

Predictive Model for Archaeological Sites of the Hopi Reservation of Northeastern Arizona



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Introduction

- The Client & Background
- Problem Statement
- Goal
- Solution & Methodology
- Predictive Modeling Results
- Model assessment
- Model Fitness
- Conclusion

Background

- Dr. Wesley Bernardini, Associate Professor in the Department of Sociology and Anthropology at the University of Redlands
- 1.6 million acre Indian reservation in Northeastern Arizona
- 1,580 sites already located and knows there are many more
- Established settlements between 500-1500 A.D.

Problem Statement

- Needs to locate archaeological sites within a large reservation, 1,619,936 acres
- Has to pinpoint where to focus his survey efforts

Goal

- To create predictive models for three archaeological site types: Rock Art, Scatter, and Habitation

What is Rock
Art?

What is a
Habitation site?

What is a
Scatter Site?

Influential Work

1. Statistical Research, Inc.

“Archaeological Sensitivity Modeling in Southern New Mexico: Automated Tools for Planning and Management”

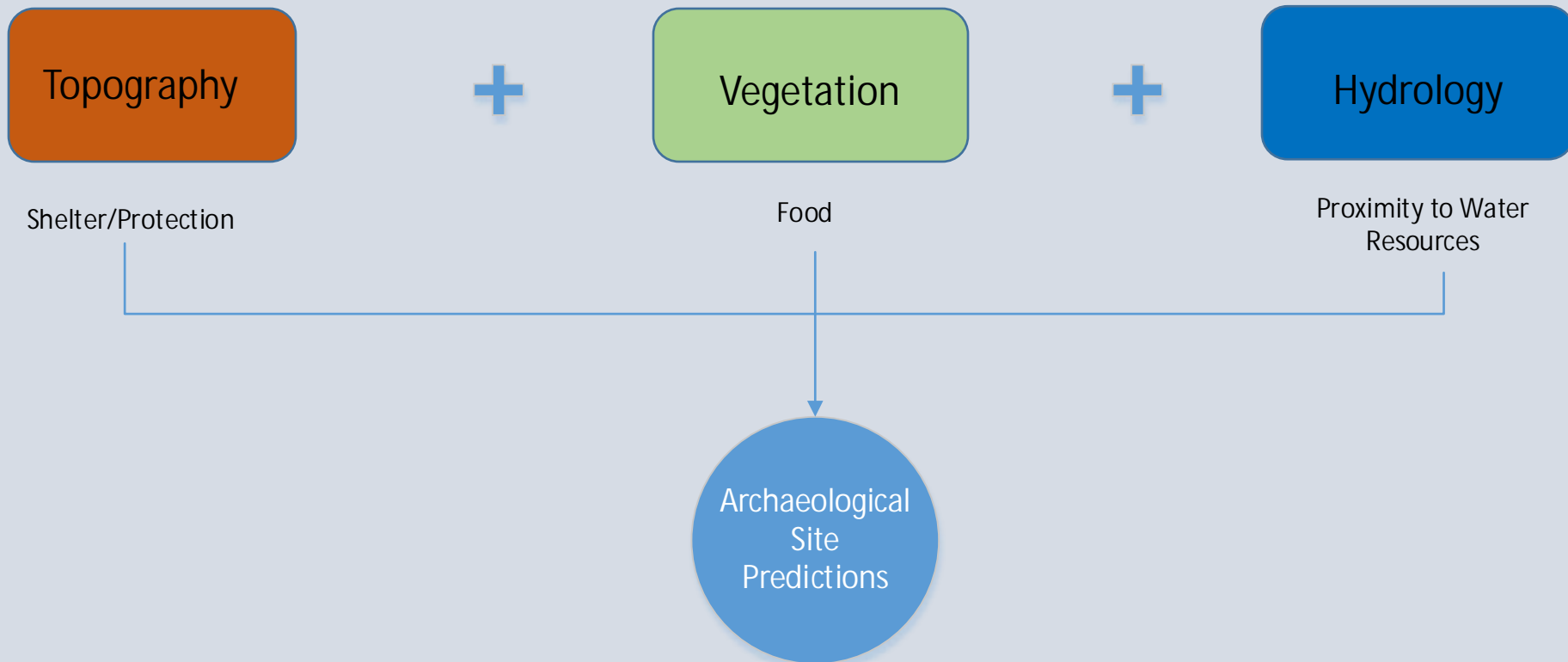
2. Australian Centre for Sustainable Catchments & Engineering and Surveying

“Predictive Mapping of Blackberry in the Condamine Catchment Using Logistic Regression and Spatial Analysis”

3. J. R. Leathwick, Department of Conservation: Te Papa, New Zealand

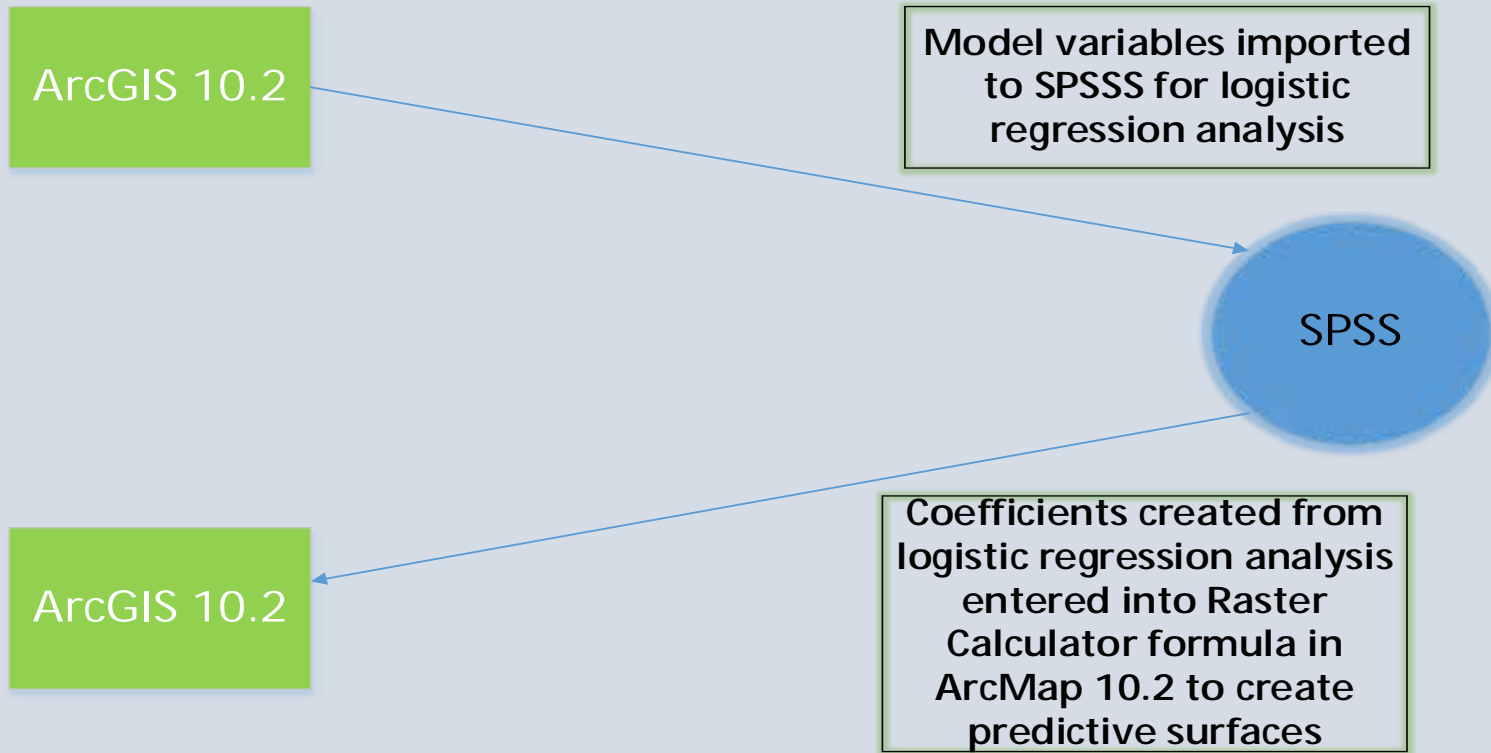
“Predictive Models of Archaeological Site Distribution in New Zealand”

