

Assessment of WUP Volcanic Soils and SUCR Volcanic Cinder Terrain

Begin date: 07/01/2015; end date: 06/30/2019

Total allocation: \$18,000.00

Project Summary:

Per the project agreement, the services provided by the principal investigator (Dr. Kirk C. Anderson) will support a collaborative project that provides an assessment of natural resource conditions for Wupatki National Monument (WUPA) and Sunset Crater National Monument (SUCR). This project will assist resource management staff in assessing specific park-based resource priorities and needs. The project involves an interdisciplinary team of specialists whose objectives include characterizing biological and physical resource conditions at appropriate scales; defining threat and stress factors and their relationship to identified resources; identifying critical data gaps; and suggesting data collection or resource investigations to address those gaps.

MNA's focus for this project addressed recent Sunset Eruption tephra deposits, including unique effects on soil nutrient cycling, ecosite stability, and resultant increased vegetation productivity at WUPA. The focus will also be on the condition of unique volcanic eruption features (e.g., fumarole deposits), larger landforms (e.g., cinder cones), and unconsolidated scoria/cinder/ash slopes at SUCR. Field visits to selected locations within each monument supplemented the review of published and archival literature.

Work was completed by MNA in two phases, one at WUPA and one at SUCR. Deliverables comprised two separate chapters that were included within Natural Resource Condition Assessment volumes for each monument. For the WUPA Volcanic Cinder Soils Assessment, MNA provided a chapter that explored the unique aspects of the WUPA cinder soils, integrating a review of scientific publications, technical reports, NPS file information, and GIS-based spatial data on the volcanic cinder soils and their conditions at WUPA (provided by NPS). The chapter included a summary of pertinent scientific and technical data on the timing and extent of the Sunset Volcano Eruption and unique effects of resultant tephra deposits on soils, geomorphic stability, and ecosystem productivity at WUPA, including the relationship to prehistoric agriculture and land use patterns. The chapter also described potential effects from prehistoric, early historic, and post-settlement land-use (primarily livestock grazing, homesteading, NPS facility development, and public recreation) on soil function, stability, and vegetation productivity. Finally, the report summarized potential impacts and concerns under climate warming scenarios.

For the SUCR Recent Volcanic Cinder Terrain Assessment, MNA again reviewed scientific publications, technical reports, NPS file information, and spatial data on the volcanic cinder terrain and resource conditions at SUCR. The chapter summarized scientific and technical information on soil formation and primary ecological succession in the recent volcanic cinder terrain at SUCR, including a comparison to published results on older cinder cone volcanoes in the San Francisco Volcanic Field (chronosequence) and methods to identify or estimate human land use and recreational use thresholds that may disrupt ecological processes. A summary of potential impacts and concerns under climate warming scenarios was also included, which addressed potential effects of land-use (primarily timber extraction, NPS facility development, and public recreation) on soil formation, landform stability, and vegetation establishment.

In order to disseminate the project results to a broad public and academic audience, the final NRCA report is posted to the NRCA website at (<http://www.nature.11ps.gov/water/nrca/repo11s.cfm>). The final NRCA report and supporting GIS data will also be uploaded to the Integration of Resource Management Applications (IRMA) Data Store site, another site accessible to the public where NPS documents and datasets are stored (<https://inna.nps.gov/App/Portal/Home>).

MNA's chapters for the two NRCA volumes were accepted as final in late 2018. All field data and research results compiled by MNA in the course of this project are on file at Flagstaff Area National Monuments (FLAG).