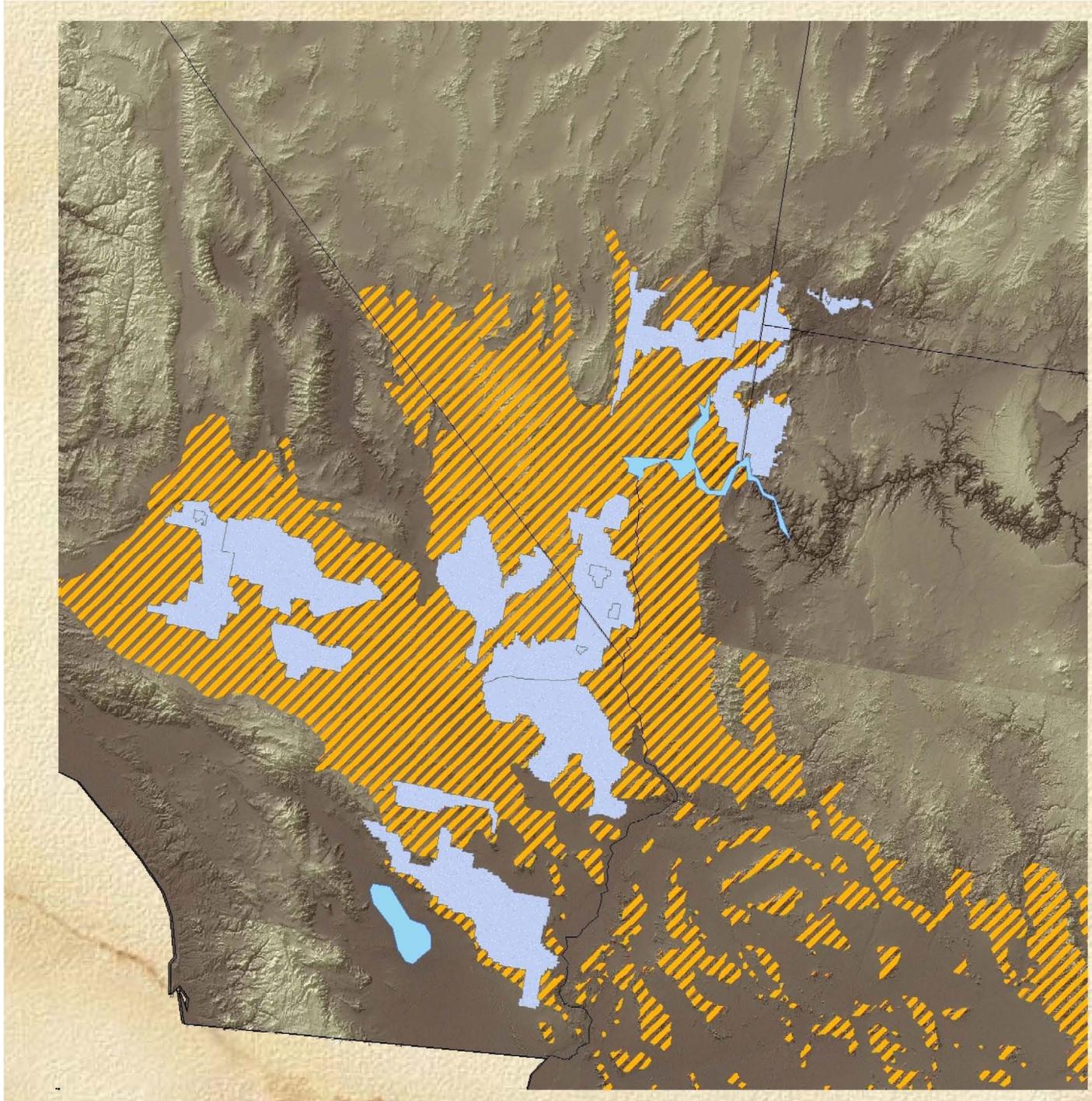


A photograph of two tortoises in a rocky, scrubby environment. The tortoise in the foreground is facing the camera, while the one behind it is slightly to the left. The ground is covered with small, light-colored rocks and sparse, dry vegetation. The background is out of focus, showing more of the same terrain.

