Background:

Military installations face many challenges that impact their ability to carry out their military mission. An increase in land use and development, water resource constraints, climate change impacts, and declining species and associated ecological systems are impacting Department of Defense (DoD) inside and outside their installation boundaries. More and more, a regional, multi-stakeholder approach to planning and land management is the only way to continue to preserve lands for military training and testing activities. To address species protection requirements at this regional scale, the military needs to know where species occur and how they are doing on and off military lands. In addition, knowing where at-risk species potentially occur or could be restored is critical to the long-term success of balancing military and natural resource needs.
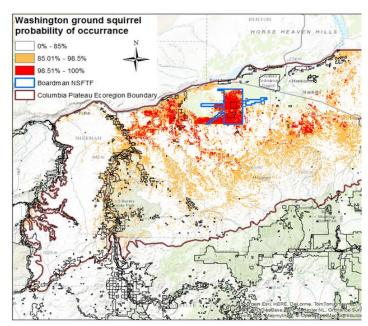

Figure 1: Predictive distribution map for the Washington ground Squirrel. Red areas indicate where the species is most likely to occur.

Goal and Objectives:

The overall goal of this project is to demonstrate standard methods for identifying known and potential locations of high priority at-risk species occurring on and around three DoD installations (Eglin Air Force Base, Boardman Navel Weapons Systems Training Facility, and Fort Huachuca Military Reservation), assess these areas for potential impacts to these species, and then make recommendations for conservation and mitigation based on these assessments.

Summary of Approach:

To achieve the objectives, the project team worked with the natural resource staff of the three installations to select a sample of high priority species that are imperiled and of concern to the installation due to the fact that these species could impact military activities (hereinafter "at-risk species"). Then the project team created predictive distribution models for these at-risk species using the "random forest" modeling package - the best approach when prediction accuracy is the primary goal. Inputs included many types of environmental data including highly detailed species occurrence data, and input from species experts on the species probability cutoff thresholds. This process resulted in very accurate predictive models identifying where species are known to occur, and where there is a high probability of occurrence in and around the installations. Figure 1 shows the results of the predictive modeling for the Washington ground squirrel in and around the Boardman Naval Weapons Systems Training Facility. Next, the team integrated the predictive modeling results with many land use and land management data layers into the decision support tool NatureServe Vista. It is specifically designed to support a regional analysis of land use and land management effects on species conservation goals. This analysis provided information on the degree of impact each land use could have on each at-risk species, leading to the identification of areas of conflict and areas of mitigation opportunities. Figure 2 shows the results of the vulnerability assessment for the Ridge-nosed Rattlesnake in and around Fort Huachuca. Based on the vulnerability assessment results, the team was able to work with DoD staff to determine where threats or opportunities for recovery are located in and around the installations.

Benefit:

The probable or potential distribution is among the most important information to adequately plan for species protection and recovery. The predictive species modeling and assessment methods demonstrated in this project can
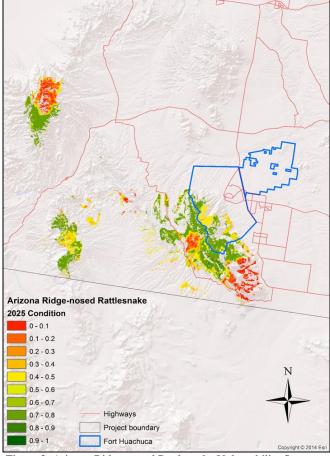
Figure 2: Arizona Ridge-nosed Rattlesnake Vulnerability Score Map for area in and around Fort Huachuca. Red indicates the most vulnerable areas.

contribute to reducing the decline of at-risk species thereby precluding some species from being listed under the Endangered Species Act, and reducing the long-term impacts to military installations. This is accomplished through a better understanding of the full extent of potential impacts and range of successful conservation management strategies that can be applied to high priority imperiled species on and around the installations in collaboration with other land owners and land management agencies.

The following are some potential applications of the project methods.

- Species distribution models can narrow areas to target for species inventory and research to support effective implementation of conservation and mitigation efforts.

- High-resolution species distribution models and vulnerability assessments can anticipate and reduce impacts to at-risk species on military lands, and have the potential to reduce the area subject to activity restrictions.

- Standardized and automated vulnerability assessments done at a regional scale promote collaborative conservation efforts that can be revised as new information is available or as land use or species distributions change.

Accomplishments:

This project addresses the challenges inherent to modeling at-risk species by leveraging a uniquely comprehensive dataset of at-risk species locations, along with a team of both technical and biological experts. This data and expertise from NatureServe and its network of member programs increased the species location data samples available and the resulting precision of the distribution models, which validated with high accuracy. The three project sites encompassed a wide range of environmental conditions and the consistent methodology worked well at all three sites with no loss in quality. This consistency, along with using information and expertise from organizations holding the most consistent and comprehensive data sets for at-risk species brings us a step closer to making these methods more transferrable and readily applied wherever this work is needed.

The participating installations were given access to the vulnerability analysis inputs and outputs in a decision support tool that can be updated and expanded by the installations. Thus vulnerability assessments can be re-run and expanded as additional and updated information on land use, land management, species distribution, and species status is available. This tool supports an accurate and current view from which planning and land management decisions can be made at a regional scale in collaboration with other land management agencies and organizations.

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