



## ***Integrating Military Training and Archaeological Site Integrity: A Data Analysis Approach***

**Project  
09-435**

### **Background:**

The purpose of this study was to identify practical methods to measure impacts of military training activities on archaeological resources on Department of Defense (DoD) installations with the goal of sustaining these activities while complying with cultural resource stewardship responsibilities.

In order for an archaeological site to remain eligible for the National Register of Historic Places (NRHP) it must retain sufficient integrity to convey its significance. How much impact an archaeological site can sustain without losing its necessary integrity and how to measure the impact is as yet unclear. Considerable research has been done both on the impact of military vehicles on soils and on the nature and distribution of archaeological sites on military installations. While some of these studies have focused on the vulnerability of archaeological sites to predictable impacts from vehicle traffic, the research has been primarily qualitative rather than quantitative in nature. This project proposed to integrate the body of knowledge concerning the effects of military training and testing activities on archaeological sites with information about archaeological site distributions, characteristics, sampling strategies, and evaluation criteria. The end result was proposed as a series of recommendations for practical methods aimed at assessing site impacts.

### **Objective:**

The objective of the project was to identify methods to measure impacts of military training on archaeological resources with the goal of sustaining these activities while complying with cultural resource stewardship responsibilities.

### **Summary of Approach:**

The major challenge for this study was assessing ways of modeling the thresholds at which vehicle impacts from military training may adversely affect the NRHP eligibility of an archaeological site. The investigation began with a review of current literature regarding site significance and the assessment of site integrity, or the ability of a site to convey its significance. Next, archaeological site formation processes were summarized to review current understanding of the ways in which the archaeological record is both formed and transformed by human and natural agents. The extensive literature on the interaction between military vehicles and landscapes, particularly as presented in a field of research known as terramechanics, was then reviewed. Finally, geoarchaeological studies of soil mechanics and soil deformation were examined for relevant information to help bridge the sometimes abstract terramechanics research with the observations made concerning archaeological site formation processes.

### **Benefit:**

The project will assist DoD installations nationwide that conduct training exercises in the field in meeting their cultural resources management compliance requirements while

maintaining mission-critical training activities. The results of the investigation assessed the types of information necessary to determine minimum and maximum levels of disturbance sustainable by NRHP-eligible sites and whether or not such information is available or routinely collected in the course of present cultural resource investigations. The end result will be the ability to design and execute training exercises that can be conducted in areas containing potentially vulnerable archaeological resources, rather than having to avoid those areas as is currently often the case.

### **Accomplishments:**

The investigation indicated that a potentially large and complex set of variables could be incorporated into the modeling process. Careful selection of a subset of these variables focused on the creation of a model grounded in real-world conditions. The selected variables are related to: a site's cultural attributes; a site's locational/environmental attributes; and military vehicle attributes.

Recommendations for specific data type or formats were proposed:

- Major data categories that should be collected systematically include: artifact and feature density; representativeness and redundancy of cultural deposits; depth of deposits; and the spatial distribution of cultural materials.
- Soils data, including texture, horizonation, and other physical and chemical attributes, should be collected on a finer scale than are currently mapped in most USDA soil map units that typically exceed 10 acres in size. These data should be integrated with LiDAR information where possible to enhance topographic resolution.
- Experimental studies should be developed to link archaeological site formation processes with military vehicle impacts, particularly on actual training landscapes as opposed to the analysis of hypothetical data or analyses of ruts created in controlled circumstances.
- Eligibility determinations should be conducted on sites that are currently categorized as potentially eligible to determine whether or not they actually retain sufficient integrity for NRHP eligibility and thus require protection from military vehicle impacts.

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