



Department of Defense Legacy Resource Management Program

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**Identification and Status of Sensitive Bat Habitat
Resources on the Marine Corps Air Station Yuma,
Barry M. Goldwater Range, and Yuma Proving
Ground**

Year 1 – Technical Analysis

**Technical Analysis for the Development of a Remotely-Sensed
Model for Identification of Potential Subterranean Bat Features
Across the Barry M. Goldwater Range and Yuma Proving Ground,
Arizona.**

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SUMMARY

This project identified diurnal bat roost structures (i.e., caves and mines) on the combined lands three Department of Defense (DoD) lands: Barry M. Goldwater West (BMGR West), Barry M. Goldwater East (BMGR East), and Yuma Proving Ground (YPG). This effort was facilitated through the development of a remotely sensed Geographic Information System (GIS) based model that utilizes site specific geo-referenced macro-variables to predict potential bat roosting features on the three DoD installations.

Model Development

In order to identify potential bat roost structures (caves, crevices, and mines), we developed a Geographic Information System (GIS) based modeling framework. We structured the framework around known bat roost locations within the study area to determine what macro site conditions exist that support roosting bats in mines and caves. We included datasets from various sources (*see Data Sources below*) and imported the geographic coordinates of these features (including caves, crevices and mines) into ArcGIS (version 10.0; Environmental Systems Research Institute, Redlands, California, USA) and related them to datasets describing terrain and landform characteristics (*i.e.*, aspect, slope, landform type, vegetation, elevation, and surface formation; Table 1).

TABLE 1. Datasets related to feature and bat roost locations on military lands in southwestern Arizona, 2011.

DATASET	DATA TYPE	DESCRIPTION
TERRAIN	Elevation, Slope, Aspect	Elevation, slope, aspect: 30 meter raster data layers
LANDFORM	Categorical	USGS Southwest ReGAP 2007
VEGETATION	Categorical	USGS Southwest ReGAP 2007
SURFACE FORMATION	Categorical	Arizona Geological Survey Geological Characteristics dataset

We determined the frequencies of each covariate associated with roost site locations and reclassified each into an ordinal ranking, with values ranging between one and ten. Higher values were associated with a higher frequency of occurrence. Each covariate was assigned an equal influence value and combined using a weighted-overlay analysis (ArcGIS; Spatial Analyst Extension). The final model is a surface dataset with values ranging between (0-10) where ten being the most suitable habitat and zero is the least suitable (Figure 1). We used the resulting raster dataset as a matrix to direct sampling efforts. This likelihood model described the lands on a scale ranging from three (lowest likelihood) to ten (highest likelihood). We applied the top results of this model (red/orange colors; Figure 1) to focus our search efforts. For each of the three installations, we focused efforts specifically in areas predicted with high likelihood of bat roost habitat.

Data Sources

Development of the habitat suitability model required baseline bat roost location data to determine what macro-variables exist that support roosting bats in mines and caves across the three DoD military installations in southwestern Arizona. BMGR East has the largest population

of known bat roosts compared to the other installations surveyed during this study. We included a dataset of known bat roosts (n = 234) on BMGR East. These historical inventories were surveyed by Dalton and Dalton (1994) and Dames and Moore (1996) and were reviewed, revisited and summarized in a report (Lowery and Ingraldi 2006) with the additional locations of roosts identified in Lowery and Ingraldi (2006). We were not aware of any documented bat roosts on BMGR West during model development.

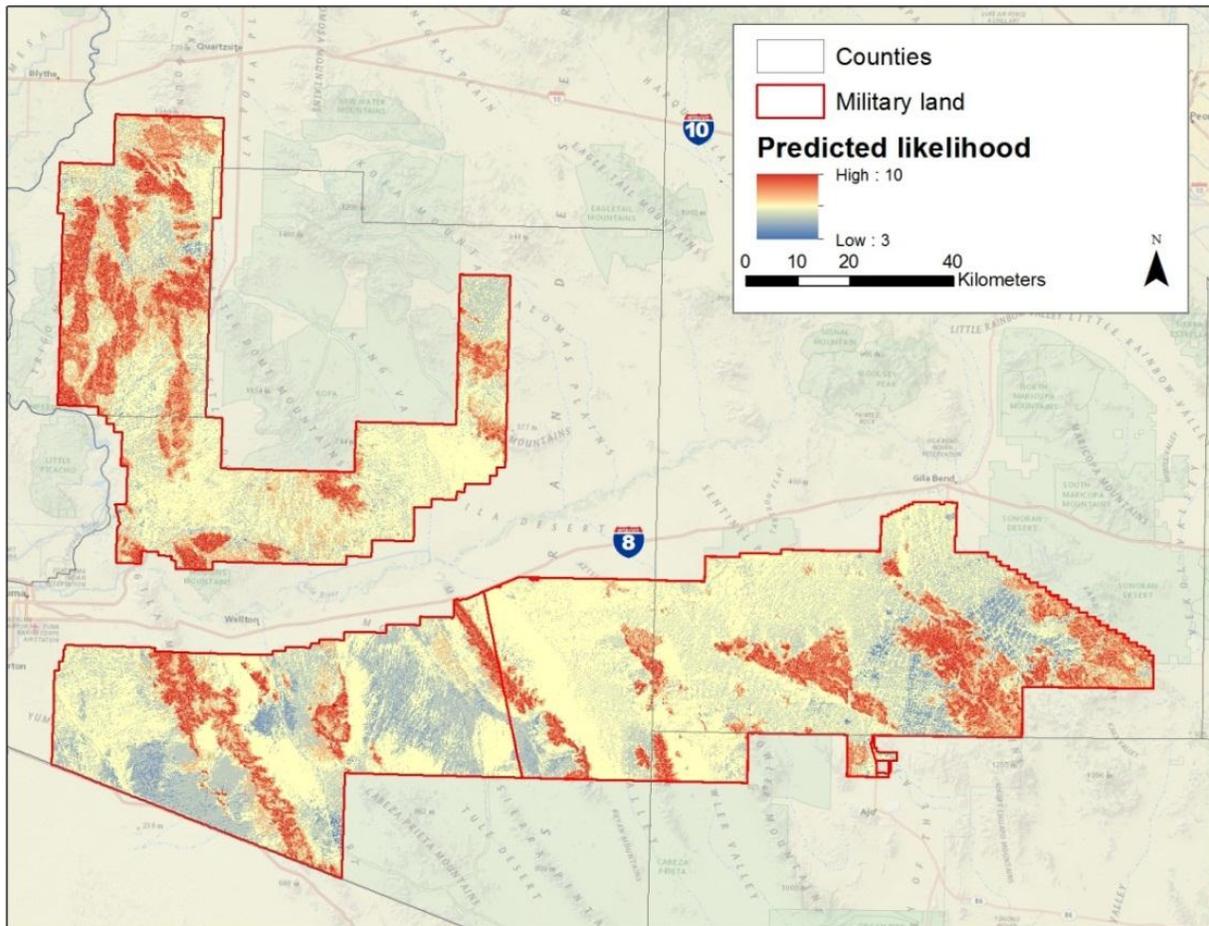


Figure 1. Predicted likelihood of bat roost habitat on military lands in southwestern Arizona, 2011.

LITERATURE CITED

- Dalton, D.C. and V.M. Dalton. 1994. Mine/Bat Survey: Eastern and Western sections, Barry M. Goldwater Air Force Range. Contract No. DACA65-92-M-1138. Report to Luke Air Force Natural Rec. Prog.
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