**Award Number (for administrative use only):**

**PR/J Number: R-7127-100102**

**PROJECT ABSTRACT**

**Colorado Plateau Cooperative Ecosystem Studies Unit**

**(Cooperative Agreement # H1200-09-0005)**

**Park:** Bandelier National Monument

**Project Title:** Structural Assessment and Monitoring of Cavate B002, Bandelier National Monument: Phase II, Tuff Testing and Analysis

**Funding Amount:** $7,050

**CPCESU Partner Institution:** University of New Mexico

**Principal Investigator:** Douglas Porter, Associate Professor

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**Start Date:** August30, 2010

**End Date:** August 30, 2011

**Abstract:** The mineralogy and alteration states of the Bandelier Tuff vary widely making it highly vulnerable to deterioration. Variability in tuff character ranges from large-scale, based on such factors as depositional strata, geographic location, and exposure, to small-scale variations based on mineralogical composition, biological growth, and localized decomposition. This project seeks to examine the pore structure and permeability of tuff immediately adjacent to cavate B002 in order to better understand the structural properties of the cavate and predict erosion rates that may lead to catastrophic collapse of the masonry enclosure wall.

Porosity and permeability have a strong correlation and susceptibility to weather, and are altered by weathering processes (erosion, disaggregation, deposition of deterioration products). Stone heterogeneity also plays a principal role in the types and distribution of stone weathering. The spatial distribution of permeability, considered along with porosity and other inherited characteristics of the stone, can result in a fuller understanding of variations in durability and types/distribution of different weathering forms.

To facilitate characterization of the tuff, samples representing the competent and weathered states of the tuff will be collected from the vicinity of cavate B002. The samples will be collected using a chisel and/or a battery-powered core drill and transported to a laboratory for analysis. The pore structure and permeability properties of the tuff will be determined and mapped using a combination of technologies including gas permeability, wicking tests, and microscopy with image analysis. This analysis should provide (a) useful predictors of the susceptibility to weather of the tuff in its several forms and (b) quantitative descriptions of the weathering profiles encountered at Bandelier.

By collating test results on volume porosity, pore area, pore size distribution, and water transport properties for each of the tuff compositions and weathering states, investigators will gain a basic understanding of their susceptibility to environmental deterioration. Profiles based on these measurements will provide powerful tools in the interpretation of weathering processes directly relating to cavate B002. These will play a critical role in subsequent research, including accelerated weathering, modeling of tuff hydrology, determination of erosion rates, and development of preservation strategies.

**Keywords:**

**Cultural Resources**

Modeling

Native American

Archaeology

Historic Preservation

**Geology**

Tectonics / Structural Geology

Hydrogeology

Miscellaneous