

# COST-EFFECTIVE AUTONOMOUS MONITORING OF MILITARY RANGES FOR THREATENED/ENDANGERED SPECIES

## PROJECT OVERVIEW

Autonomous cameras have been used for decades to monitor wildlife species, however, the development of accompanying software that would allow automated animal identification from camera images has lagged. Recently developed deep learning software has shown great promise with >90% accuracy for animal identification. Here, we demonstrate the integration of hardware and software for monitoring threatened and endangered species (TES) on military lands.

## BENEFITS

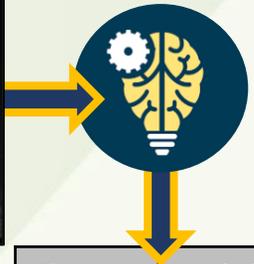
TES on DoD installations can cause restrictions on training lands via regulatory drivers such as the Endangered Species Act. Many installations are required to monitor TES, but surveys can be costly and time-intensive. This technology improves efficiency, resulting in cost and time benefits for monitoring TES, thereby enabling regulatory compliance and minimizing impacts of TES encroachment on military training.

## PATH FORWARD

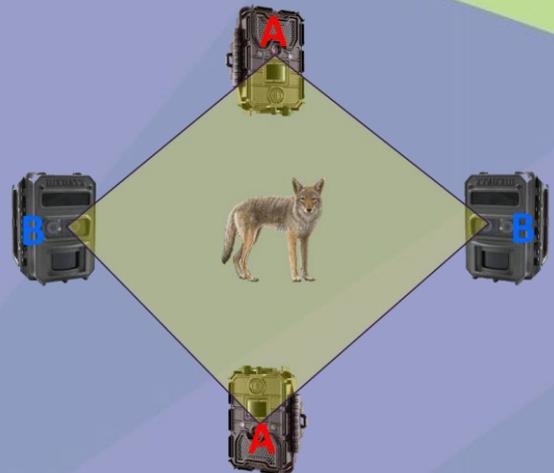
We are demonstrating remote, autonomous camera deployment and validating the performance of deep learning algorithms in DoD-specific TES management scenarios. By providing detailed, step-by-step guidance on how to transition DoD datasets to available animal ID programs, as well as identifying limitations to their use, we will enable adoption of this technology by installation natural resource managers interested in a wide variety of at-risk species and with varying technical skills. Further, we will initiate an equipment loan program in FY21 whereby interested DoD land managers can borrow game camera equipment to pilot the technology on their installations.



Autonomous cameras photograph wildlife in remote field locations, then deep learning software identifies the species present.



Class	Probability
Bobcat	0.97
Coyote	0.23
Gray fox	0.15



Quantifying the ability of different camera models to detect different wildlife species.

### DoD Executive Agent

Office of the Assistant Secretary of the Army for Installations, Energy, and Environment

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### FOR FURTHER INFORMATION

National Defense Center for Energy and Environment  
<http://www.denix.osd.mil/ndcee/home>

Engineer Research and Development Center  
<https://www.erd.c.usace.army.mil>