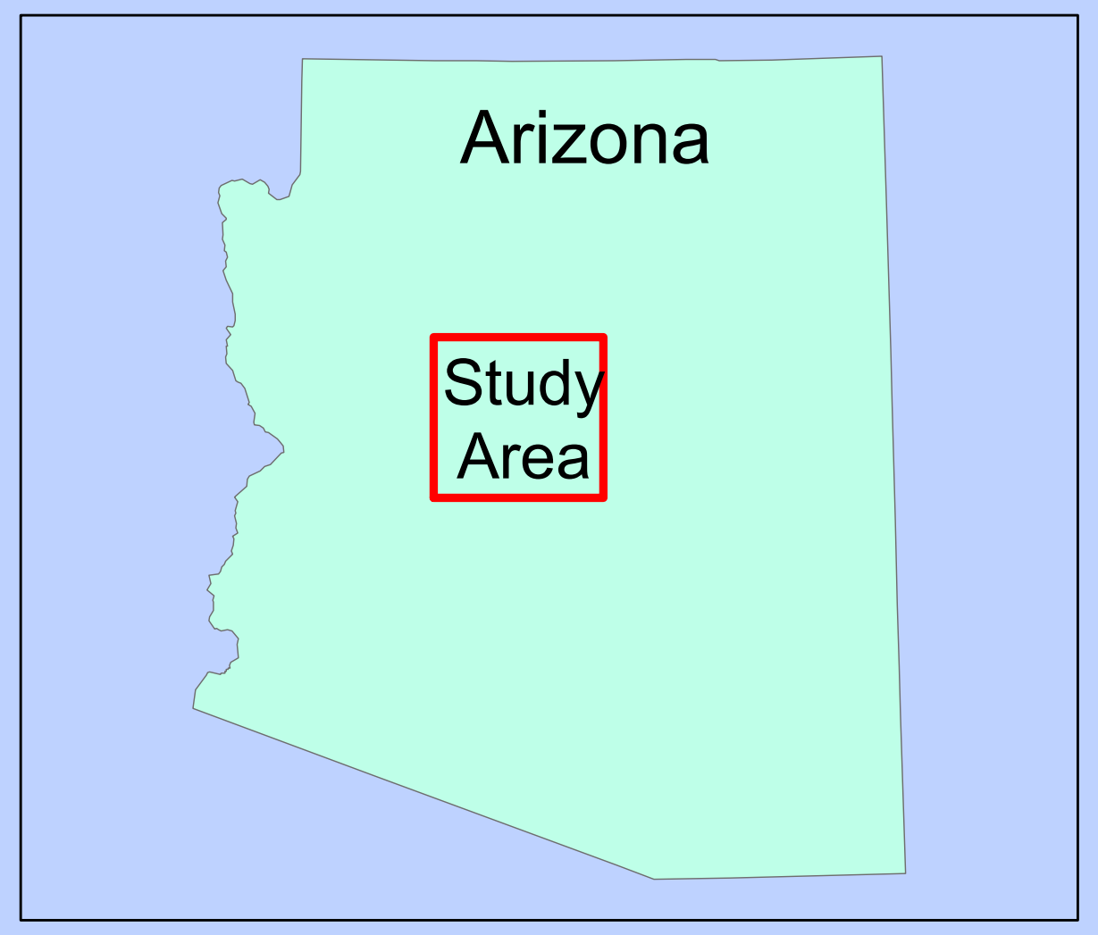
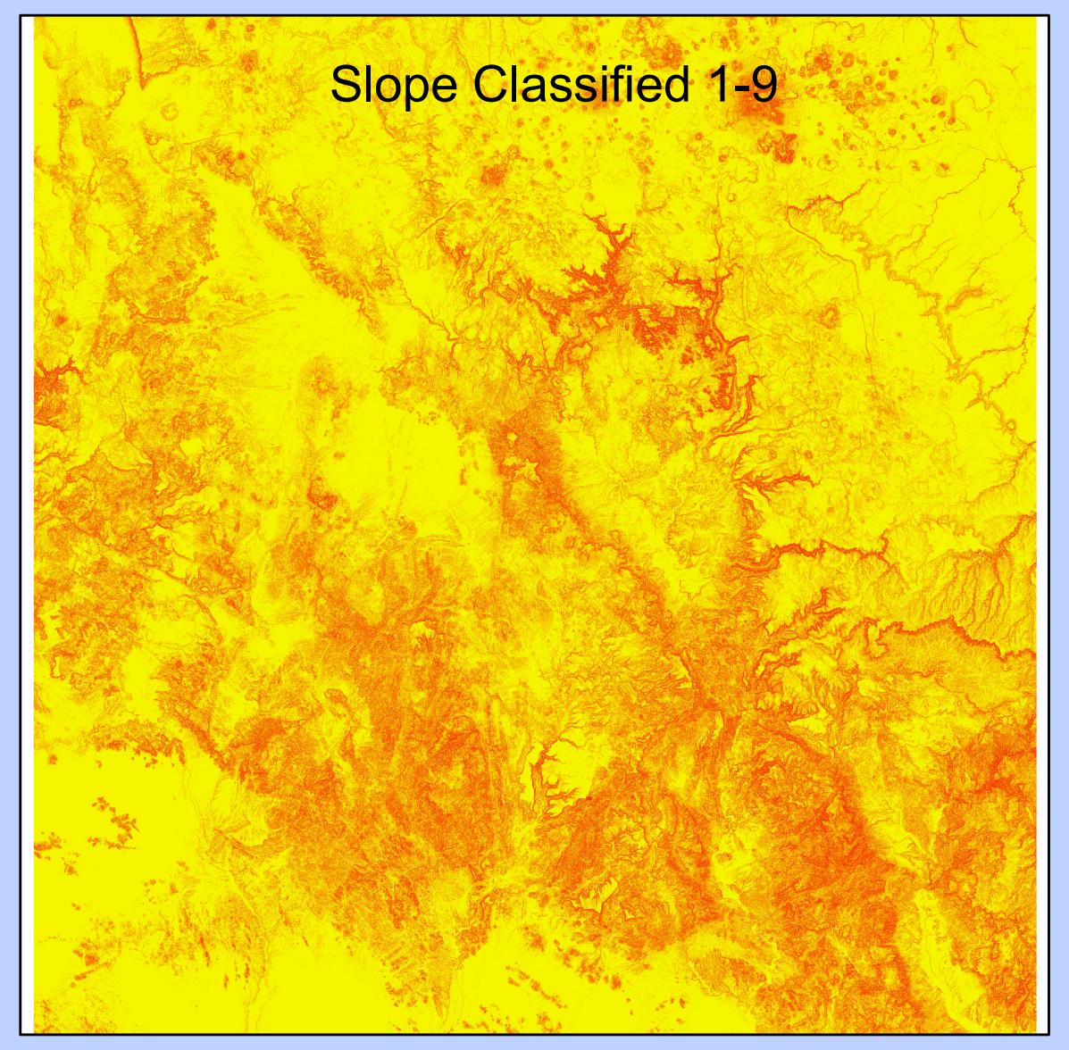
PREHISTORIC OBSIDIAN ACQUISITION IN WEST-CENTRAL ARIZONA

