SERDP
Strategic Environmental Research and Development Program
Improving Mission Readiness Through Environmental Research

Predicting the Effects of Ecosystem Fragmentation and Restoration: Management Models for Animal Populations

Conservation
CS-1100

Background:

The detrimental effects of habitat fragmentation on animal populations, especially on threatened and endangered species, are widely documented. In contrast, the development of practical tools to predict fragmentation and design appropriate mitigation efforts has progressed slowly. An improved understanding of the dynamics of ecosystem fragmentation is required for better integration of Department of Defense land management and training objectives while still ensuring the benefits of land rehabilitation and habitat restoration projects.

Objective:

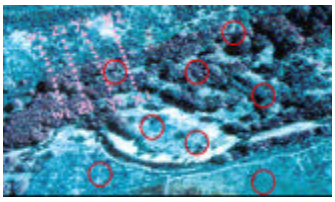
This project will develop species-specific models to predict the fragmentation of animal habitats caused by training and testing operations as well as the responses of mobile animal species to habitat fragmentation and restoration efforts.

Summary of Process/Technology:

This project links the following three areas of investigation: 1) acquisition of ecological field data on the responses of animals to their habitat fragmentation, 2) the mapping of animal habitats in three dimensions and at scales relevant to habitat management, and 3) the linking of empirical ecological data and spatially-explicit habitat information in a management-oriented model. Field data will be collected along transects running orthogonal to habitat edges and will quantify population density and other relevant parameters at different distances from habitat edges. Field research will target species of special interest to managers, such as sensitive, threatened, and endangered species. Habitat mapping relies on information derived from remote sensing technology and field measurements. The modeling approach will project species-specific edge responses, measured in the field and characterized mathematically, onto the spatially-explicit habitat maps, weighting each habitat patch according to its area and the influence of the surrounding habitat on species abundance and demographic variables.

Benefit:

This project will link data obtained from field studies and remote sensing technologies in validated landscape models that will permit comparison of alternative land use strategies on wildlife species of management concern. Extensive field testing of model predictions in different environments will permit evaluation of model effectiveness in forecasting the responses of a wide range of species to landscape-scale alterations in forested and riparian habitats. Through manipulation of habitat maps, the Effective Area Model (EAM) will be capable of predicting the effects of alternative landscape modifications on various animal species.



The Fort Huachuca/San Pedro, AZ study site. The circles and transects denote sampling locations for birds and butterflies, respectively.

Studies of birds and butterflies will test the generality of the modeling approach for mobile animals in two habitats.

Accomplishments:

The sharing of data obtained from remote sensing technologies and leveraging of field efforts initiated the collaborative efforts between the Semi-Arid Land Surface/Atmosphere Program and the project scientists. Avian field research, the butterfly census methodology, and the characterization of microclimatic gradients of habitat edges commenced at ponderosa pine sites in Camp Navajo, AZ, and Mount Trumbull, WA. At the Fort Huachuca/San Pedro study sites in Arizona, raw, high-resolution data was acquired, and field data collection is underway.

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