Conceptual Model



Methodology

1. Created explanatory (independent) raster variables
2. Compiled dependent variables
 - archaeological sites
 - non-site points
3. Built logistic regression model in SPSS to compute coefficients



Variables included in building models:

Topography:

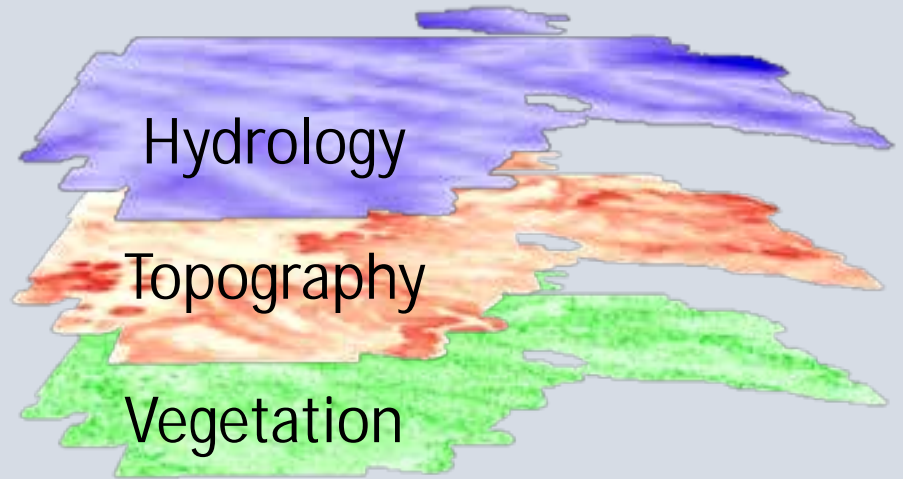
- North-South Aspect
- East West Aspect
- Slope
- Relief
- Shelter
- Terrain texture
- Cost surface
- Topographic Position Index

Cost Distance Hydrology:

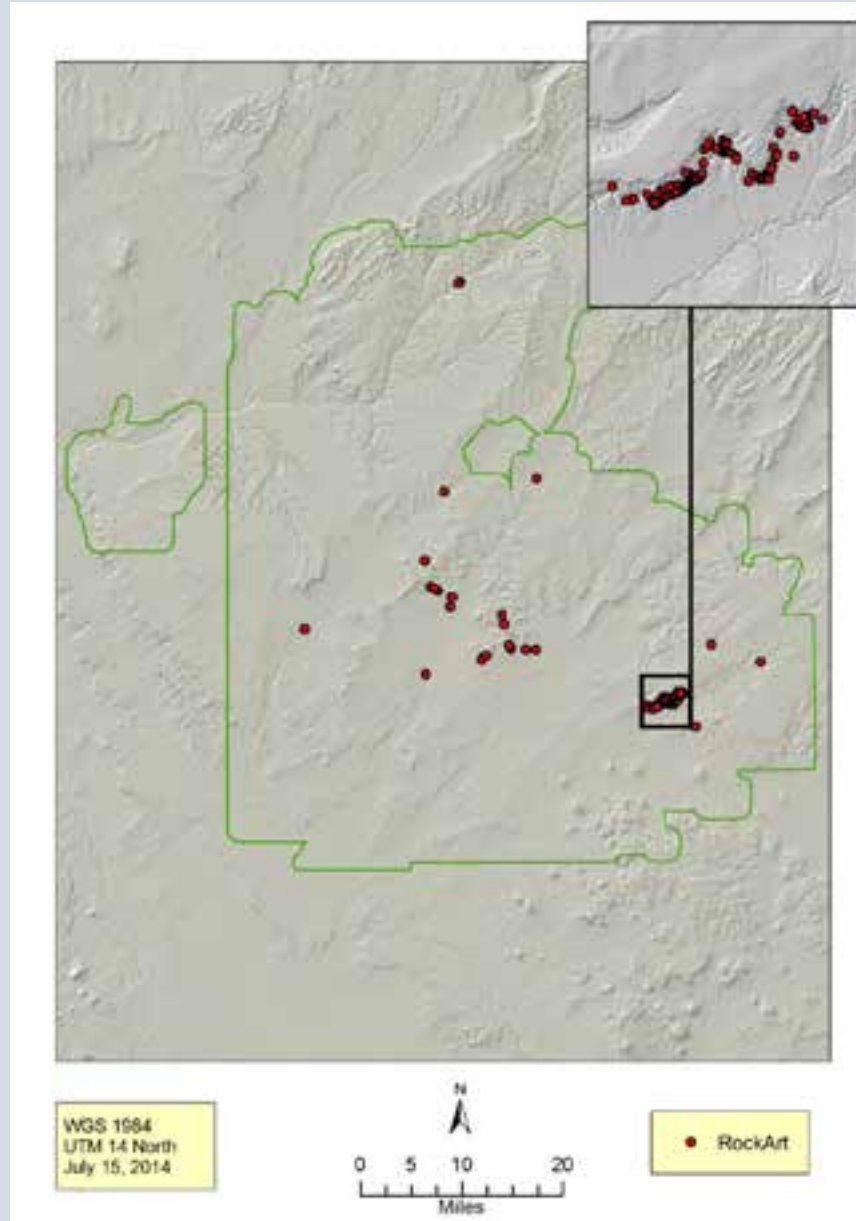
- Springs
- Streams
- Major Streams
- Water Bodies
- Stream Nodes
- Major Stream Nodes

Vegetation:

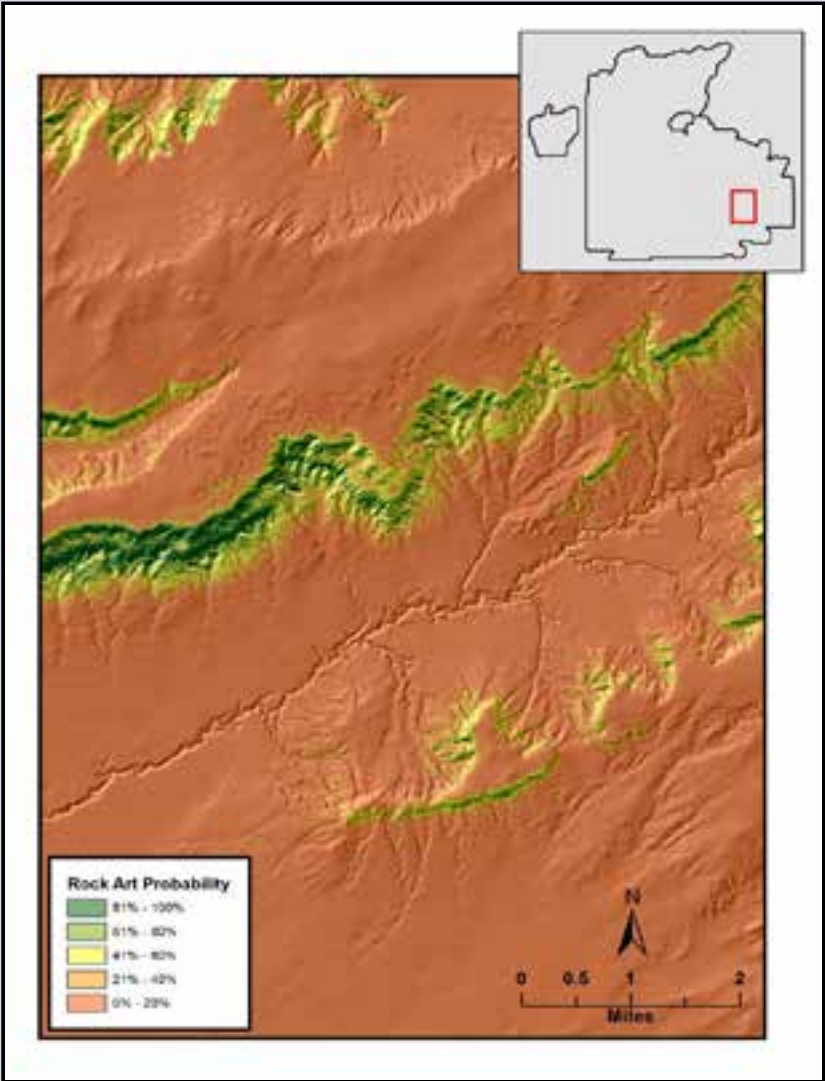
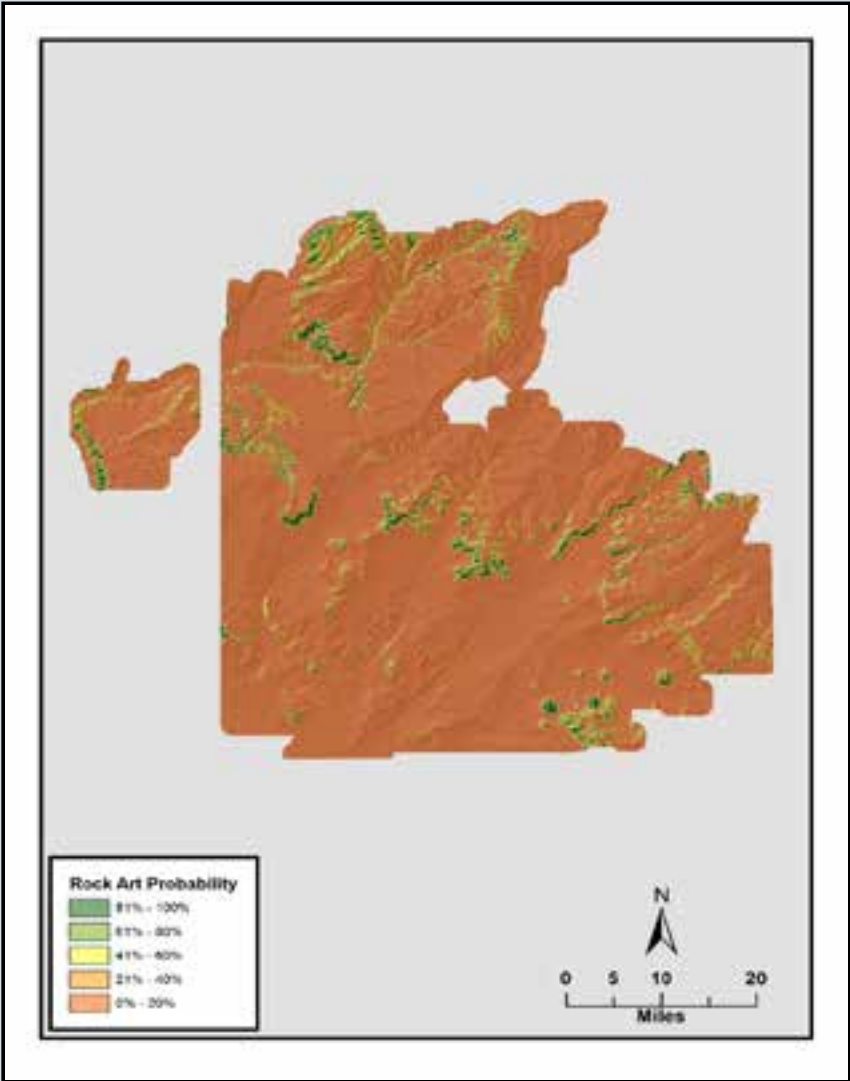
- Vegetation Richness



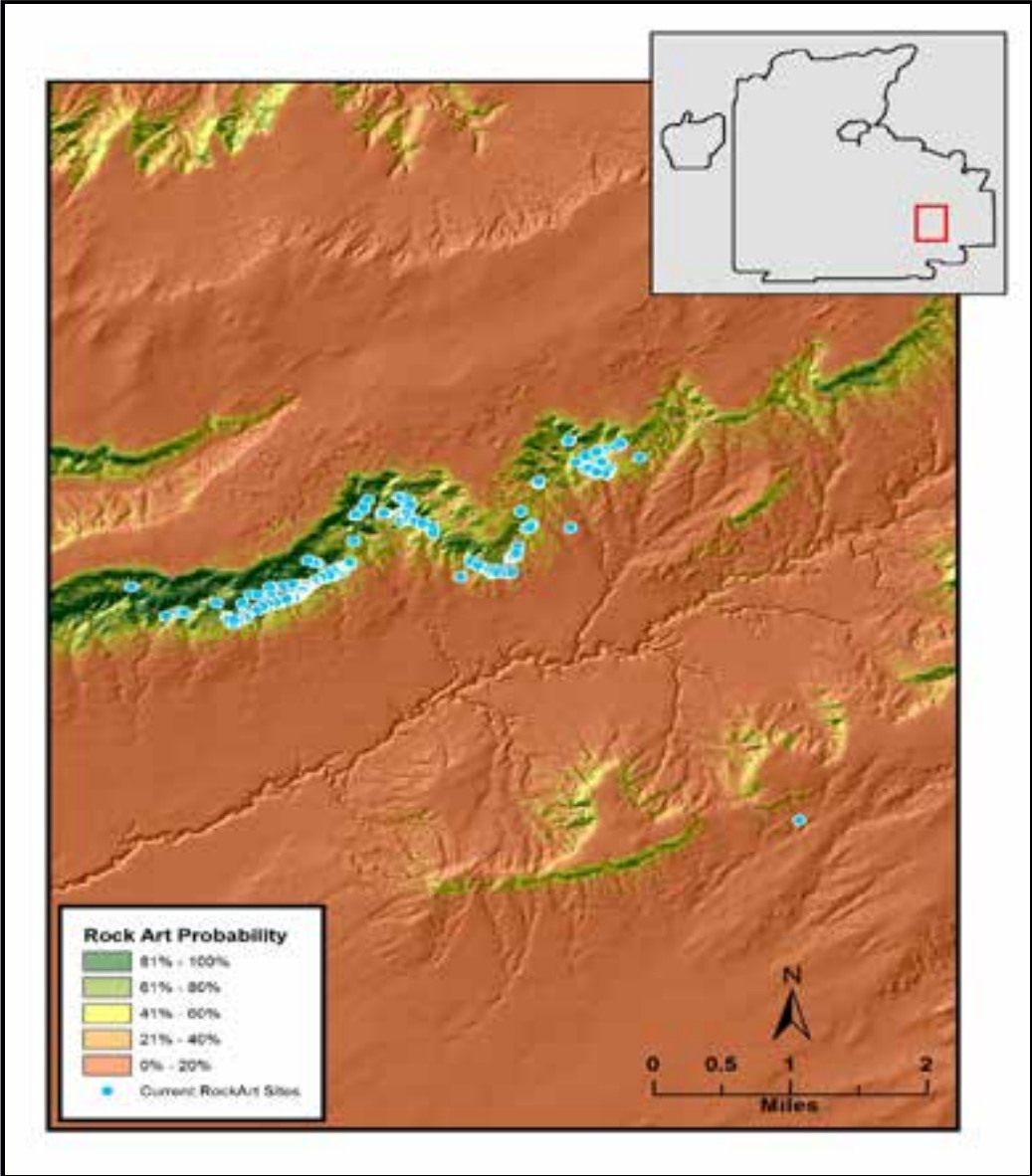
Distribution of Rock Art Sites from 500 to 1500 AD