Results from 2001-2004 Range Wide Monitoring

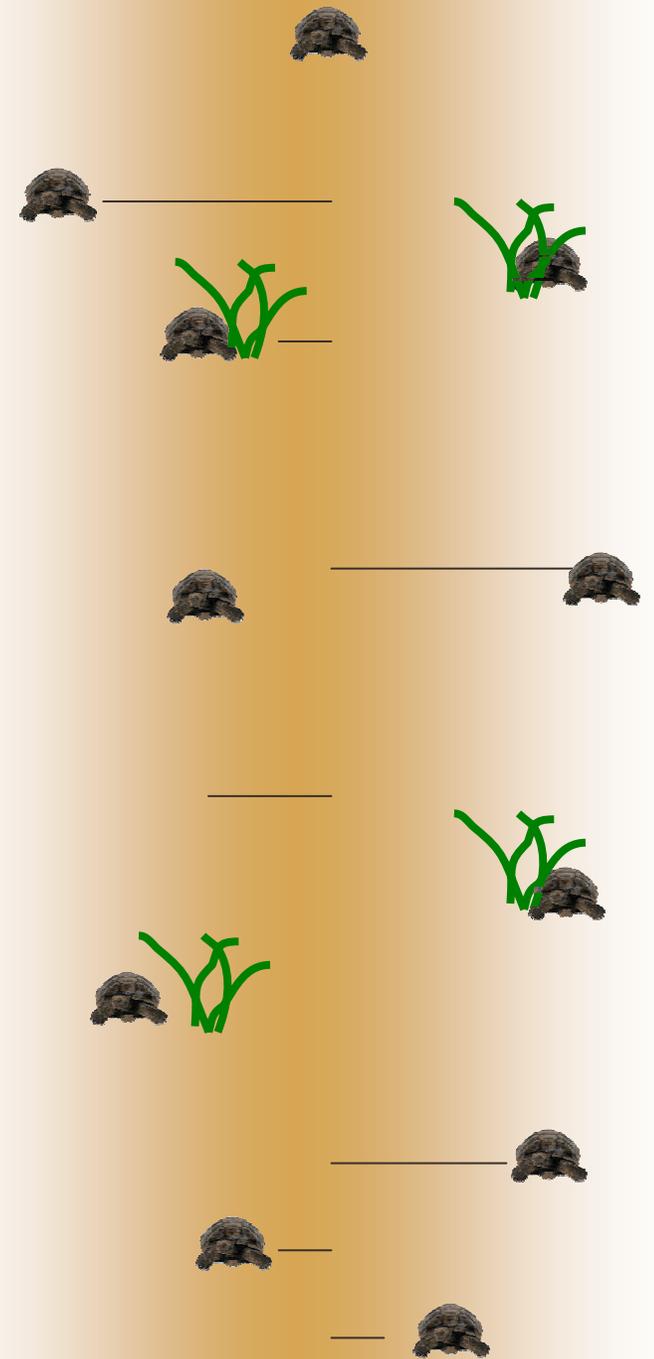
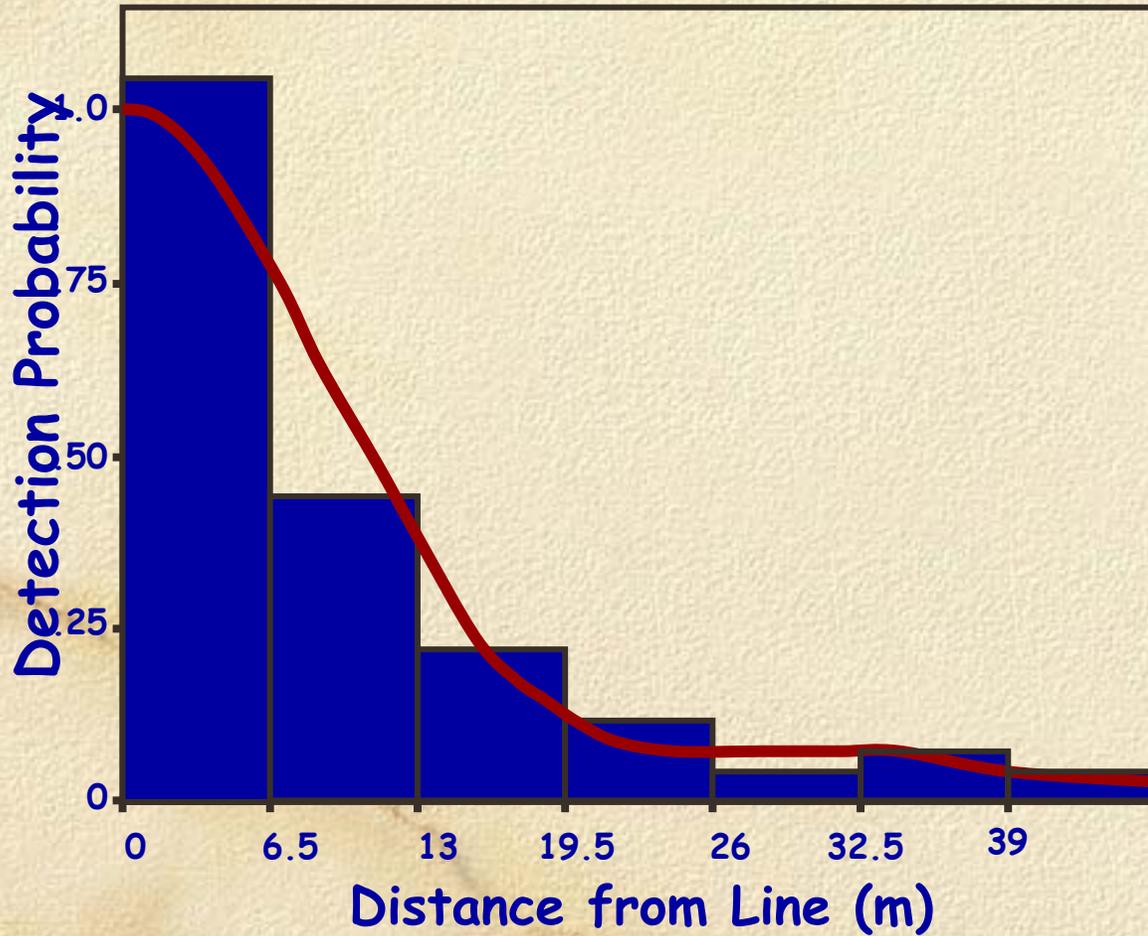
P.S. Corn, Ken Nussear

