

## **Use of Camera Traps to Monitor Mohave Ground Squirrel Populations on Mitigation Lands**

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Camera traps should be a useful tool to monitor MGS populations on mitigation lands, but the most appropriate application of this technology would be to determine presence rather than abundance. However, the number of camera sites at which MGS are detected could provide an index of abundance. It would be most useful to time camera monitoring surveys for the period from March 15-May 15 so as to assess presence of resident adults, especially females.

Two questions need to be addressed: 1) what should be the intensity of camera trapping on a mitigation property? 2) how frequently should monitoring be carried out?

The basic issue regarding intensity of camera trapping is whether to completely sample a property with cameras or to space cameras out so that some percentage of the property is surveyed. The sampling approach (5%, 50%, 100%) doesn't have to be same for all mitigation lands. Smaller parcels (e.g., 160 acres) could receive 100% coverage while larger properties (e.g., 2000 acres) might be sampled to a lesser extent. If the habitat on larger parcels is relatively uniform, it would be reasonable to monitor by deploying cameras on a random basis. However, if different habitat types are present there should be an effort to sample all habitats in proportion to their area within the property.

The size of the area that is effectively sampled by a single camera isn't clear at present. Delaney and Leitner have used an array of 10 cameras arranged in 2 lines of 5 cameras each. The lines are separated by 150 m and the 5 cameras in each line are spaced 150 m apart. There is strong circumstantial evidence that the same individual MGS is capable of visiting 2 adjoining traps, which suggests that good coverage could be obtained even with greater separation between cameras. Harris and Leitner (2004) have reported on the movements of radio-tagged adult female MGS during the period from mid-March to the end of June. The maximum recorded within-day movements ranged from 24-371 m (median 205 m). These data suggest that MGS living within a distance of 150-200 m from a camera could be detected, especially given that cameras are operated for 5 days and are provided with a bait attractant. If we assume that cameras can detect MGS living within a radius of 150 m, a given camera should be able to cover an area of ~7 hectares (~17 acres). Thus, 10 cameras would be sufficient to sample approximately 160 acres. If it is not considered necessary to achieve 100% coverage of a larger mitigation parcel, cameras could be spaced farther apart or arrays of cameras could be located randomly or according to some other criterion. If desired, this assumption about the area of camera coverage could be tested rigorously by radio-telemetry of adult MGS.

The frequency of camera monitoring should be guided by what we know about year-to-year fluctuations in MGS numbers. The only continuous record we have of MGS abundance was developed at two Coso study sites (Leitner 2015). The graph (Figure 1) below shows the record from 1990 through 2015. (The numbers of adult MGS captured in 2016 were slightly higher as compared to 2015.)

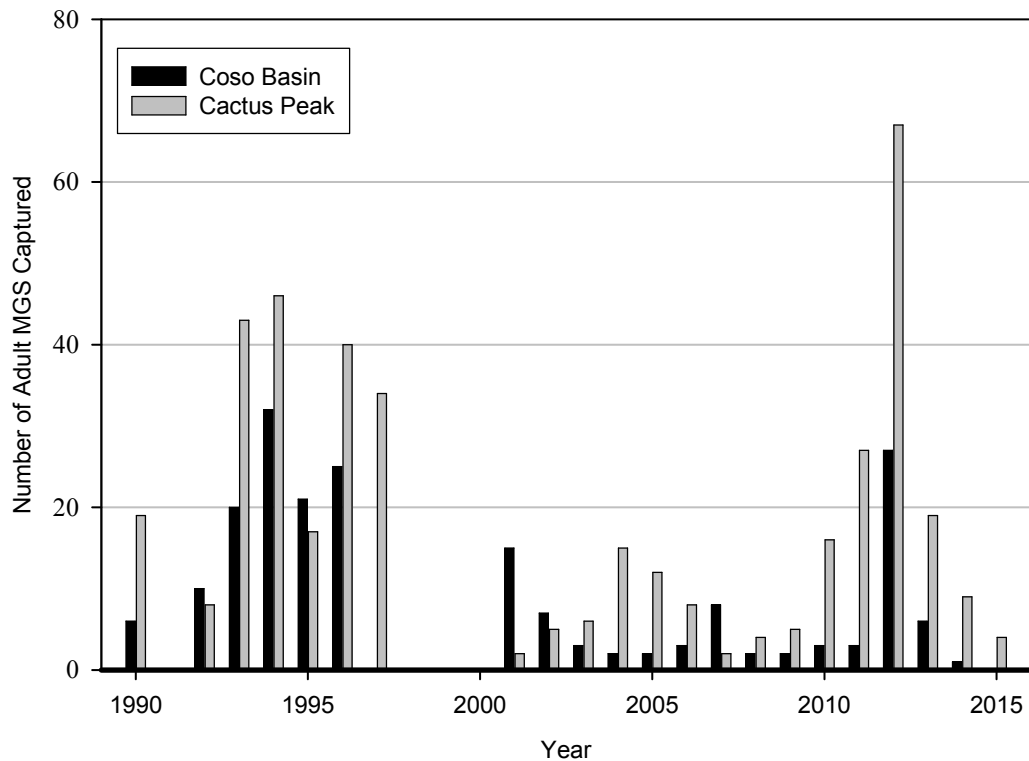


Figure 1. Mohave ground squirrel captures at the Coso Basin and Cactus Peak study sites in March-May during the period 1990-2015.

By examining these data, it can be seen that MGS numbers can change rapidly over the course of just a few years. For example, if sampling were conducted every 5 years (from 2010 to 2015 for example) the record-breaking high of 2012 would have been missed completely. As a result, it seems wise to conduct monitoring at least every 2-3 years. Annual monitoring would be the best approach but may not be feasible because of logistic or financial considerations.

#### Literature Cited

Harris, J.H. and P. Leitner. 2004. Home-range size and use of space by adult Mohave ground squirrels, *Spermophilus mohavensis*. *Journal of Mammalogy*, 85:517-523.

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