APPENDIX A
Live-Trapping Monitoring Study

INTRODUCTION

An important element of the Stephens' Kangaroo Rat Habitat Management Plan (SKR HMP) is a 3-5 year live-trapping across the SKR Reserve System to monitor the spatiotemporal variation in populations. Prior methods of estimating population densities such as burrow counts based on estimates of populations densities at a single point in time do not provide a reliable surrogate for estimating population because of the high amount of spatiotemporal variation, although there is a correlation between burrow counts and SKR abundance (Diffendorfer and Deutschman 2003).

The purpose of the 3-5 year live-trapping program is to begin to assess the dynamic patterns of SKR populations across space and time and in relation to natural and anthropogenic environmental factors that appear to be important determinants of SKR population densities and distribution, such as precipitation patterns, vegetation changes, wildfires, etc. The results of the 3-5 program will help inform the monitoring program for the long-term, or as Diffendorfer and Deustchman (2003) state, "we must 'monitor to understand how to monitor' for the next 3-5 years."

The live-trapping protocol described here is based on the recommendations of Diffendorfer and Deutschman as quoted here.

> *We strongly recommend a coordinated trapping effort, implemented immediately, across all reserves. In all cases, trapping should take place at least 2 but no more than 4 time per year, simultaneously at all locations (a 1-2 month "window" of trapping should be adequate), using 7x7 trapping grids or larger, trapped for 2 or 3 days. Within each reserve, if funds are available, 10-20 sites should be sampled. At each site, SKR should be individually marked and a burrow count assessment done using at least 3 assessment lines. The effort should last for at least 3 years.* (p. 44)

These recommendations are based on a power analysis of trapping methods conducted by Diffendorfer and Deutschman that examined the relationship between variables such as grid size and shape and the number of trapping nights. The goal of the power analysis was to identify a trapping program that would provide statistically reliable and valid data to assess SKR population densities; e.g., what happens with reduced or increased trapping efforts such as a 7x7 trapped 2 days versus 3 days, etc.?

Based on the Diffendorfer and Deustchman recommendations, and as described in more detail below, the live-trapping monitoring program included the following:

- 10 7x7 trapping grids on the Lake Mathews Reserve and 1 7x7 grid on the Steele Peak Reserve.
- Trapping conducted 4 times per year for 3 consecutive nights on each Reserve.
- Burrow counts in conjunction with trapping on each gird
- Vegetation monitoring in conjunction with trapping on each grid (see Appendix C)

METHODS

Trapping Grid Selection and Establishment

A total of 10 7x7 trapping grids with 15-meter (m) intervals between trap stations was established on the Lake Mathews Reserve and one 7x7 grid was established on the Steele Peak Reserve. Ideally grids would have been selected on a random or stratified random basis to avoid any bias in locating the grids. However, because of the existing spatial distribution of the RCHCA lands in the Reserves, the distribution suitable habitat, the distribution of existing SKR populations, and the accessibility of sites for long-term trapping, the selection of trapping grids could not be randomized. Nonetheless, the selection of the trapping grid locations attempted to distribute the grids in a way that provides a broad sample of the Reserves' landscape and thus should provide a representative sample of the Reserve lands. Selection of grid locations considered the following factors:

- The potential grid location had a high probability of supporting the SKR based on a visual survey for diagnostic surface sign (burrows, scat, runways, etc.).
- Representative locations in the Reserves tied to the distribution of RCHCA lands and accessibility factors (e.g., lands that required access via private property or were remote from access roads were given a lower priority).
- Representative locations with regard to the Habitat Suitability Index (HSI) rating for the area, which reflects vegetation, soil and slope conditions.
- Representative locations with regard to SKR occupied status such that areas with trace through medium-high population abundances were sampled.

- Locations where a 7x7 trapping grid could be practically laid out and sample suitable SKR habitat (i.e., the grid would need to cover generally level and open vegetation and avoid steep and/or densely vegetated areas that do not support the SKR).

- The individual trapping grids were far enough apart that at least within each 2-month trapping period it was unlikely that individual SKR would be trapped on more than one grid (the two closest trapping grids, LM1-K and LM2-A, are about 600 feet apart).

The actual selection of grid locations in the Lake Mathews Reserve was based on field site visits in April 2006 by Dudek biologists Phil Behrends and Brock Ortega and the contracted trapping consultants Karen Kirtland and Philippe Vergne. The selected trapping grids for the Lake Mathews Reserve are shown in *Figure 13* of the SKR HMP. Using the criteria stated above, all of the trapping grids in the Lake Mathews Reserve were located north of Dawson Canyon. The RCHCA lands south of Dawson Canyon were unsuitable for establishing long-term trapping grids for two main reasons: (1) poor accessibility due to remoteness and/or the need to cross private lands; and (2) poor suitability for establishing the trapping grids due to extremely rugged terrain and generally poor soils. The SKR is scattered throughout these southern parcels, but generally is confined to ridgelines, hilltops and other relatively level and sparsely vegetation areas patchily distributed on these lands.

Trapping Protocol

The trapping protocol follows well-established standard small mammal trapping/census practices and the conditions and requirements of the federal permit and state Memorandum of Understanding help by the trapping contractors (Kirtland and Vergne).

Four separate trapping sessions are conducted annually generally in the periods of February/March, May/June, August/September and November/December. To the extent possible, all trapping for each session is conducted within these 2-month periods. However, due to inclement conditions due to winter storms or some other foreseen circumstance, trapping in the November/December and February/March periods may occasionally be disrupted, and if extended inclement conditions or other factors occur, trapping may extend several days or up to two weeks beyond the designated period. As long as every attempt is made to conduct all trapping within the designated period, overruns beyond the period are not considered a significant problem for analyzing and interpreting the census data.

Three consecutive nights of trapping are conducted on each trap grid per session. Sherman live-traps suitable for capture of kangaroo rats (i.e., of sufficient length or modified to prevent tail lacerations by the trap door) are set at dusk and baited with mixed bird seed. The traps are left

open for at least 4 hours, checked and then closed for the night. All captured animals are processed and the following data are collected: species, sex, weight (to nearest gram), age-class (adult or juvenile) and reproductive condition (lactating, estrous, testicular), if observable. All captured SKR are scanned with Passive Integrated Transmitter (PIT) tag reader. If the SKR was not previously PIT-tagged, a new PIT tag is injected under the animal's skin just lateral to the dorsal midline. All SKR and other captured animals are released immediately at the point of capture following processing. Typically an animal is held no longer than 5 minutes once it is removed from the trap.

Trapping is not conducted during inclement weather conditions such rain or otherwise wet/foggy and muddy conditions, high winds, or cold temperatures (approximately 40 degrees Fahrenheit) to minimize the risk or injuring or killing animals.

Burrow Counts

During each trapping session a count of active kangaroo rat burrows is conducted on each trapping grid. Burrow count transects are conducted between each of the seven traplines on a north/south alignment and starting from west to east. Each transect is a 6-meter wide belt 90 meters long. The centerline of the belt transect (i.e., 3 meter on each side) is slowly walked and all active kangaroo rat burrows within the belt transect are recorded. Active burrows are distinguished from inactive burrows by evidence of recent kangaroo rat activity, including relatively unobstructed openings (i.e., lack of cobwebs, debris, crushing), fresh digging and maintenance of the burrow apron (the flattened area the burrow entrance), scat (fecal pellets), tracks, and tail drags.