Tortoise Monitoring

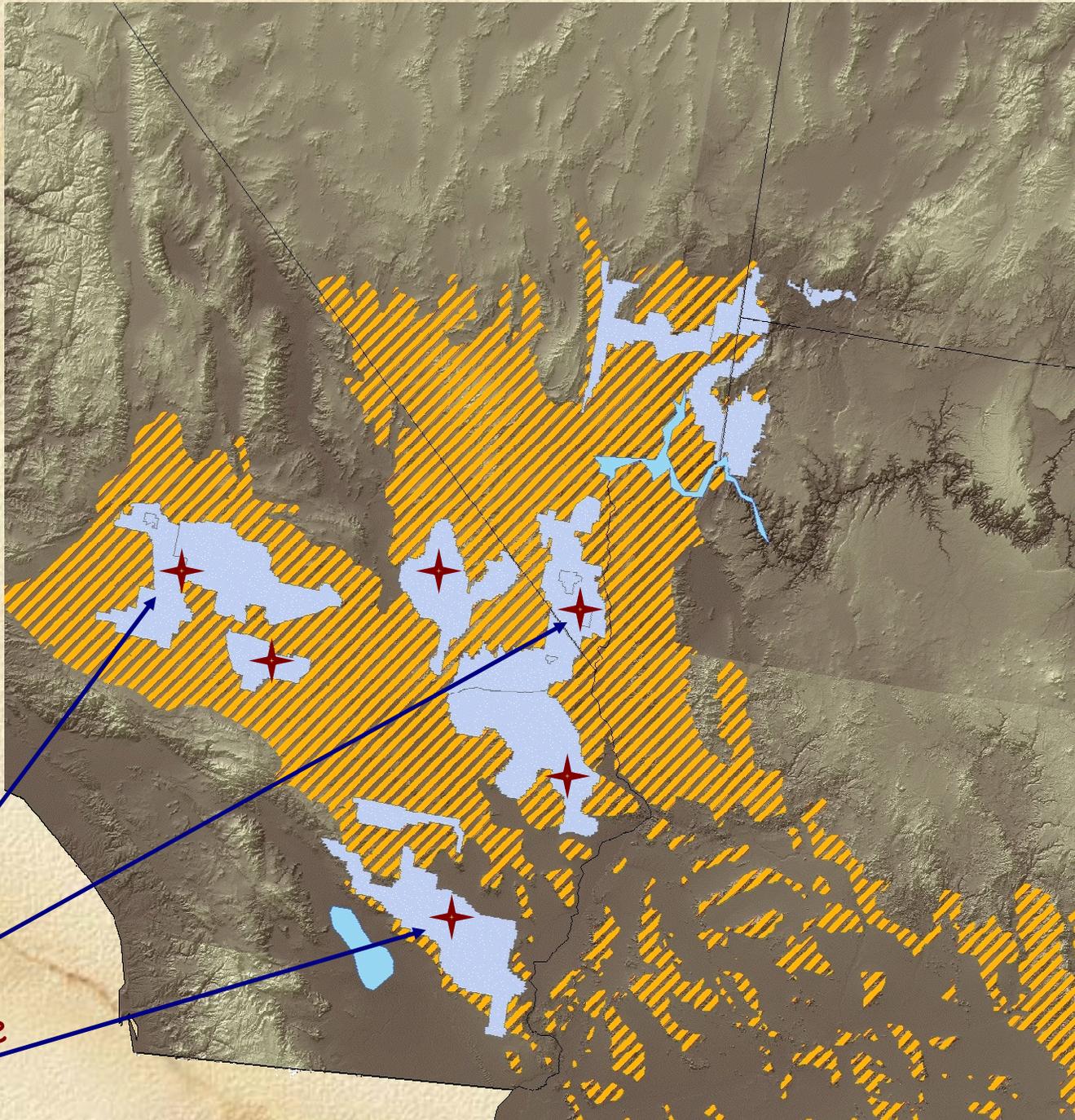




LSTS 1999



Global Activity Estimate



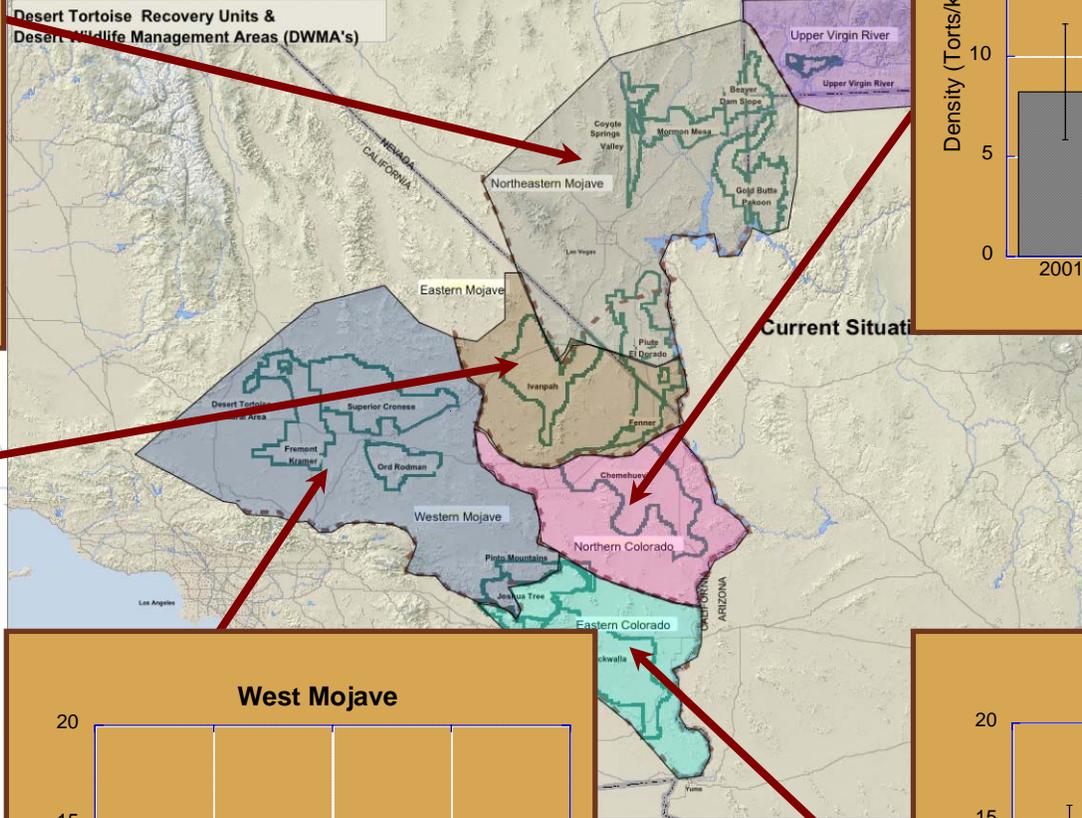
Focal
Populations
to Estimate
 G_0

Data Analysis

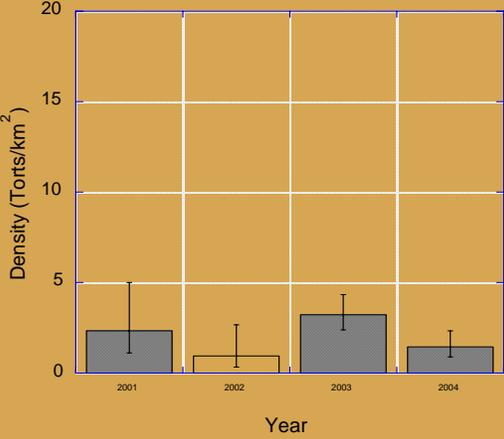
- Annual estimates of abundance are adjusted by the proportion of the population available to be sampled (G_0)
 - Tortoises deep in burrows or hidden in dense vegetation are invisible to sampling
- G_0 estimated using telemetry of focal tortoises
 - 2001: 0.89
 - 2002: 0.64
 - 2003: 0.89
 - 2004: 0.85



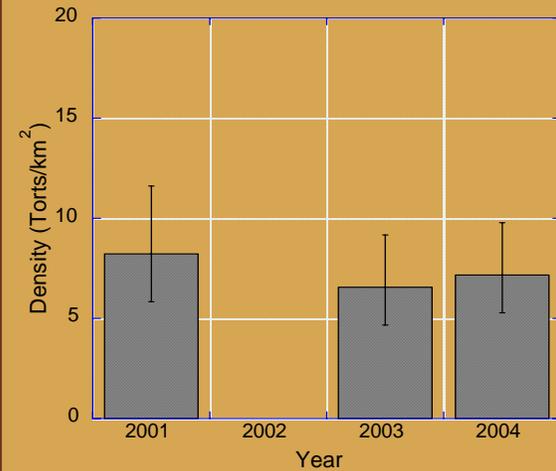
Distance Transect Analyses - by Recovery Unit



