Desert Tortoise Occupancy Sampling Pilot Study

Introduction

The desert tortoise (*Gopherus agassizii*) is a representative species of the Mojave Desert in the southwestern United States, but it has declined throughout its range and was therefore listed as a threatened species by the U.S. Fish and Wildlife Service.

Determining the status and trend of the species is difficult. The desert tortoise is hard to detect in the field because only part of the population is outside of burrows at any given time and individuals are difficult to see among rocks and vegetation.

The USFWS has developed a scientifically sound sampling methodology to estimate population numbers in large recovery units, but land managers need to make restoration and conservation decisions at smaller spatial and temporal scales (5-10 years). The pilot study presented here explores the use of occupancy sampling in meeting the needs of land managers.

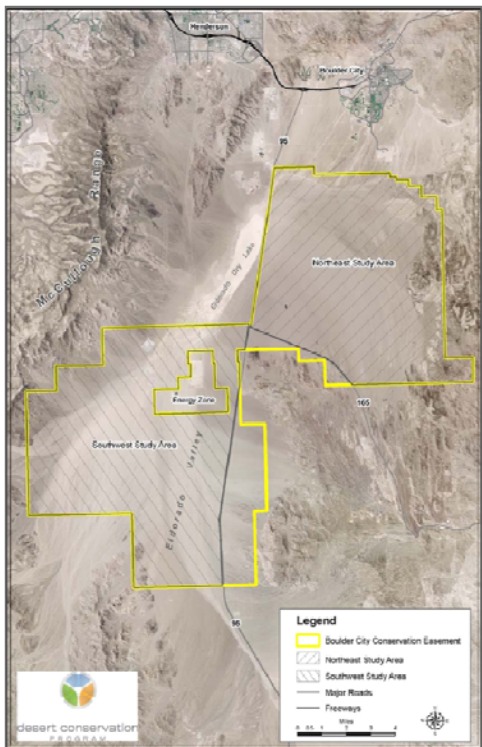**Location of Study Area within BCCE**

Occupancy Sampling

❖ Defined as determining the proportion of habitat within an area that contains indicators of a targeted species.

❖ Assesses the proportion of habitat occupied by a species and does NOT estimate abundance or density.

❖ Assumes that status and trends in the population can be assessed by changes in the proportion of the sample units that are occupied or used by the species.

❖ May be able to provide land managers data that detect trends over shorter timeframes than other sampling methods.

Desert tortoise basking in sun

Study Area

The monitoring protocol developed for the pilot study will be tested in the Boulder City Conservation Easement. The BCCE is in the Eldorado Valley and southwest of the populated area of Boulder City. The BCCE covers 86,423 acres of land owned by the City of Boulder City, with an easement held by Clark County that is managed by the Desert Conservation Program. For purposes of the pilot study, the BCCE is divided into the Northeast Study Area and Southwest Study Area.

Objectives

❖ Analyze status and trend in desert tortoise occupancy/use within the BCCE using the indicators of live tortoises and active burrows.

❖ Correlate pattern and change in occupancy/use with habitat (e.g., cover of vegetation, herbaceous vegetation), habitat alteration (e.g., roads, off-road vehicle disturbance), and management practices (e.g., closing roads, vegetation restoration).

Assumptions

❖ Tortoises will respond to changes in habitat, habitat alteration, or management practices by their occupancy or use of an area.

❖ Tortoises will not occupy unsuitable habitat unless all suitable habitat is beyond capacity to support additional tortoises.

❖ Tortoises will vacate non-preferred suitable habitat areas before vacating preferred suitable habitat areas.

❖ Management actions can make improvements to non-preferred or non-suitable habitat to increase their suitability and value to tortoises and can also prevent declines in suitability or preference value of habitat areas.

Indicators

Live tortoises and active tortoise burrows are indicators of occupancy and will be recorded. Tortoises will be measured, sexed, and tagged. Tortoise burrows will be identified as active or non-active, height and width measured, and location and soil type described. Habitat indicators will be assessed for possible correlation with occupancy. Habitat quality and alteration (threats) and management practices within sample units will be recorded.

Indicators – live tortoise and active burrow

Sample units placed using GRTS sampling approach

Sampling Design

❖ Sample unit is 4 hectares square (≈10 acres).

❖ 80 sample units with 40 units in each study area section.

❖ Units randomly placed using Generalized Random Tessellation Stratified (GRTS) sampling approach.

❖ Achieve 100% coverage of each unit by 2 surveyors walking 10-meter belt transects.

❖ Units sampled 3 times annually between March 15-May 15.

Data Analysis

❖ Data analyzed by leading statistician using a model (Program PRESENCE 3.1) that assesses occupancy data.

❖ Model relates occupancy to characteristics of that sample unit and incorporated detection probability.

❖ Total number of live tortoises identified, measured, and tagged in sample units by date and time of day, and average number of tortoises per sample unit.

❖ Burrow data summarized spatially, tally number of burrows occupied by one or more tortoises or defined as active.

❖ Temperature data correlated with tortoise activity and time of day.

❖ Habitat, habitat alteration, and threat data correlated with occupancy data to identify patterns.