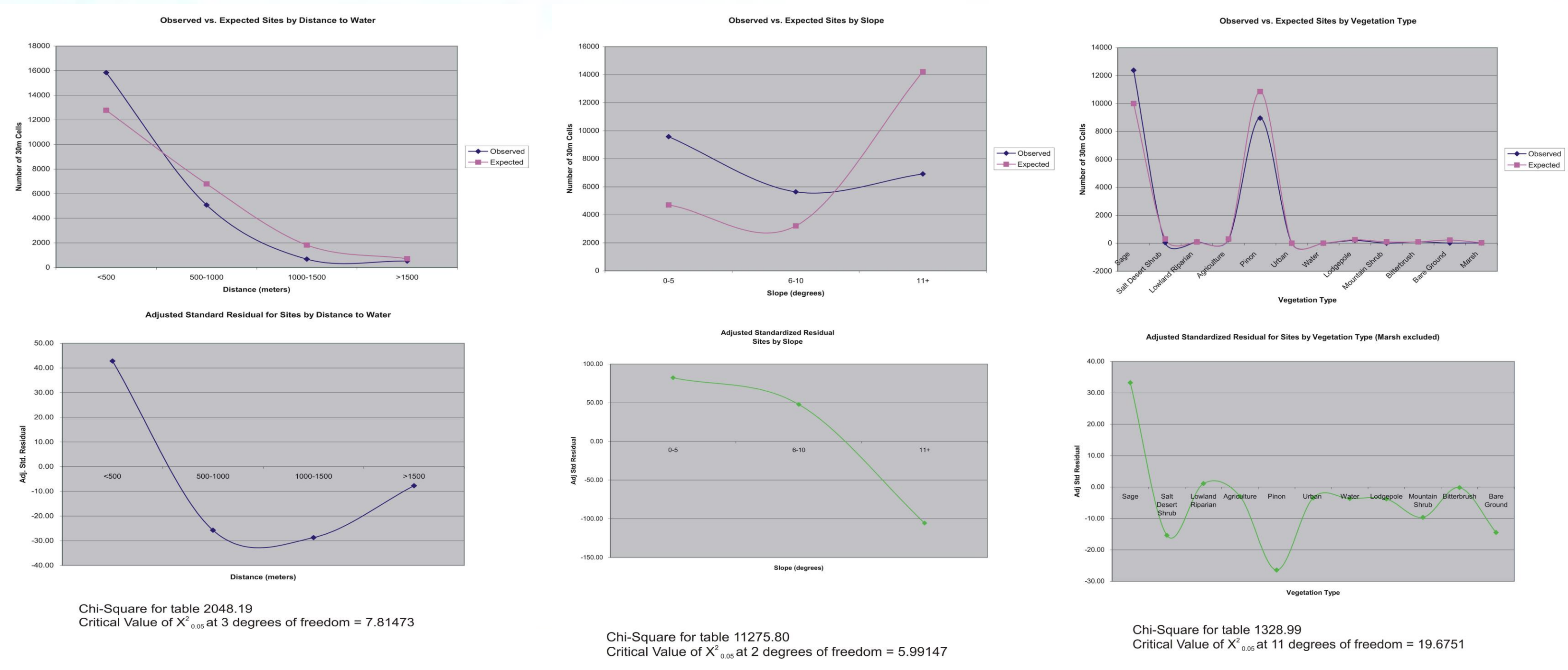
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INTRODUCTION