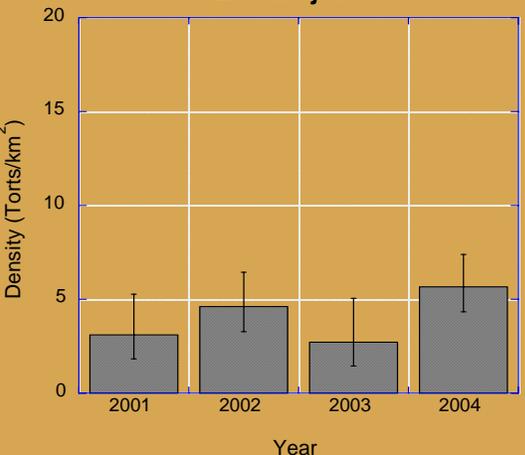
Northeast Mojave



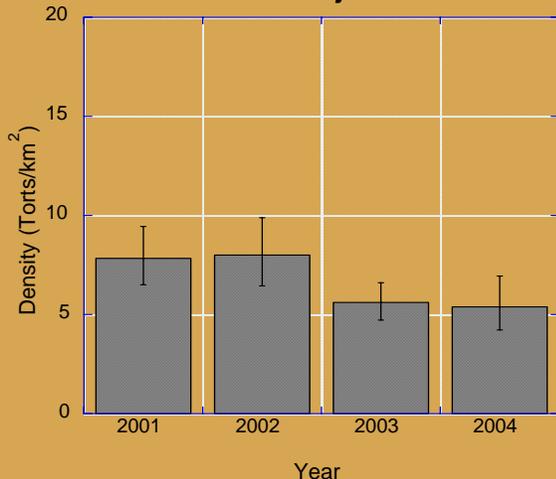
Northern Colorado