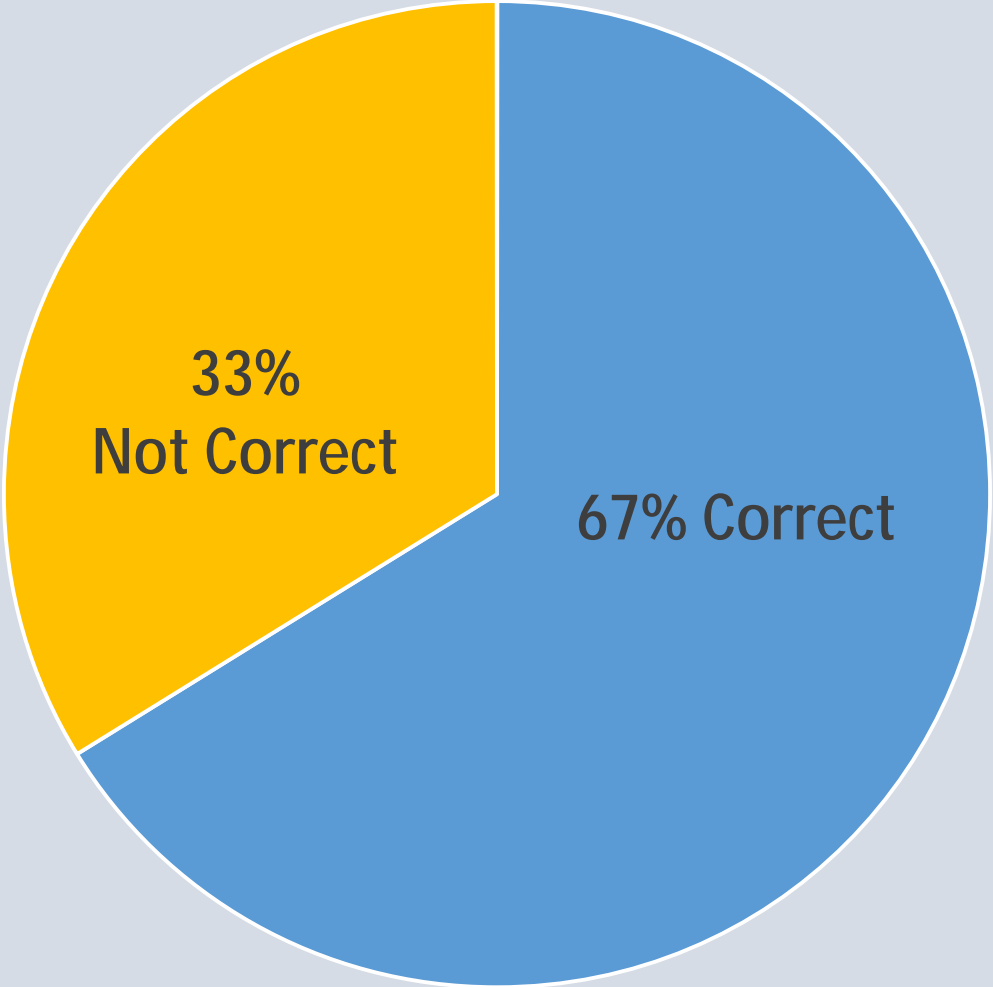
Rock Art Predictive Model Results



Rock Art Predictive Model Results (Continued)



Rock Art Site Model Percent Correctly Classified Assessment



Rock Art Model Goodness of Fit

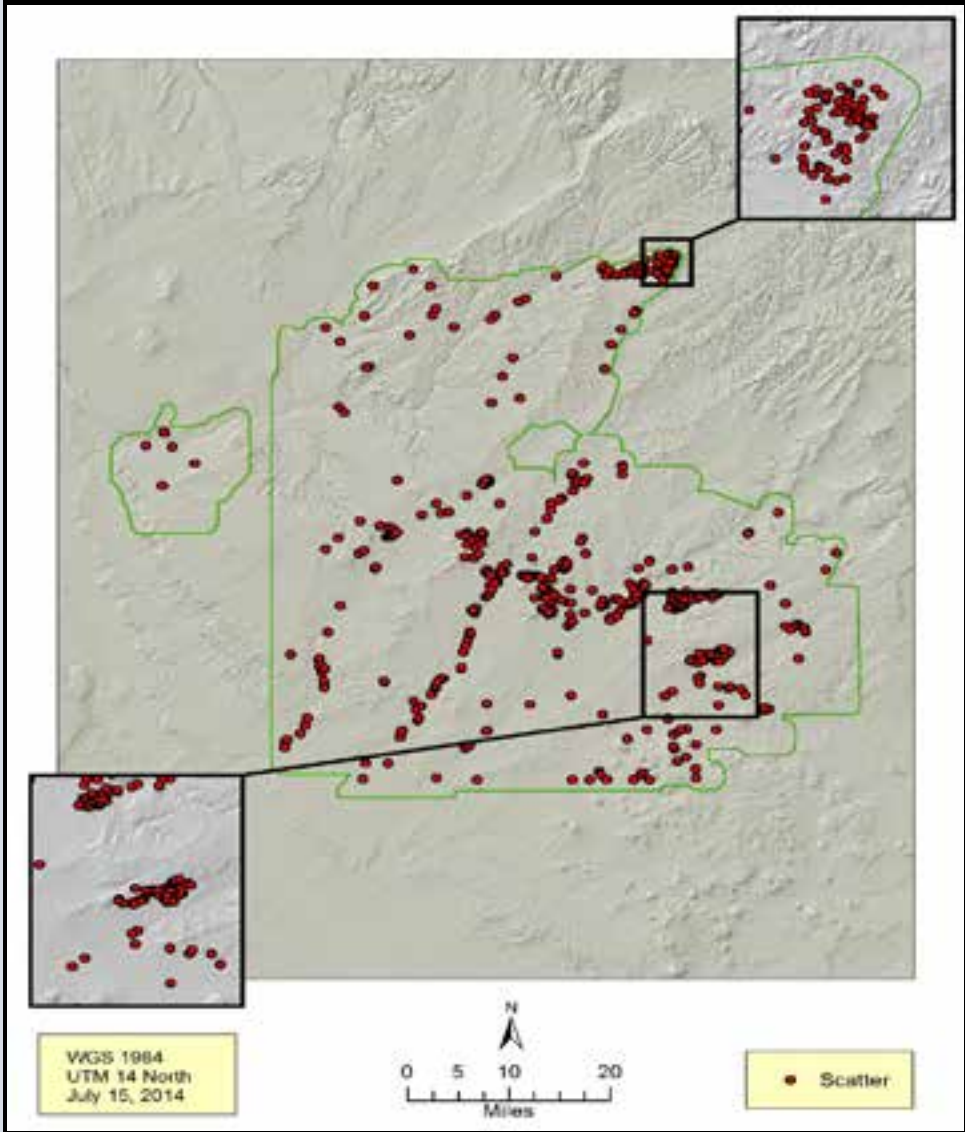
		Chi-square	df	Sig.
Step 1	Step	131.930	1	.000
	Block	131.930	1	.000
	Model	131.930	1	.000
Step 2	Step	12.960	1	.000
	Block	144.890	2	.000
	Model	144.890	2	.000
Step 3	Step	5.542	1	.019
	Block	150.432	3	.000
	Model	150.432	3	.000
Step 4	Step	7.643	1	.006
	Block	158.075	4	.000
	Model	158.075	4	.000
Step 5	Step	5.749	1	.016
	Block	163.824	5	.000
	Model	163.824	5	.000

Rock Art Model Goodness of Fit (Continues)