by: Michael S. Kellett 12/06/2019

INTRODUCTION

My research investigates prehistoric obsidian acquisition in the Northern and Southern Sinagua, Prescott, and Cohonina culture areas to elucidate obsidian foraging and exchange patterns among prehistoric groups that inhabited west-central Arizona. The spatial distribution of prehistoric features and elements of material culture lend themselves to archaeological study for the purpose of discerning the interactions between an area's population and neighboring people and cultures. I analyzed obsidian debitage and other artifacts at numerous, widely distributed prehistoric sites in west-central Arizona using a portable x-ray fluorescence (XRF) spectrometer, assign each sample to an obsidian source area based on microchemistry, and mapped potential obsidian exchange routes between source areas and points of deposition. I infer plausible routes of travel or exchange based on the overall spatial distribution of obsidian artifacts, landscape connectivity, proximity to water, and other variables. Preliminary work to date indicates that my research has great potential to explain foraging and exchange interactions among prehistoric groups that inhabited west-central Arizona.





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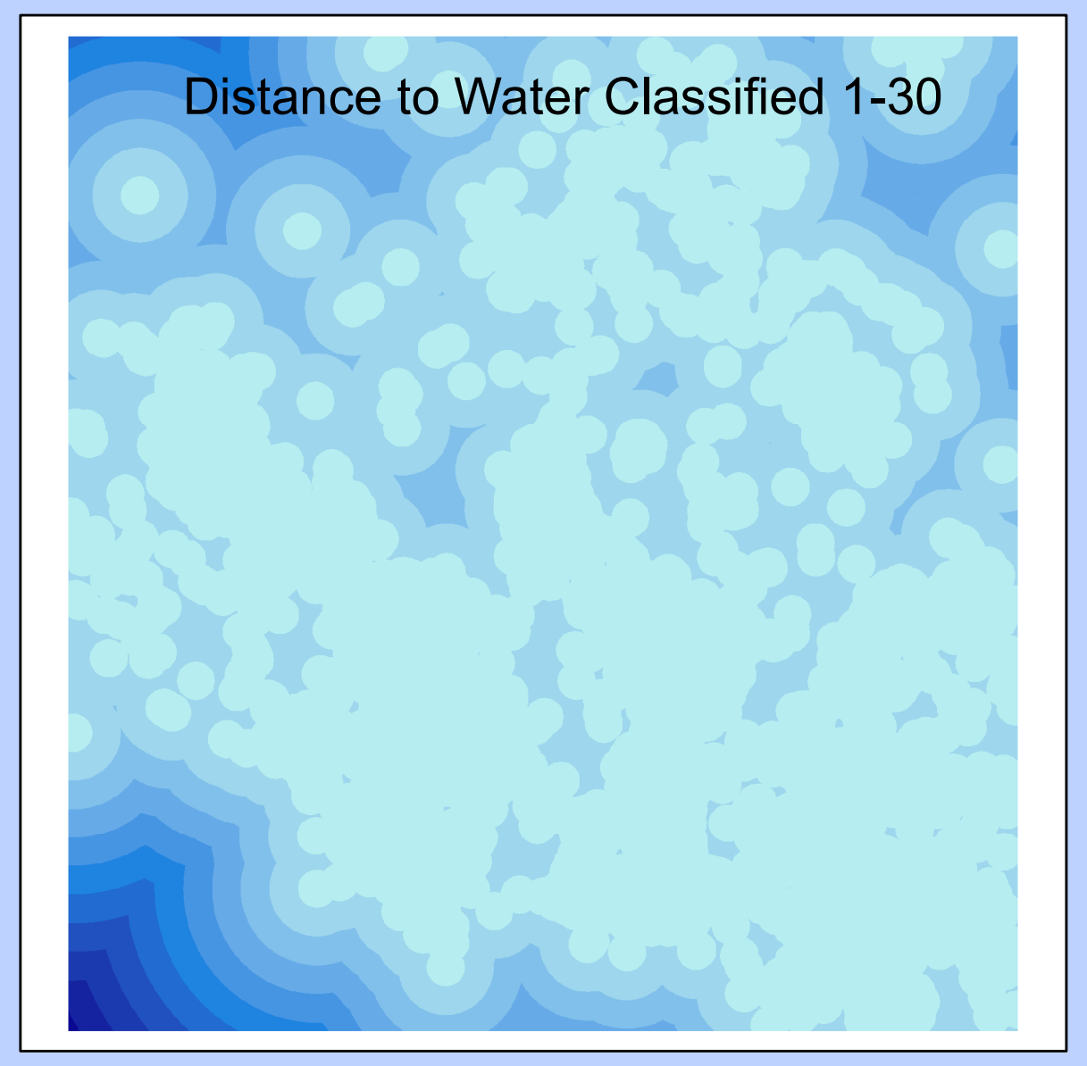