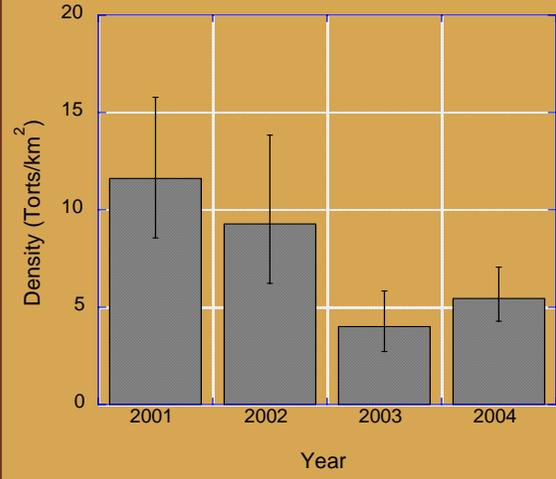
East Mojave



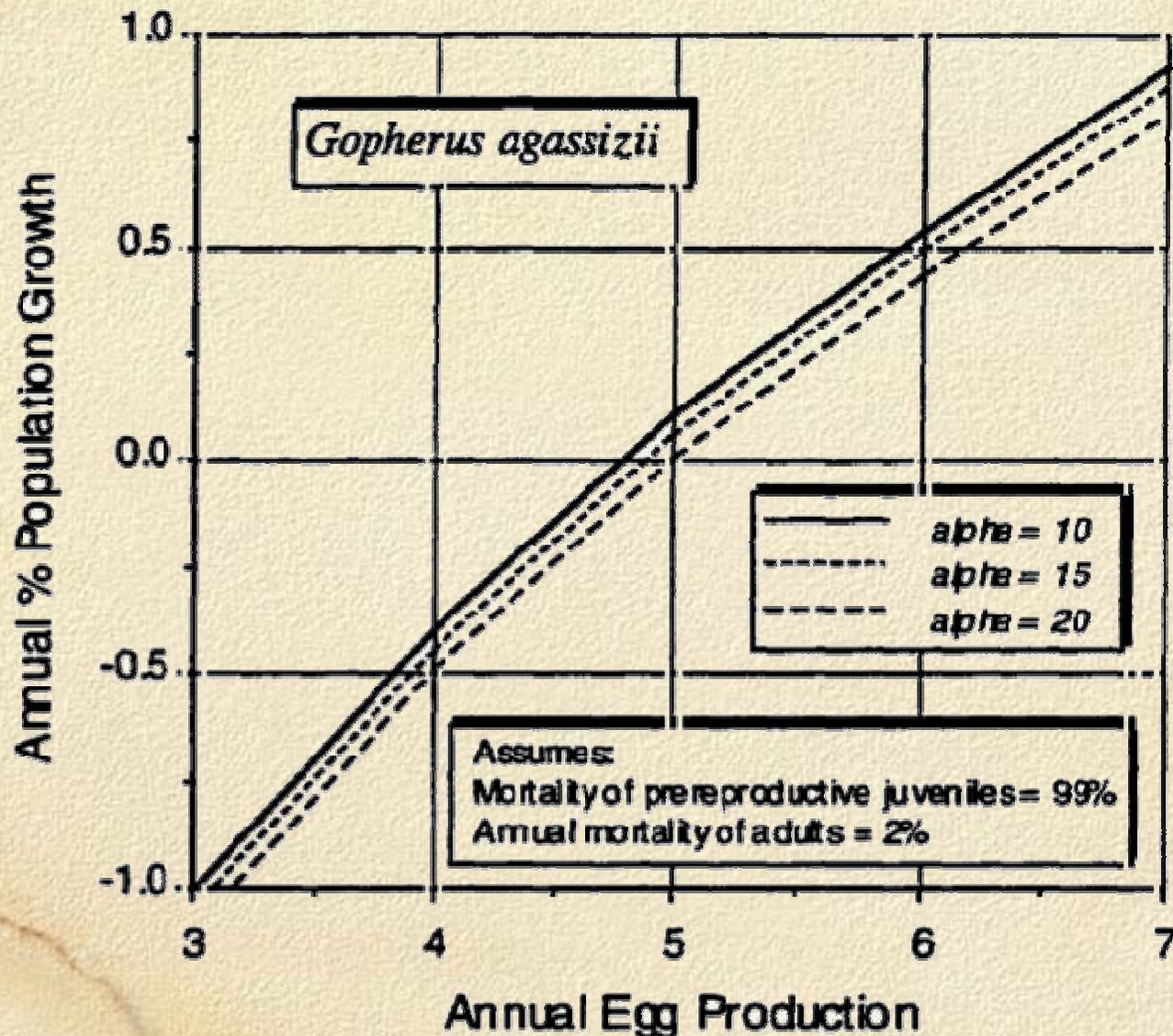
West Mojave