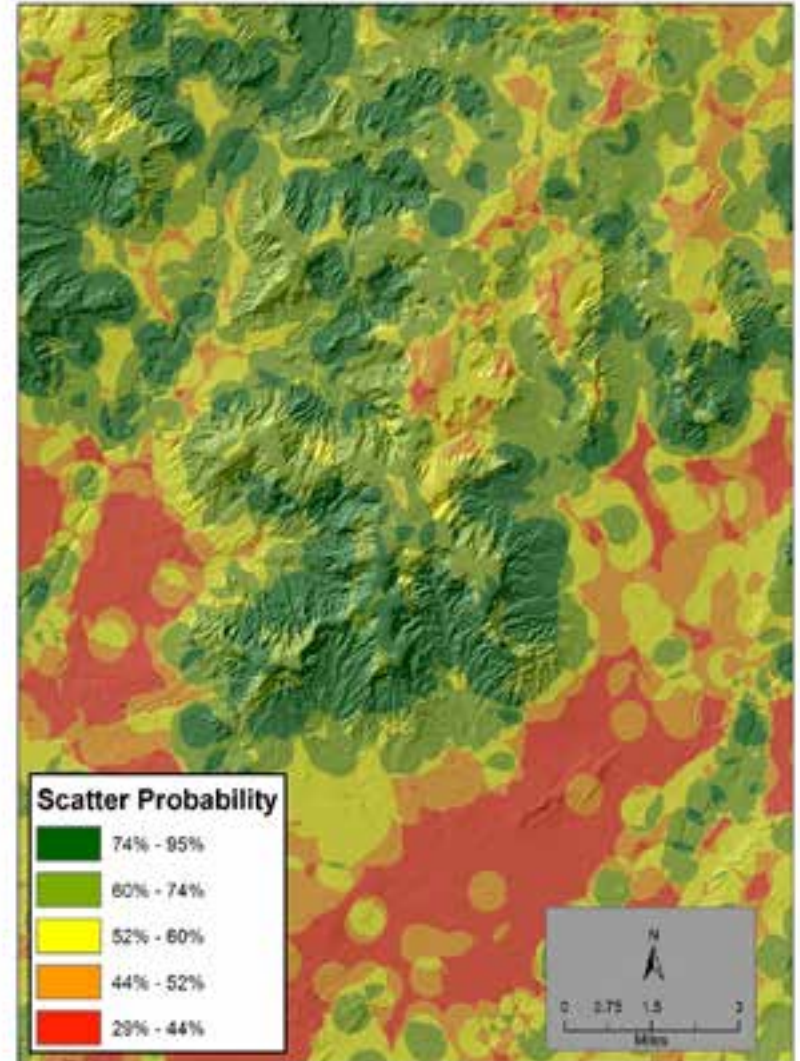
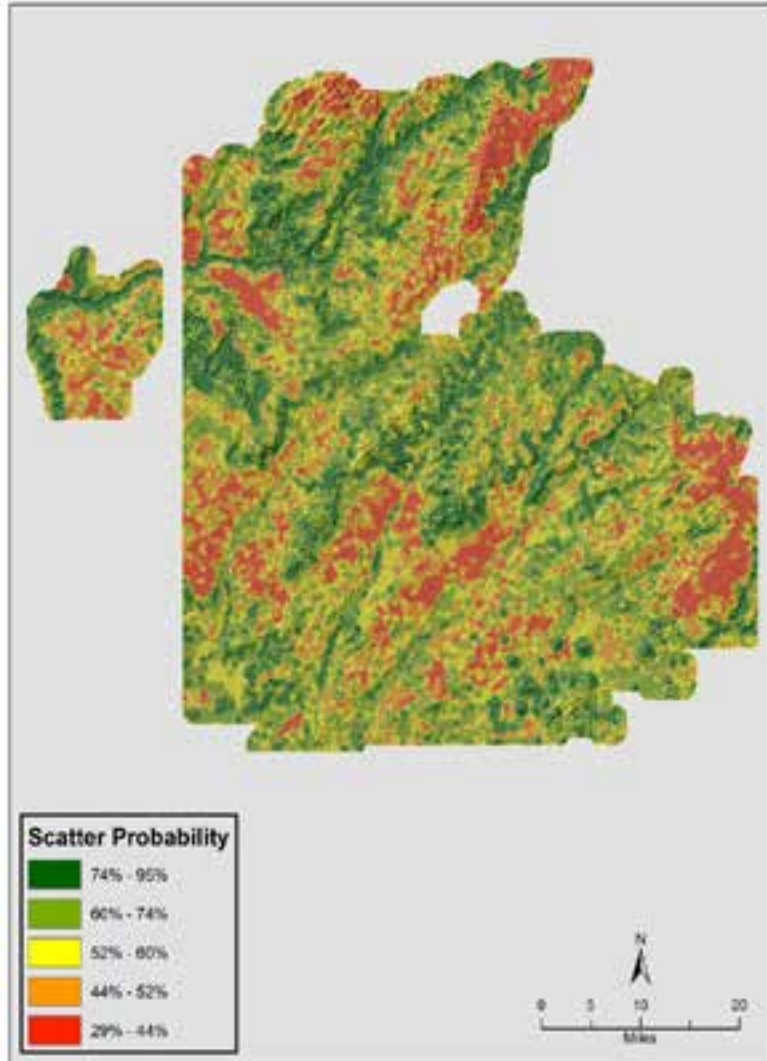
Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	22.464	8	.004
2	41.738	8	.000
3	18.949	8	.015
4	17.097	8	.029
5	8.410	8	.394

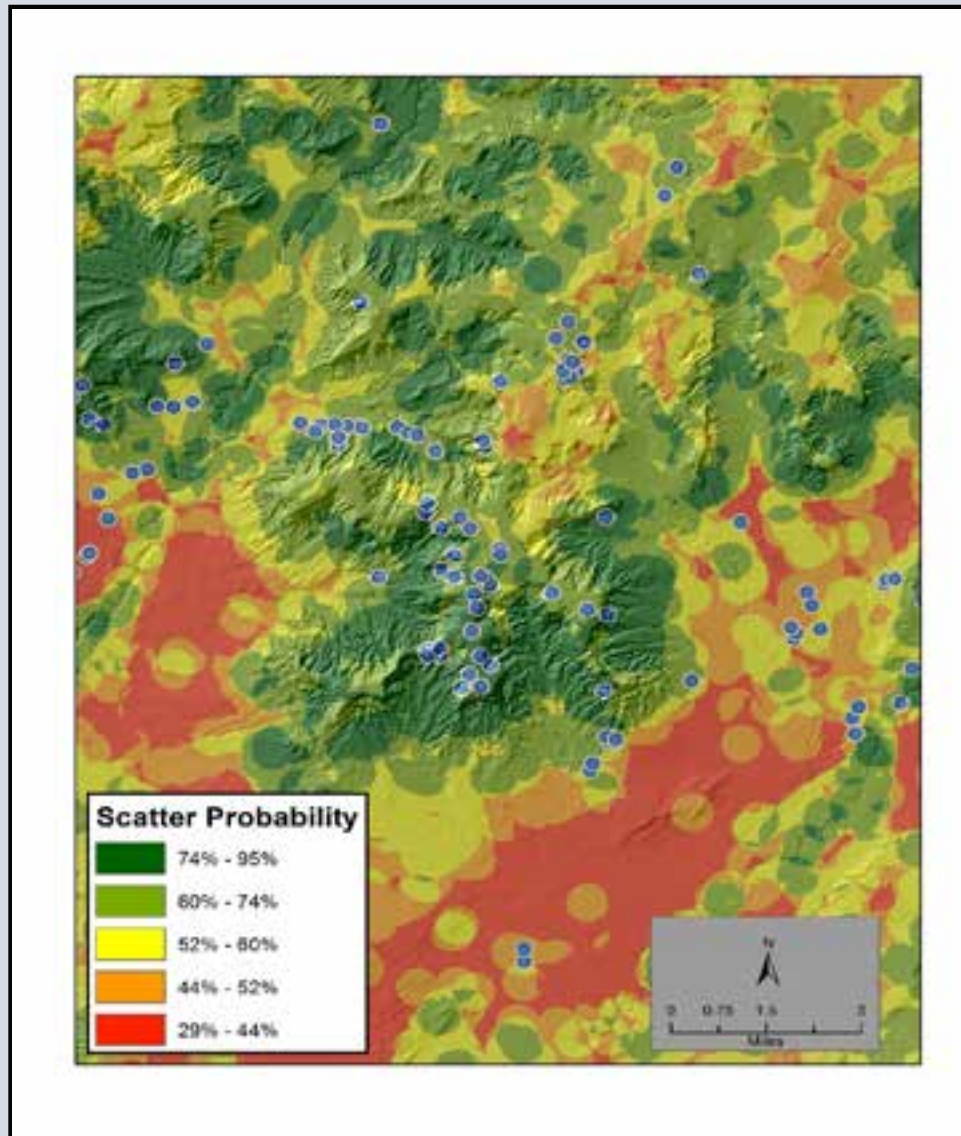
Distribution of Scatter Sites from 500 to 1500 AD