The Humboldt-Toiyabe National Forest (USDA Forest Service) has entered into a Memorandum of Understanding (MOU) with the Nevada and California State Historic Preservation Offices that clarifies compliance with Section 106 of the National Historic Preservation Act (NHPA) for rangeland management. In this MOU, the Forest Service agreed to place known sites and all inventories on GIS maps, then to develop predictive models forecasting site locations. A sampling strategy, taking into account livestock utilization and forecasted site sensitivity was also to be developed.
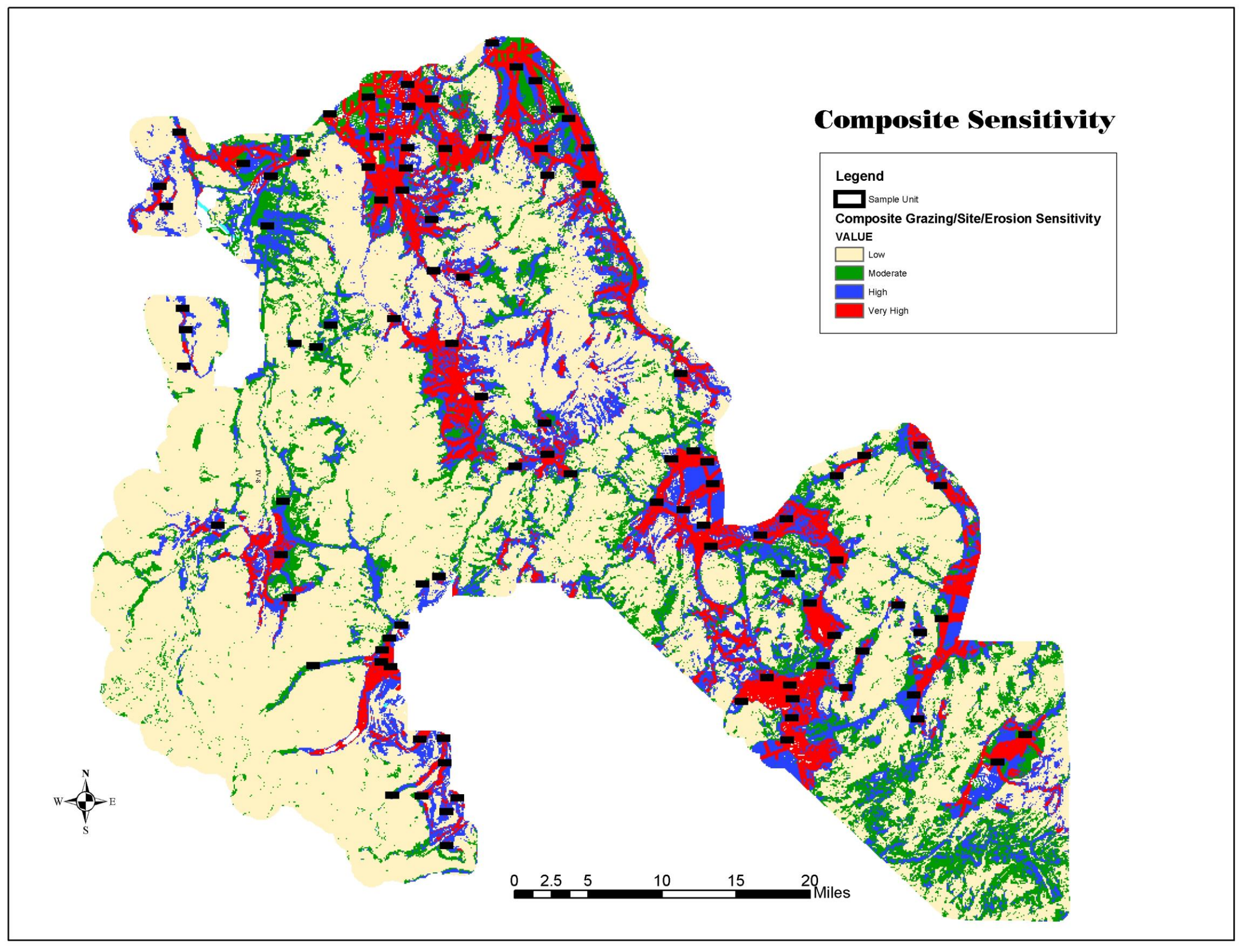
GOALS

• Use available environmental layers to forecast the location of cultural resources.

• Assess the potential effects due to livestock utilization.

• Develop an archaeological sampling strategy from the integrated model results.

• Provide forest managers with a tool that efficiently accomplishes cultural resource assessments in compliance with Section 106 by focusing survey efforts in areas where sites are likely to occur and identify areas where the risk of site destruction from grazing is highest.

METHODS

Site sensitivity was developed through a cross tabulation of cells containing archaeological sites and environmental factors of :
- Elevation
- Slope
- Vegetation
- Distance to Water
- Roads (Historic)

Chi-square values that significantly diverged from expected distributions were identified as predictive for site location.