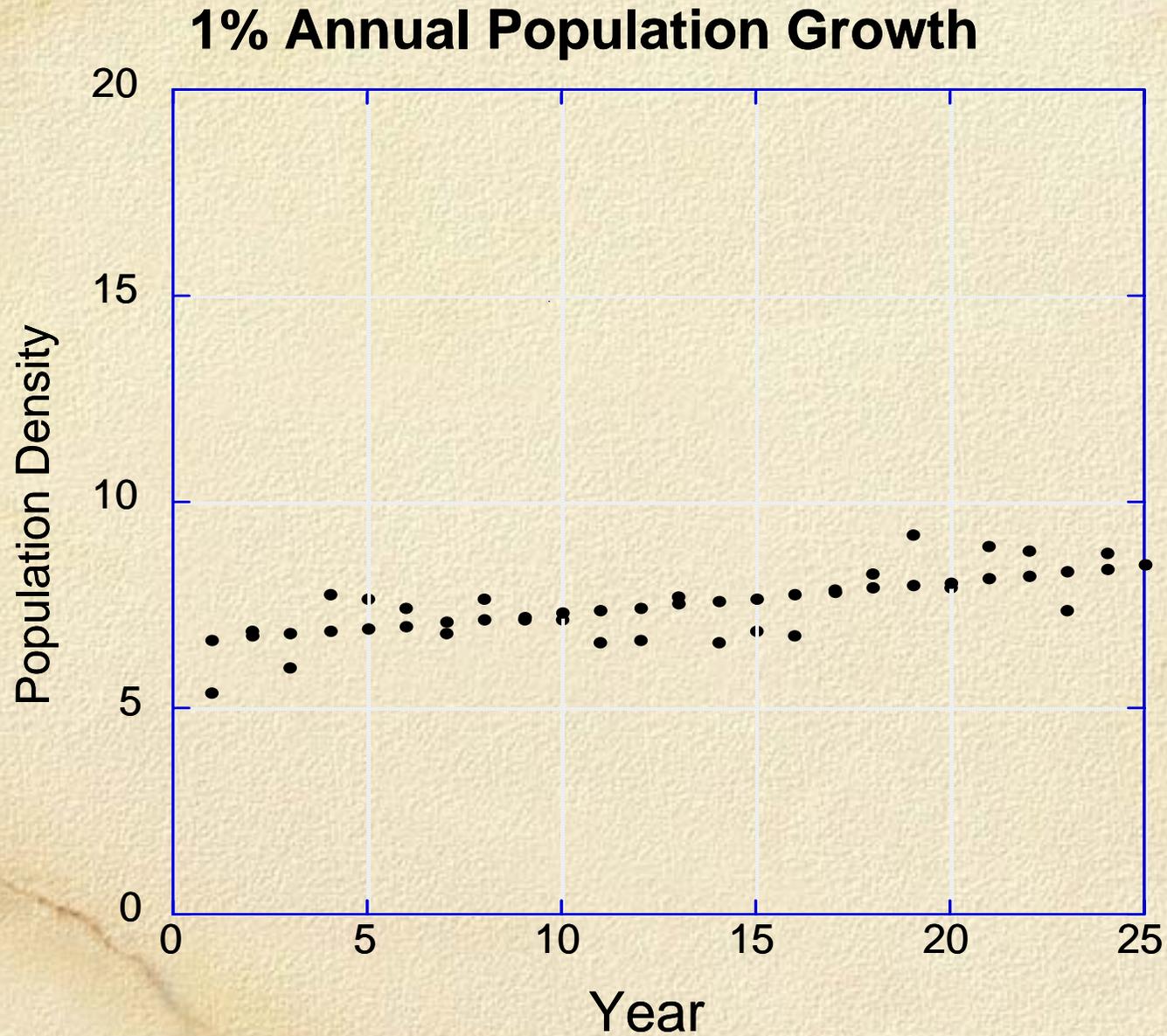
Eastern Colorado



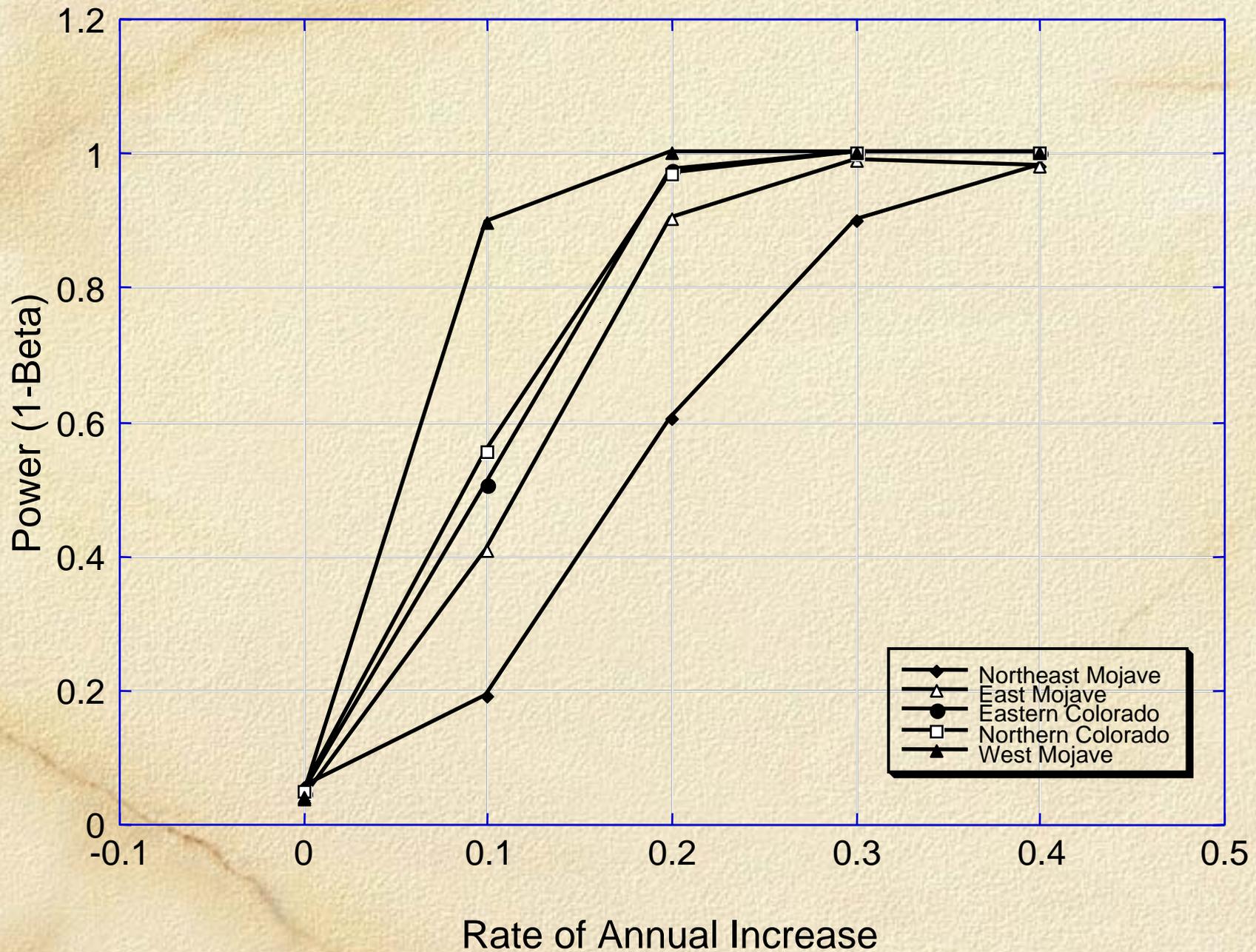
What Rate Could Populations Increase?