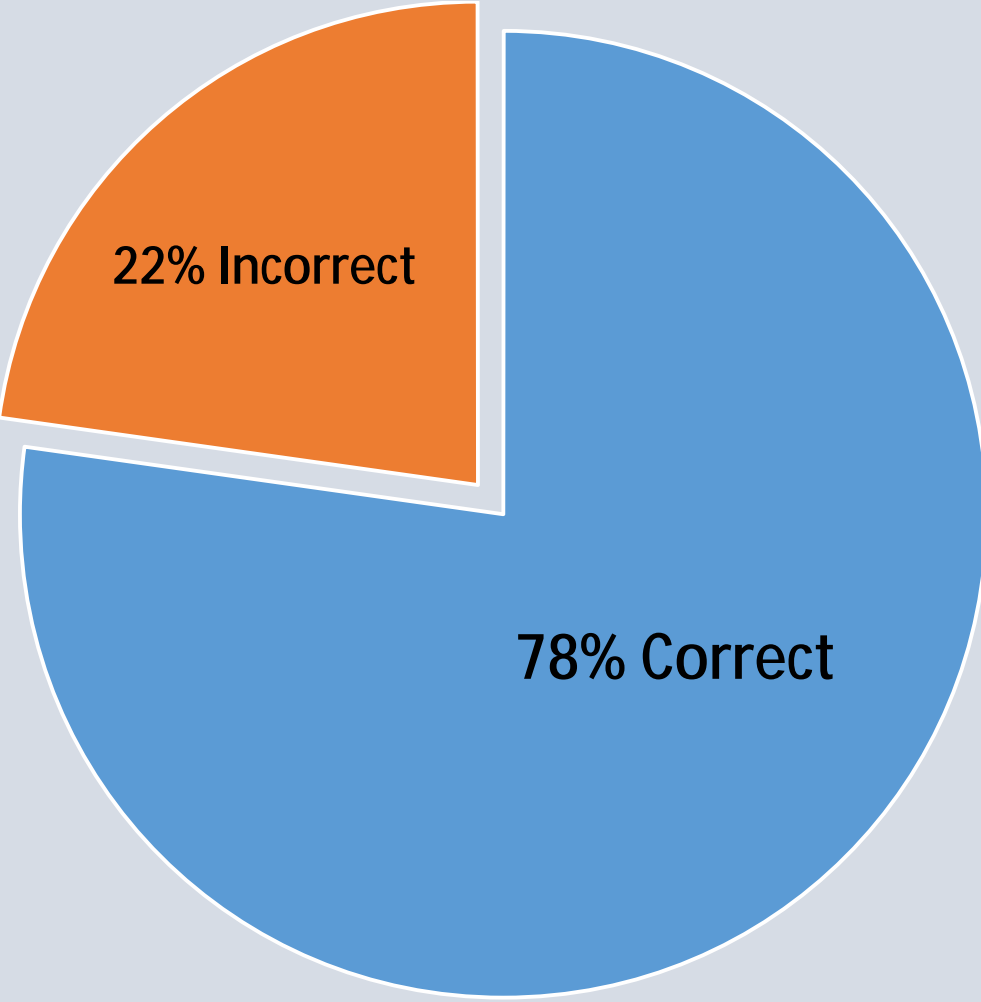
Scatter Site Prediction Model Results



Scatter Site Prediction Model Results (Continued)



Scatter Site Model Percent Correctly Classified Assessment



Scatter Site Goodness of Fit

Omnibus Tests of Model Coefficients

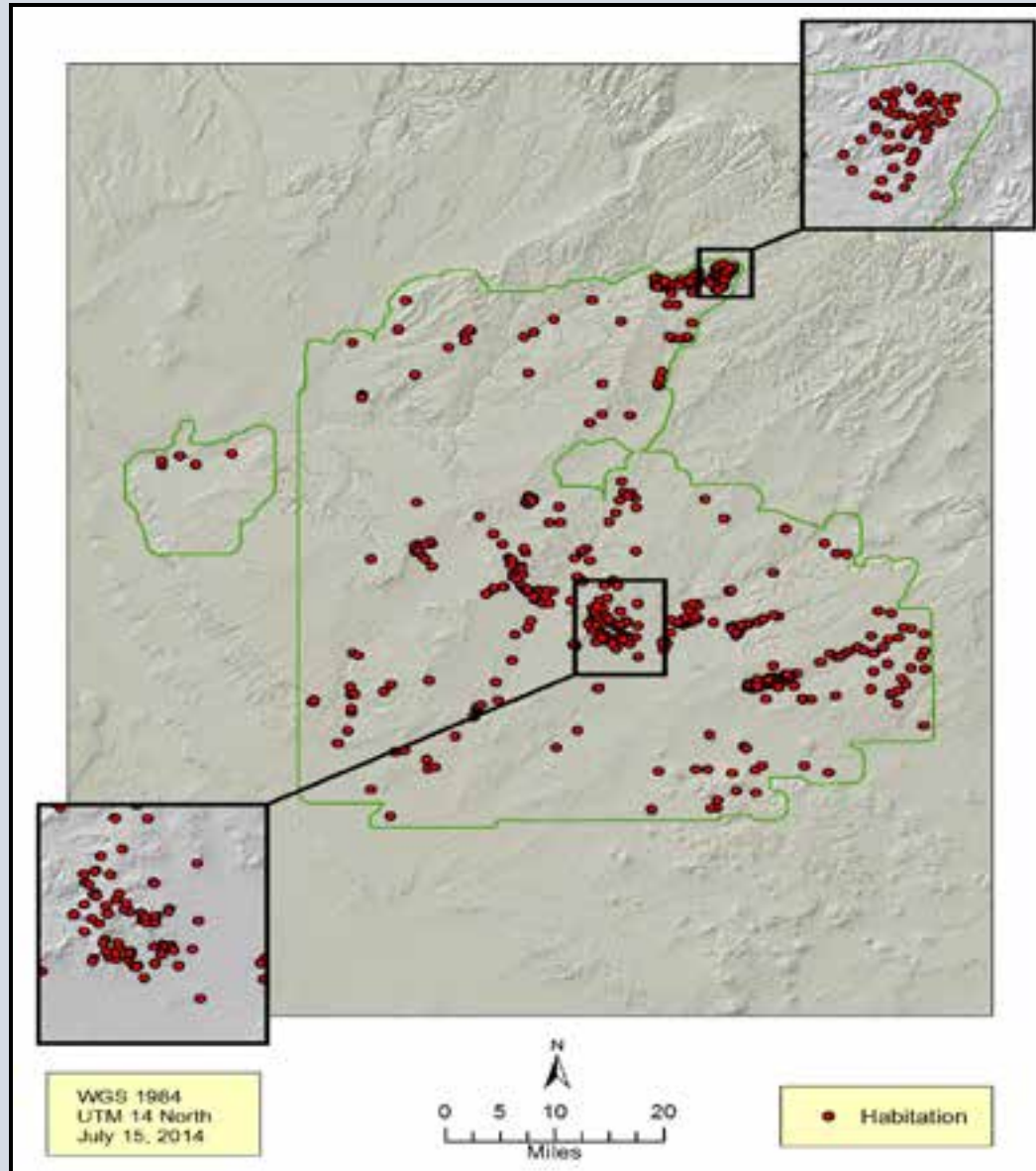
		Chi-square	df	Sig.
Step 1	Step	31.287	1	.000
	Block	31.287	1	.000
	Model	31.287	1	.000
Step 2	Step	5.384	1	.020
	Block	36.671	2	.000
	Model	36.671	2	.000