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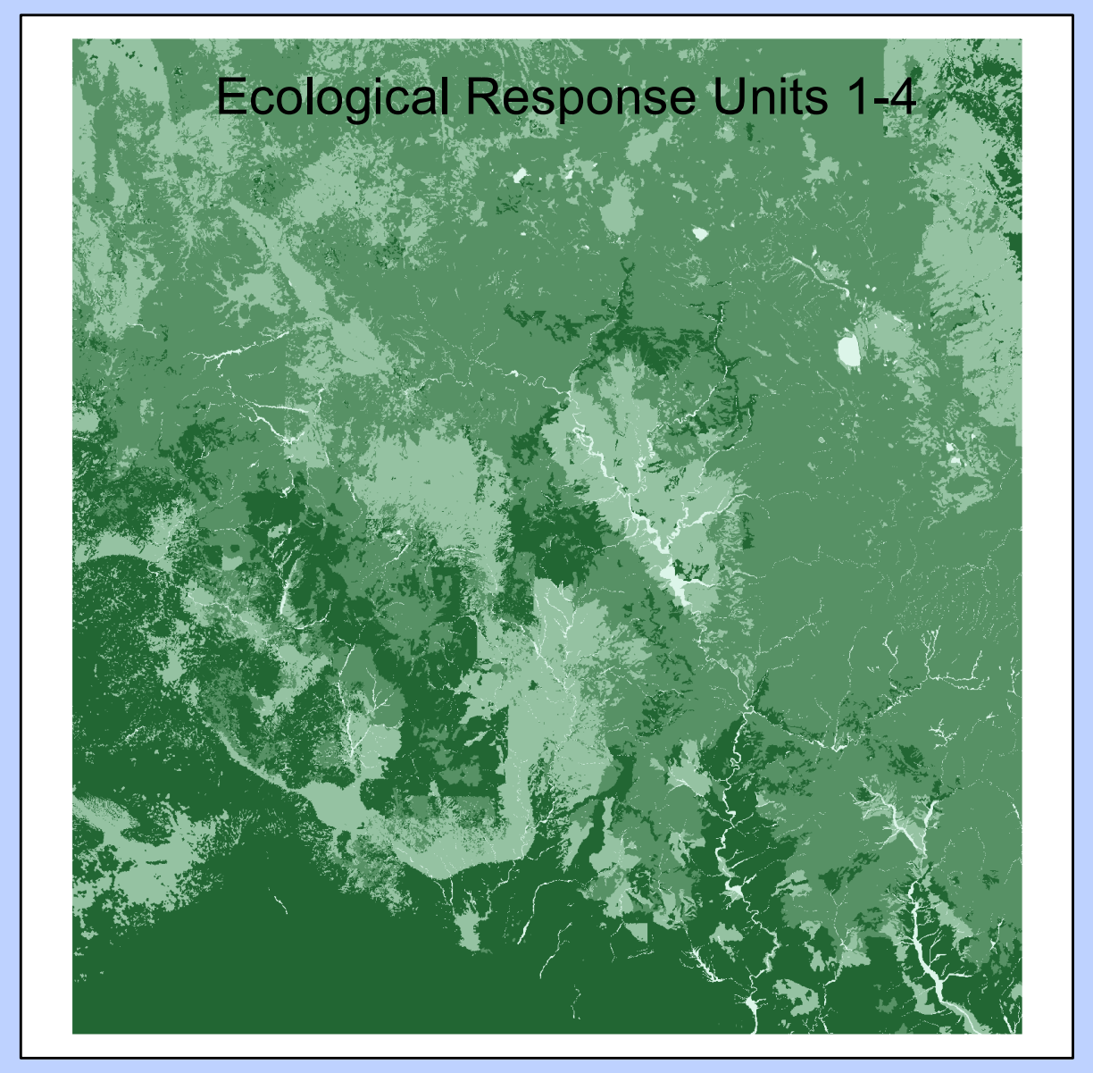

