Final Report

**Development and Testing of an Archeological Site Condition
Assessment and Monitoring Mobile Application**

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Introduction

The National Park Service (NPS) Midwest Archeological Center (MWAC) received CRPP grant funding through the National Center for Preservation Technology and Training in FY16 to create a mobile application for the collection of archeological site condition and monitoring data at Midwest region parks. Interest in the development of such an application has spiked in the past two years as tablet and smartphone use increased in the parks. MWAC proposed to develop an application that could be used by archeologists, law enforcement rangers, and other park staff, to simplify data collection and make the management of these data more efficient for our staff. The following report will discuss the creation of this application, results of the testing, obstacles that were overcome during the development, and future plans and recommendations for the implementation of this data collection workflow across the service.

Application Development

MWAC successfully created a mobile data collection workflow for archeological site condition assessments and ranger monitoring using the NPS "Developer" Portal for ArcGIS Online (DEVPORTAL) website (https://geospatial.nps.gov/devportal/) and Collector for ArcGIS application. We were unable to use the NPS Portal for ArcGIS Online (PORTAL) (https://gisportal.nps.gov/) for data hosting as originally planned. The reason for this change will be discussed in the "challenges" section of this report. Due to the sensitivity of the archeological data, it was necessary to use either the PORTAL or DEVPORTAL to ensure that the data remained on NPS servers behind the firewall. We are not able to host sensitive archeological data on the NPS Organizational ArcGIS Online site (AGOL) (https://nps.maps.arcgis.com/) at this time. Data hosted on AGOL are stored on ESRI servers, outside the firewall, which do not meet current NPS data security standards.

Park specific webmaps were created on the DEVPORTAL for site condition assessments and monitoring purposes. The archeological site location data, which MWAC already maintains in ESRI geodatabases, was provided in the webmaps through secured feature services also hosted on the DEVPORTAL. Archeologists, park rangers, and park staff conducting site condition assessments and monitoring accessed these webmaps through a secure group created by MWAC. Only members of the group, invited by MWAC, can access the map and see the archeological data. After joining the group, staff used the Collector mobile application to access the map on a mobile device. The map provided site locations, a basemap such as a topographic map or an aerial photograph, and a form for the input of condition and monitoring data. The archeologist or ranger downloaded the map to the iPad and used the map to navigate to sites and collect new site location data or update the location, take a photograph, and complete the data entry form. Different data collection forms were provided based on whether the user was an archeologist or ranger. The data was synchronized automatically with the data stored on the NPS servers if the map was used over a cellular network or, if the map was downloaded the data synced when the user returned to wireless internet connectivity. None of the iPads used in the testing are currently equipped with cellular service so no real-time data update testing has been accomplished to date.

Once the data were synchronized to DEVPORTAL, MWAC staff downloaded the data to MWAC servers. We began by importing the attribute information collected during the assessments into a Microsoft Access database to produce a printable report. This step allows the staff to review the information collected in the field for errors and make corrections to the database before it is uploaded into the park's spatial geodatabase and ASMIS. It also allows us to produce a paper or digital form that can be archived in the MWAC collections for the associated project. Documentation for every aspect of both workflows was also developed.

The data collection workflow was tested at three parks. The site condition assessment workflow was tested at Wind Cave National Park and Badlands National Park. The ranger monitoring workflow was tested at Voyageurs National Park (VOYA). We are currently in the process of testing the ranger monitoring workflow at a second park, Ozark National Scenic Riverways (OZAR) this fall (FY17). Fieldwork schedules did not allow for testing at this park during FY16. IPads were provided to both VOYA and OZAR for testing. This allowed us to test the entire work flow from database creation through data collection and then integration with our existing data in the office. Several changes to the original workflow were made based on the responses from the testers.

Challenges to Application Development

While we were successful in creating the application we originally proposed to develop, several obstacles remain before this workflow can be fully implemented. These challenges are mainly related to the NPS infrastructure and security requirements. Unfortunately, we have little control over when these obstacles to implementation will be resolved as they remain out of our control.

The main challenge at this time is the configuration of the "official" NPS Portal for ArcGIS Online (PORTAL) (https://gisportal.nps.gov/) which does not allow for offline data collection. Meaning, when the user is not connected to a wireless or cellular network, they cannot collect data using the application. This is a problem since the application needs to function in remote areas that are not covered by cellular data networks. And some parks do not have the funds to purchase iPads with cellular connectivity or to pay for the required data plan. So we view offline data collection as a necessity for final implementation of this data collection workflow.

For development and testing of the application, we were able to use the soon to be released DEVPORTAL. The DEVPORTAL is only in a testing phase and has not been released for use by all NPS employees. Unlike the current PORTAL, the DEVPORTAL has been properly configured to allow for offline data editing which allowed us to create and test our application. Eventually the DEVPORTAL will replace the current PORTAL, making this data collection workflow accessible to all NPS employees. We hope that this happens soon, but the timing is out of our control. NPS Resource Information Services Division (RISD) manages both portals and controls their development and access. So unfortunately at this time, we are completely reliant on RISD to make this happen.

Constantly changing NPS security requirements created our second greatest challenge. Within the last year, the NPS began requiring two-factor authentication requiring the use of your PIV card and PIN to access the NPS network from a mobile device connected to a public wireless network. This significantly changed the process for mobile data collection of sensitive data. To download a map from the DEVPORTAL for data collection the user must be able to connect wirelessly to the NPS network. This can be accomplished through access to a NPS wireless network, which at this point is not available in may park locations, or by using a PIV card reader that connects to the iPad to be able to login to the NPS network from a public wireless network. Card readers were not available or approved at the time of the security change and we were not able to purchase one for testing until mid-summer 2016.

The approved Thursby card readers work similarly to the current VPN process for logging into the NPS network using Pulse Secure software on a desktop. The card reader is plugged into the iPad and a Pulse Secure mobile application is then used to log into the NPS network. Once the card readers became available they worked for a short period of time before an update to the Pulse Secure app made the card readers incompatible. Thursby and Pulse secure are working to update the software so that they are compatible again. In the latest update we received, early 2017 is the best estimate for when the app and card reader will begin working together again. Until this happens, users will need to have access to an NPS wireless network to be able to use our data collection workflow.

Conclusions and Recommendations

In conclusion, we were successfully able to create a data collection workflow for securely recording archeological site condition and monitoring data on an iPad using free (to NPS users) ESRI software. The workflow can be implemented in any region and easily modified to meet the needs of varying users across the NPS. Our detailed "how-to" and instructional documentation will allow anyone to easily duplicate our workflow and implement it at their own office. We have received numerous inquiries over the last year from several regions interested in our app development, so we expect to share this documentation many times in the coming year. However, until the DEVPORTAL becomes the official PORTAL, this workflow shouldn't be implemented by other regions. The DEVPORTAL is only for testing purposes and should not be used at this time for data collection on a regular basis. Any data stored on the DEVPORTAL will most likely be deleted when it is converted. Since we cannot determine exactly when this change will take place we cannot recommend that other regions should begin to implement our data collection workflow. This is part of the frustrating reality of using emerging technology in a rapidly changing IT security environment. Hopefully, the NPS will be able to make the necessary changes to finalize the DEVPORTAL as soon as possible so that our office and many others will be able to begin to use this extremely useful free software for data collection. The possibilities are endless for how this software can be used to collect information on the important resources the NPS is dedicated to protecting and conserving. Anything that can make this job easier and more efficient for NPS staff is sorely needed in the current tight budget situation in many parks.