Scatter Site Goodness of Fit

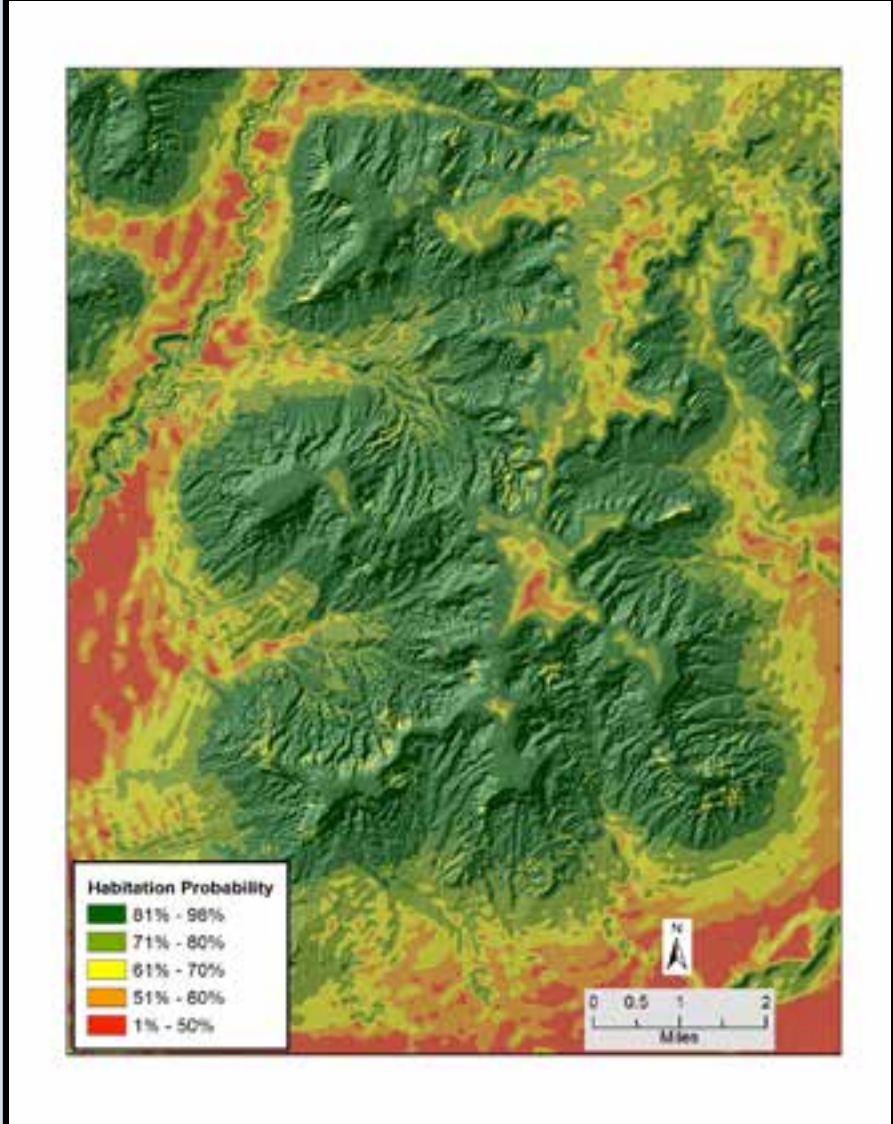
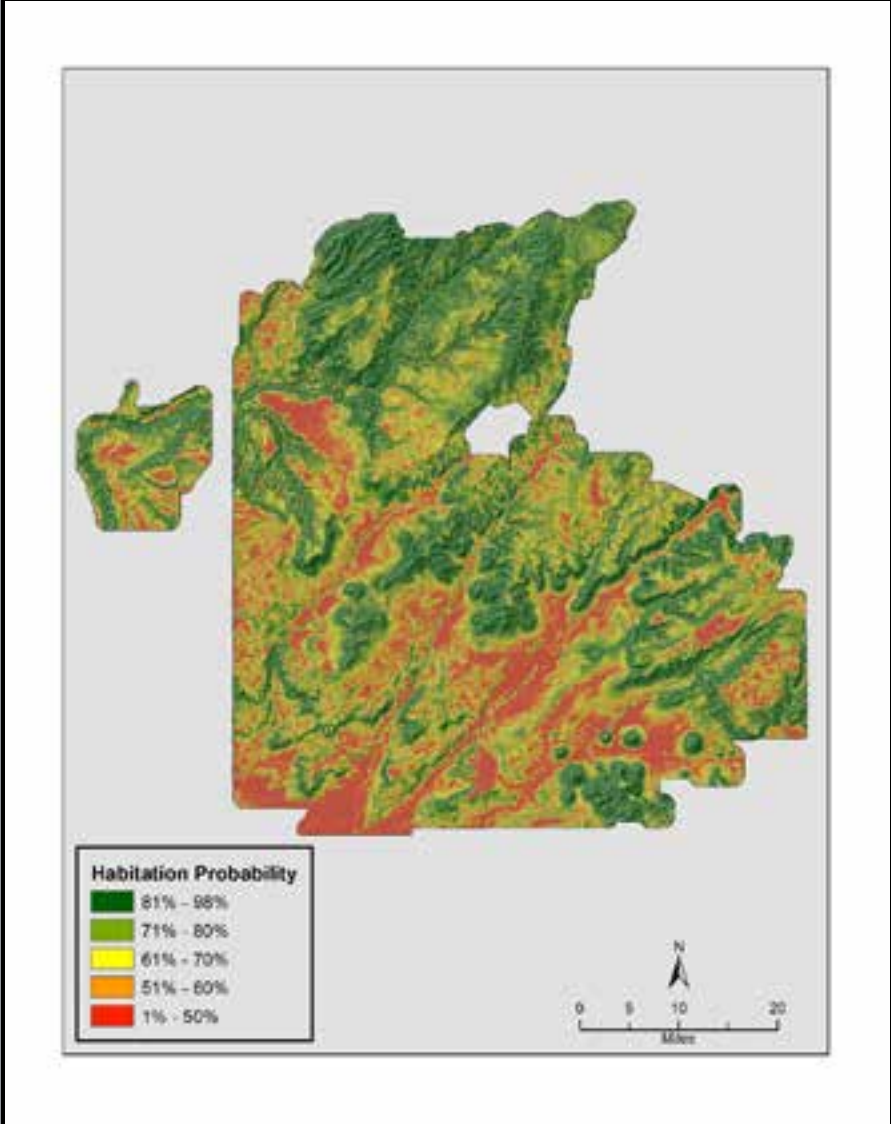
Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	6.271	5	.281
2	10.640	8	.223