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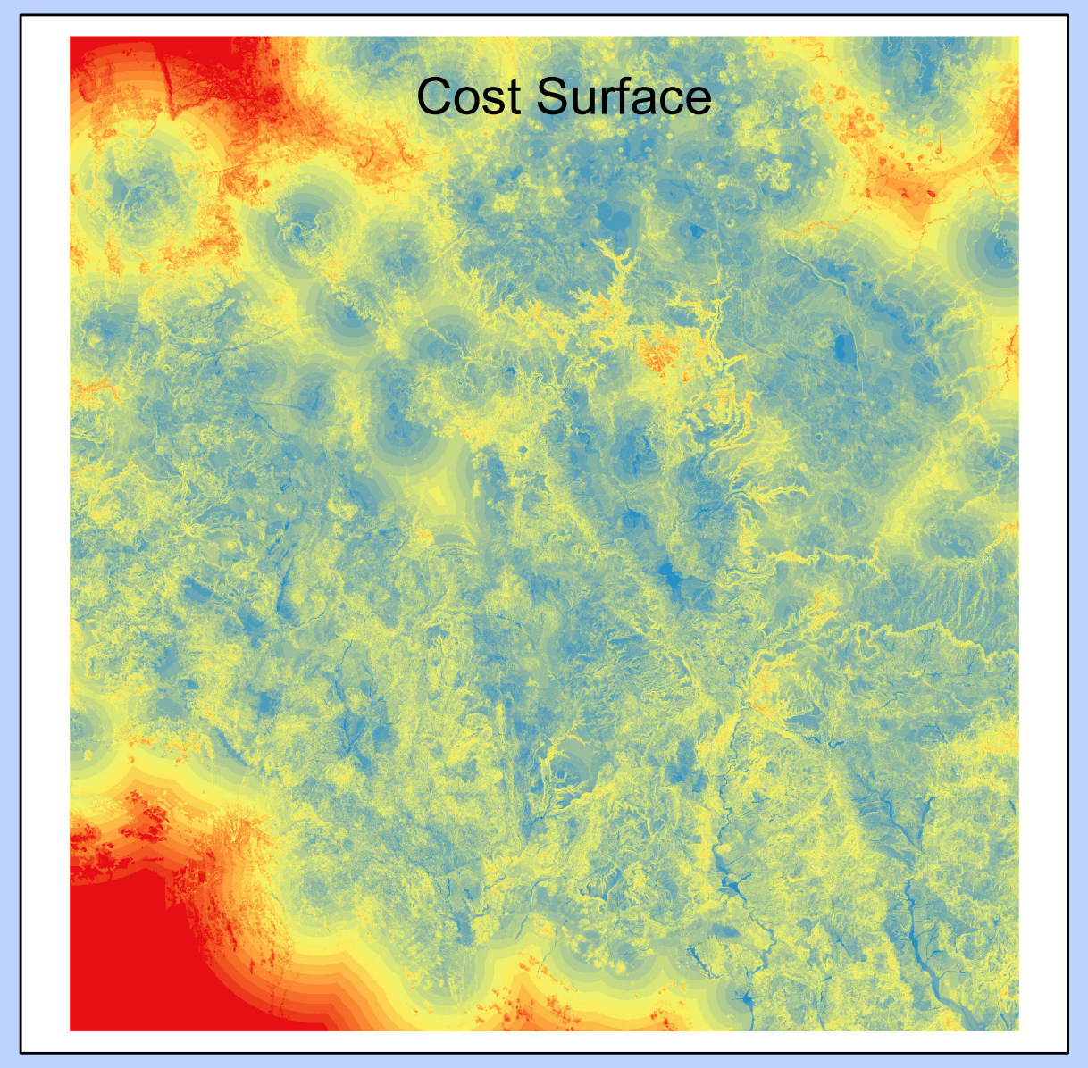