## COMPOSITE SENSITIVITY AND SAMPLE UNITS

Site Sensitivity, Grazing Utilization, and Soil Erodibility overlays were combined to create a Composite Sensitivity Layer. The greatest likelihood for site destruction due to grazing occurs where all three very high sensitivity zones overlap. Model testing will be accomplished by visually inspecting 100 (300 x 1000 meter) sample grids oriented to intersect adjoining composite sensitivity zones.
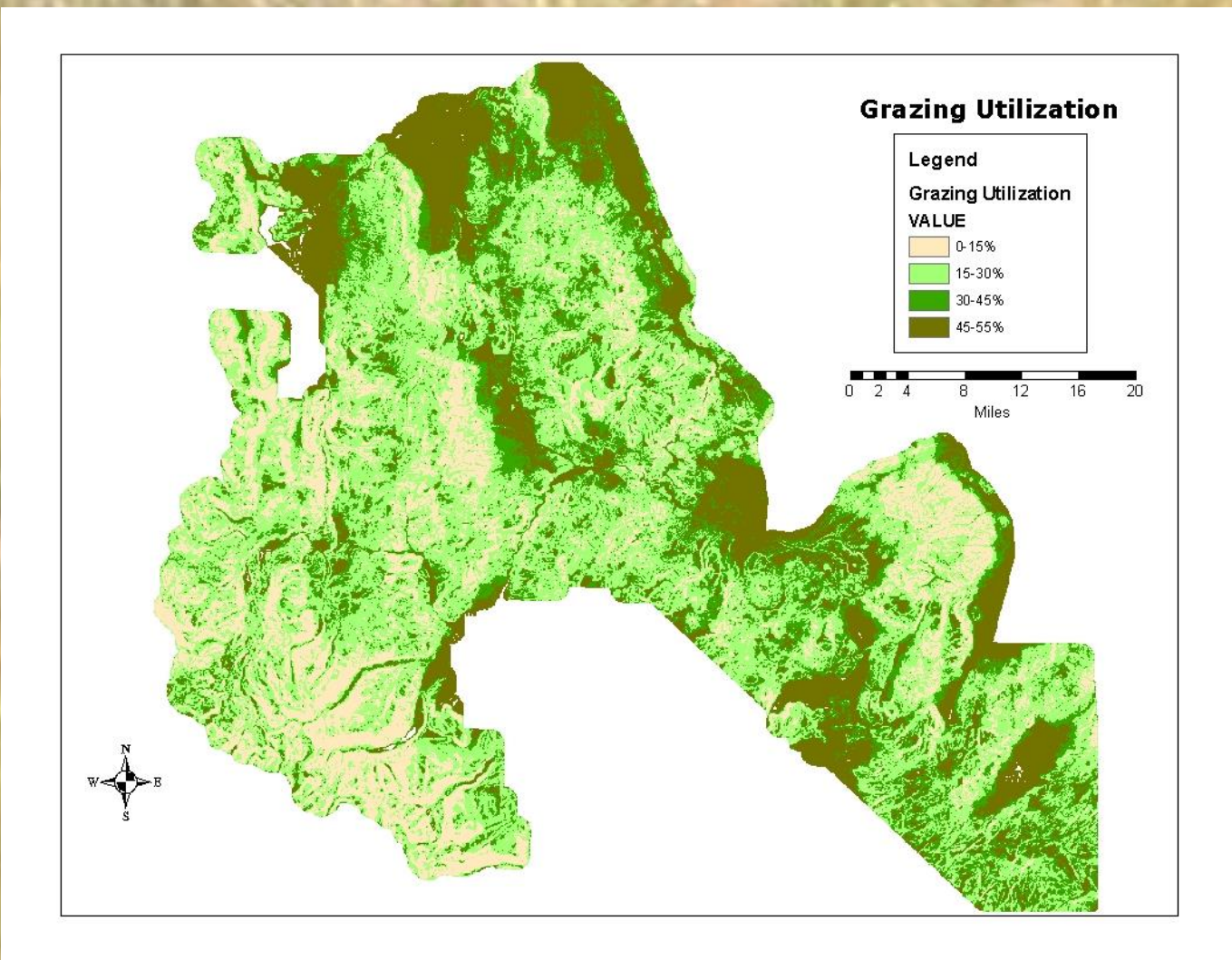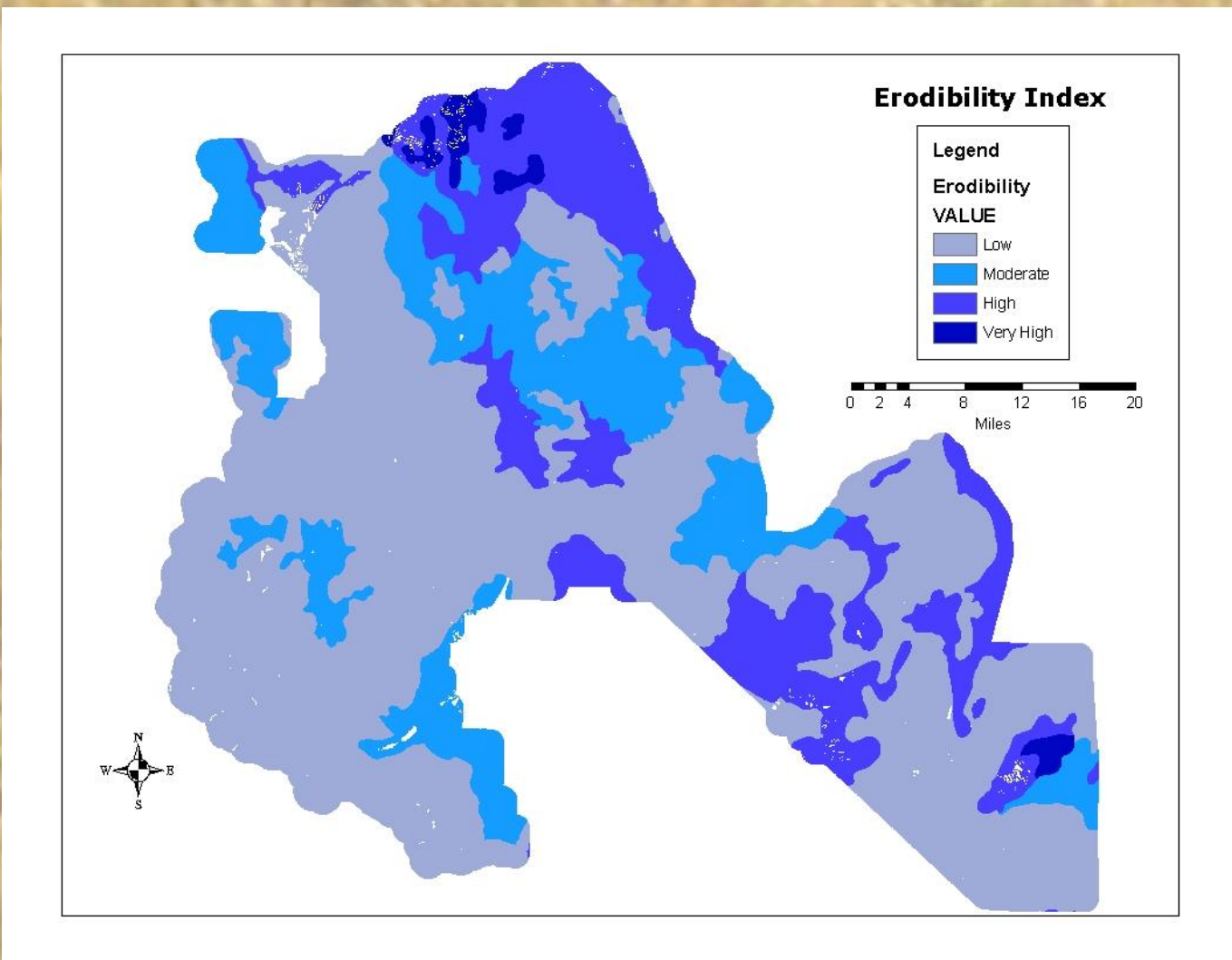
PROJECT LOCATION
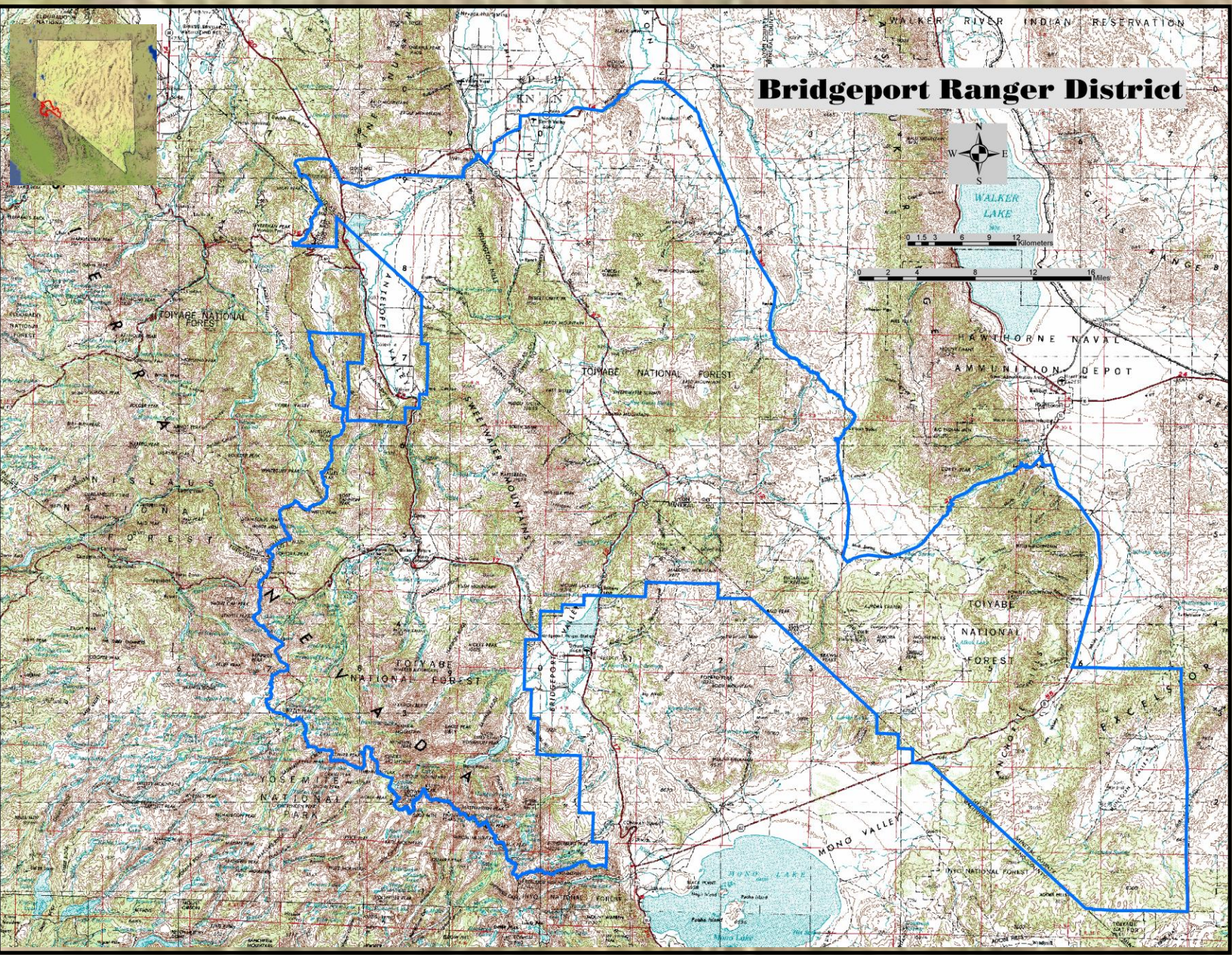
SITE SENSITIVITY
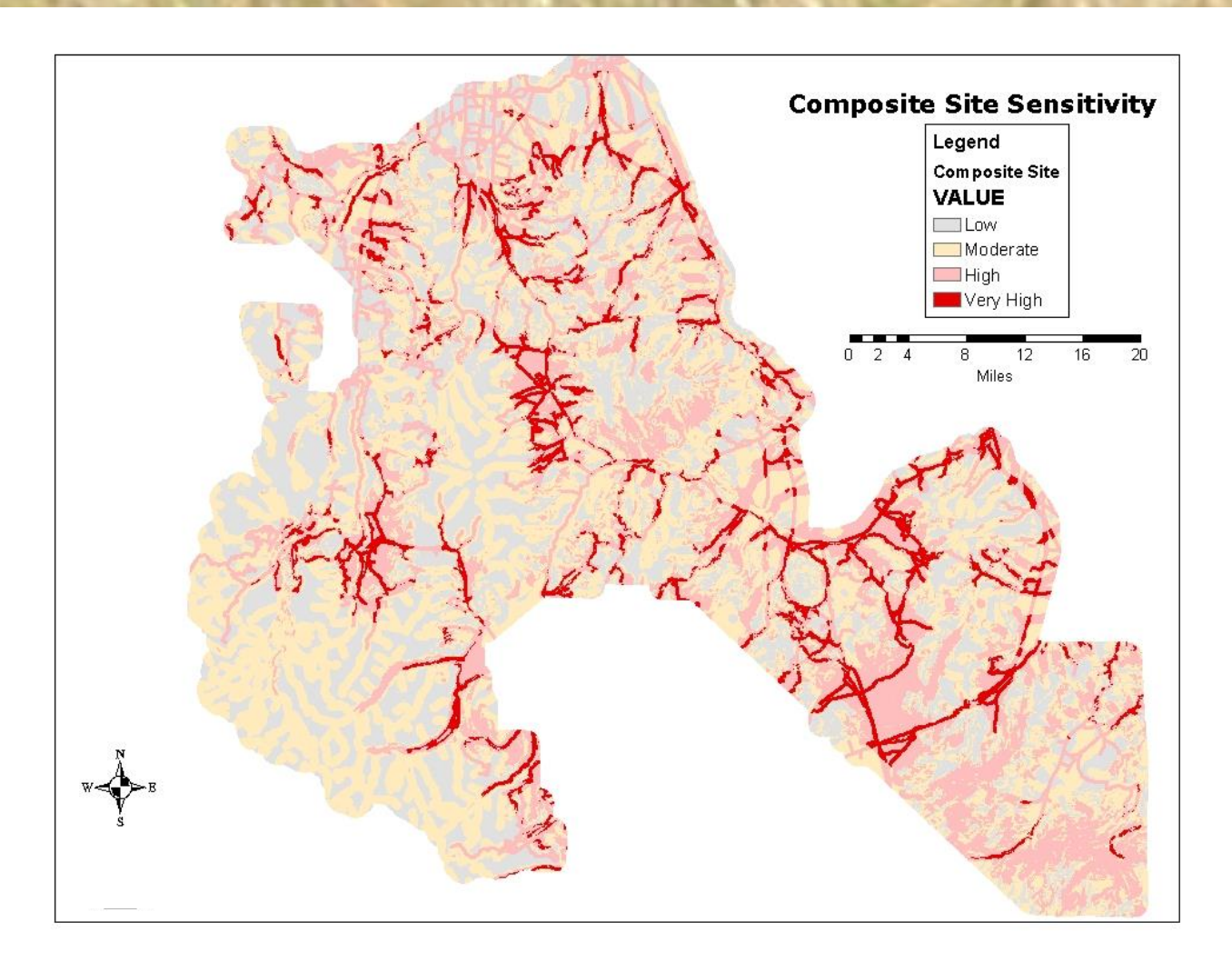
By aggregating predictive environmental variables, a prediction of archaeological site sensitivity ranging from Low to Very High was derived.

GRAZING UTILIZATION

A grazing utilization layer was provided by the Forest Service,

SOIL ERODIBILITY

Grazing effects are most destructive in areas where fine-grained soils are exposed to increased wind and water erosion. An erodibility index was derived from STATSGO soil classifications.

POTENTIAL COST SAVINGS

Grazing Utilization		Site Sensitivity		Composite Priority	
Potential Forage	Acres	Sensitivity	Acres	Sensitivity	Acres
0-15%	384,292	Low	327,727	Low	788,446
15-30%	516,120	Moderate	525,424	Moderate	184,158
30-45%	185,817	High	383,256	High	206,343
45-55%	235,266	Very High	93,232	Very High	142,265
Sum Acres High/Very High	421,083		476,488		348,608
Acreage Reduction	72,475				
Savings	17%		27%		

Using an average cost of $35/acre, a class III, inventory for cultural resources within the highest grazing utilization zones (30%-45% and 45%-55% utilization) would cost approximately $14.7 million. By developing the probability model, sensitive acreage could be reduced between 17% and 27%. Even with 100% inventory, **a cost reduction between $2.5 and $3.9 million could be realized.**