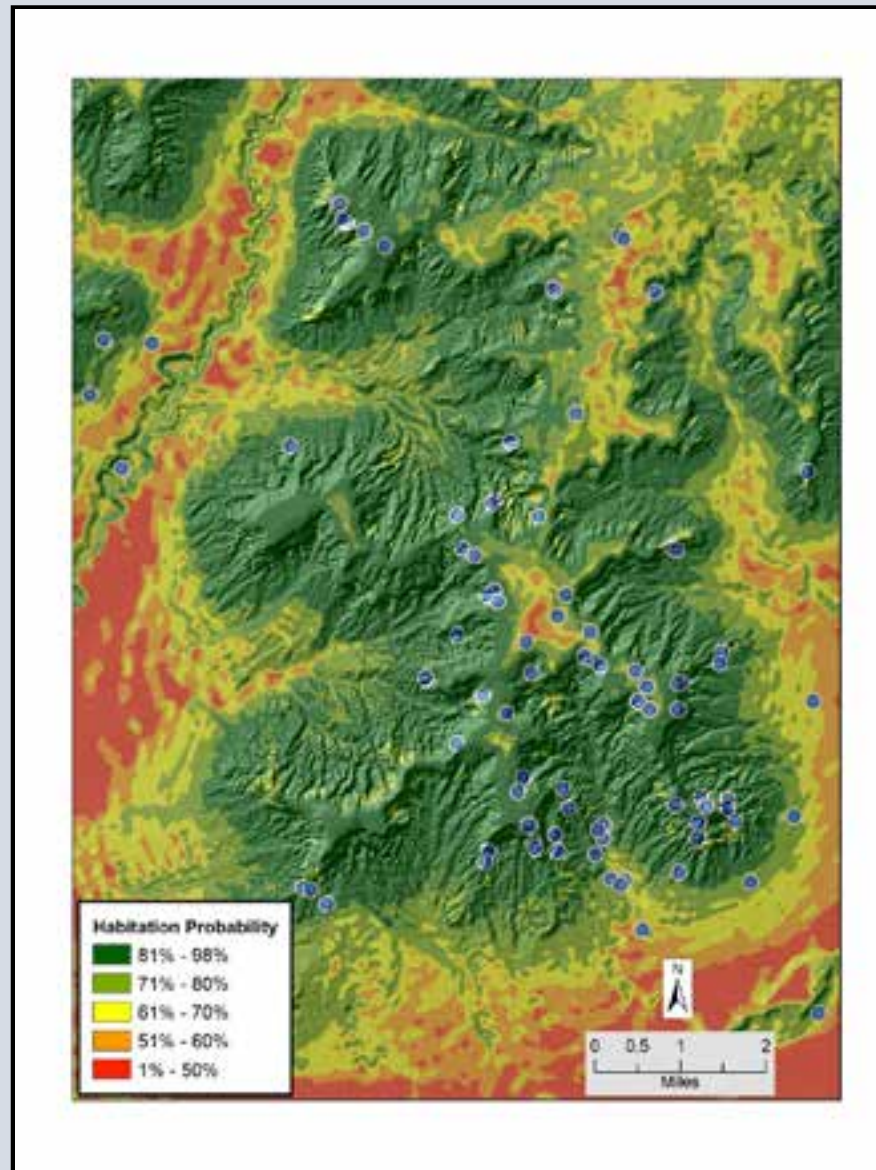
Distribution of Habitation Sites from 500 to 1500 AD



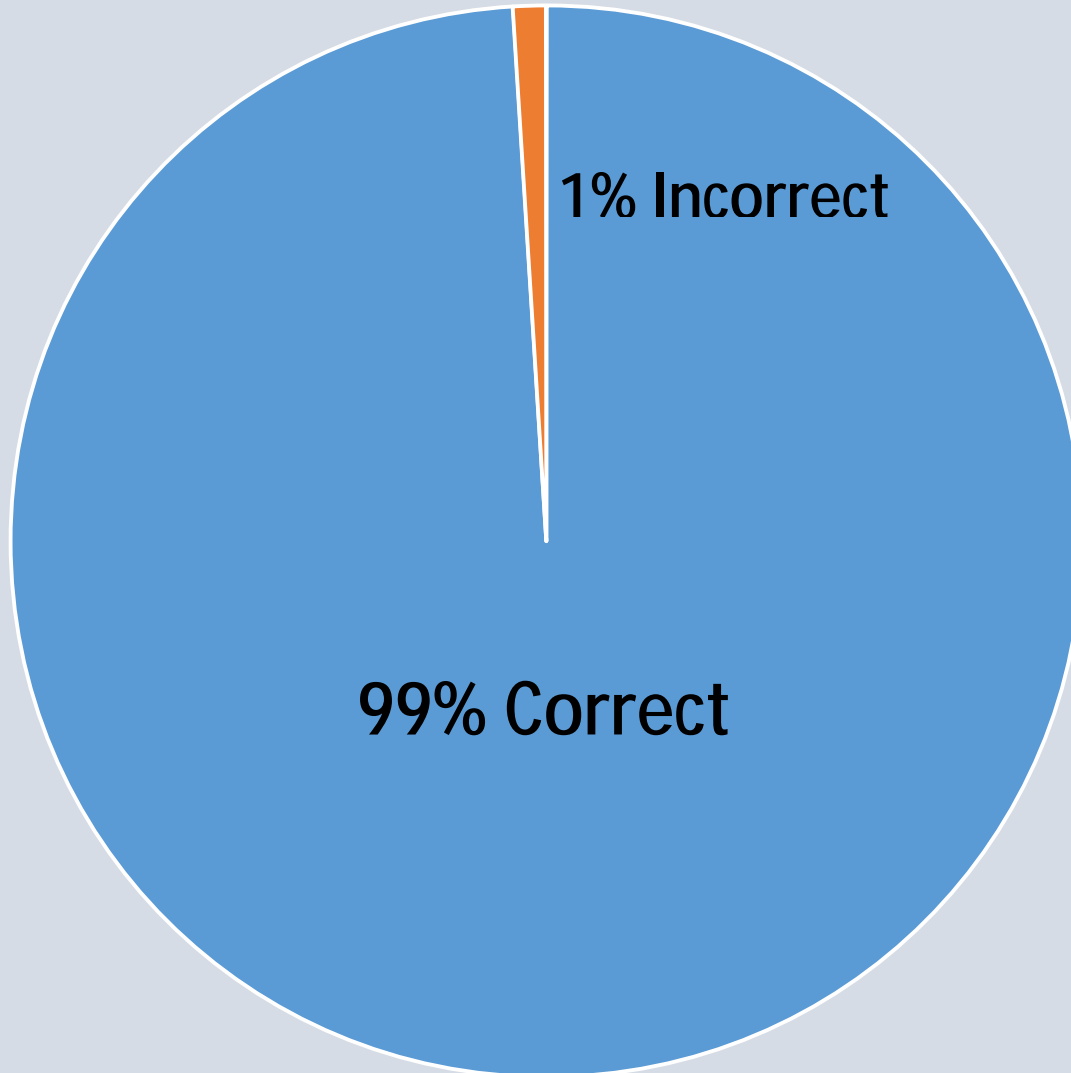
Habitation Site Predictive Model Results



Habitation Site Predictive Model Results (Continued)



Habitation Site Model Percent Correctly Classified Assessment



Habitation Site Goodness of Test

		Chi-square	df	Sig.
Step 1	Step	13.642	1	.000
	Block	13.642	1	.000
	Model	13.642	1	.000
Step 2	Step	17.380	1	.000
	Block	31.021	2	.000
	Model	31.021	2	.000
Step 3	Step	6.695	1	.010
	Block	37.717	3	.000
	Model	37.717	3	.000
Step 4	Step	6.747	1	.009
	Block	44.463	4	.000
	Model	44.463	4	.000
Step 5	Step	6.645	1	.010
	Block	51.109	5	.000
	Model	51.109	5	.000
Step 6	Step	6.072	1	.014
	Block	57.181	6	.000
	Model	57.181	6	.000
Step 7	Step	4.011	1	.045
	Block	61.192	7	.000
	Model	61.192	7	.000

Habitation Site Goodness of Test (Continued)

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	21.709	8	.005
2	5.855	8	.663
3	2.804	8	.946
4	2.741	8	.950
5	1.795	8	.987
6	3.888	8	.867
7	5.658	8	.685

Thank you!