METHODS

I analyzed obsidian debitage and other artifacts at numerous, widely distributed prehistoric sites in west-central Arizona using a portable x-ray fluorescence (XRF) spectrometer, assign each sample to an obsidian source area based on microchemistry, and spatially arrayed the obsidian source areas and points of deposition. I then constructed two cost surfaces to facilitate least-cost path analyses of the obsidian source areas and spatially arrayed archaeological sites with obsidian artifacts within my study area. Each cost surface is a composite of 30-meter raster data representing slope, vegetation, and proximity to surface water. I derived the cost-surface slope data from a 30-meter digital elevation model [USGS 2018] using the ArcMap Slope Tool, and then classified the resulting slope raster data into nine classes using the ArcMap Reclassify Tool. The vegetation data in my cost surfaces are derived from ecological response unit (ERU) polygon data downloaded from USDA (2018). I added a value field to the attribute table of the ERU data, and assigned values based on the system type field (riparian = 1, grassland = 2, woodland or forest = 3, and shrubland = 4). I assigned the values (representing costs) based on desirability for foot travel, wherein riparian areas have the highest desirability and lowest cost given their association with surface water, and shrublands (which include chaparral) have the lowest desirability and highest cost. After assigning values, I converted the ERU polygons to raster data using the ArcMap Polygon to Raster Tool. I derived the proximity to water data for the cost surfaces from the National Hydrographic Dataset (USGS 2019) points representing springs. I converted the NHD spring points into raster data using the ArcMap Point to Raster Tool, then used the Euclidian Distance Tool to assign the distance to the nearest spring to each cell in the raster dataset. I subsequently performed two classifications of the resulting distance raster data using the ArcMap Reclassify Tool – the first into nine classes and the second into thirty classes. I compiled the two cost surfaces by adding together the classified slope, classified distance to water, and ERU raster datasets using the ArcMap Map Algebra Tool. Once the cost surfaces were built, I produced least-cost paths between each of the obsidian source areas and selected archaeological habitation sites with obsidian artifacts from the corresponding source provenance using the ArcMap Cost Connectivity Tool.

REFERENCES

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RESULTS

The difference between LCP-1 and LCP-2 between Government Mountain and Chavez Pass is based on the sensitivity of the two cost surface models regarding distance to water. The surface water on Anderson Mesa is supplied by springs along the east edge of the mesa. The Grapevine and Kinnikinick sites are situated on the east edge of Anderson Mesa adjacent to springs. Given the relative sensitivity of model 2 regarding distance to water, LCP-2 more closely aligned with the east edge of Anderson Mesa than LCP-1 and passes within 300 meters of the Grapevine site. The results for LCP-2 between Government Mountain and Chavez pass comport better than LCP-1 with Brown's (1991) conclusion that the Kinnikinick and Grapevine sites were major lithic manufacturing centers that supplied Government Mountain obsidian trade goods through Chavez Pass.

Both LCP-1 and LCP-2 between Chavez Pass and Fitzmaurice Ruin follow the Palatkwapi Trail route between Chavez Pass and Pine Spring described by Byrkit (1988). West of Pine Spring, however, LCP-2 more closely approximates the Palatkwapi Trail route south of Stoneman Lake described Byrkit (1988) in comparison to LCP-1. Both LCP-1 and LCP-2 pass approximately eight kilometers south of Beaverhead Spring, where Byrkit (1988) indicated the Palatkwapi Trail forked toward the Jerome Mines and the Salt Mine in Camp Verde. Both LCP-1 and LCP-2 cross the Verde Valley following Beaver Creek past the Sacred Mountain pueblo, Montezuma Well, Lake Montezuma pueblo, and the Dyck cave shelter, then follow Cherry Creek around the south end of Mingus Mountain before reaching Fitzmaurice Ruin.

Both LCP-1 and LCP-2 between Government Mountain and the Cindy H site follows the length of Walnut Creek west through the pass, then continue west along Muddy Wash to the Cindy H site. LCP-1 between Government Mountain and the Cindy H site intercepts a total of 22 other archaeological sites in my database. LCP-2 between Government Mountain and the Cindy H site intercepts a total of 17 other archaeological sites in my database. The majority of the sites intercepted by both LCP-1 and LCP-2 between Government Mountain and the Cindy H site are located along Walnut Creek, which supports Wilcox and Samples' (1990) conclusion that Walnut Creek was an important prehistoric travel corridor that provided connectivity for the Mojave Trail from the west.

LCP-1 between the Bull Creek source area and the Joes Hill East site intercepts eight other sites with Bull Creek obsidian artifacts and a total of 14 sites in my database. LCP-2 between the Bull Creek source area and the Joes Hill East site intercepts seven sites with Bull Creek obsidian artifacts and a total of eleven sites in my database. LCP-1 between the Bull Creek source area and the Joes Hill East site directly passes through the highest concentration of sites with artifacts from multiple sources in my study area, including the Fitzmaurice Ruin. My results suggest that the prehistoric exchange route connecting the Mojave Trail from the west with the Palatkwapi Trail from the east passed through Williamson Valley and the Fitzmaurice Ruin in the heartland of the Prescott culture area.