Power to Detect Trends



Power to Detect Trends



How Can We Increase Precision?

Cum length of transects walked

Number of tortoises seen

$$D = \frac{n}{(L * w) * Pa * G_0}$$

Detectability of tortoises

Proportion of tortoises that are active (available for sampling)

Is Sampling or Abundance Affected by Long-term Drought?

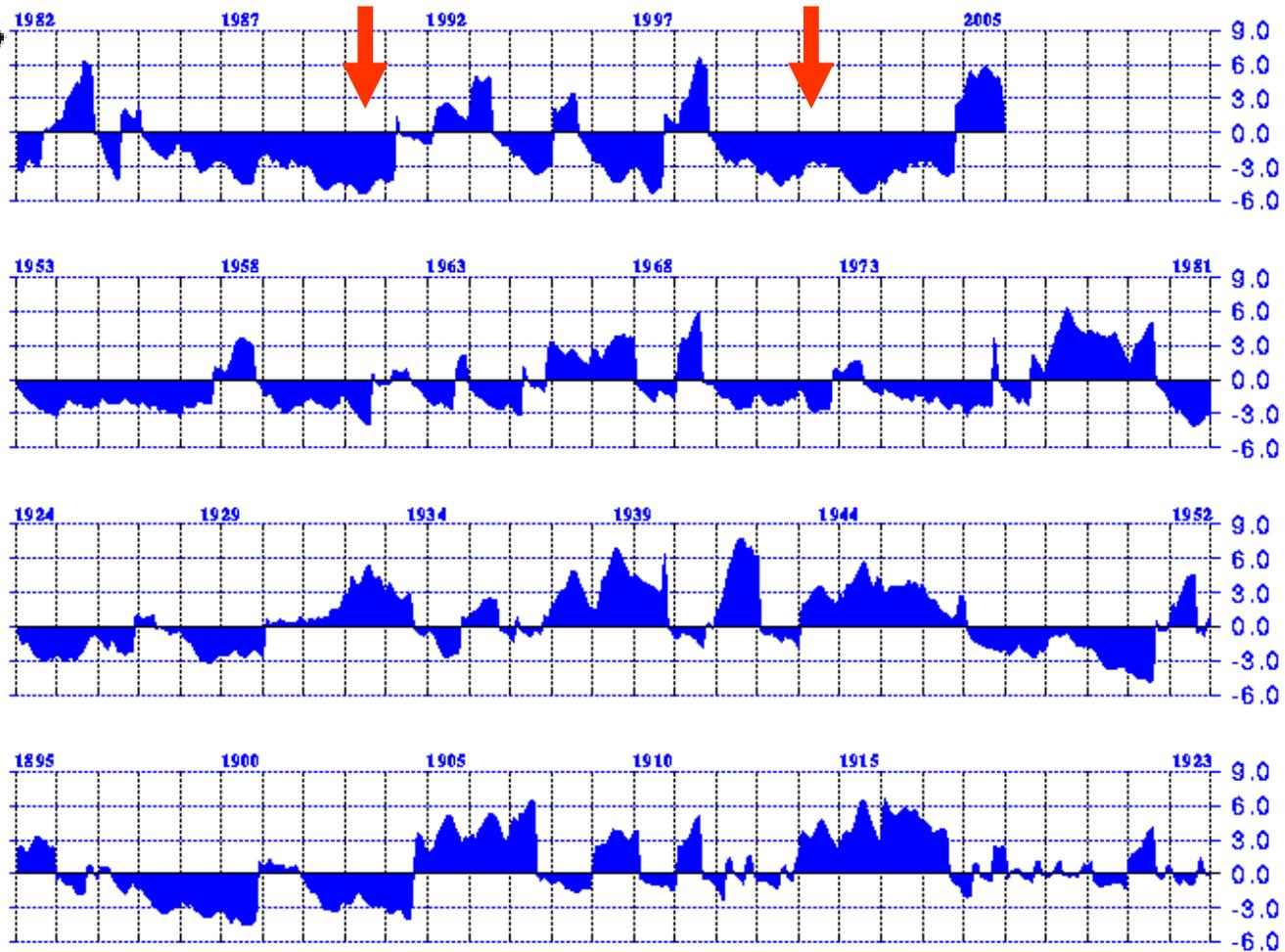
- 2 of the most severe multi-year droughts in the past century have occurred since 1984.
- Potential effects on survival of tortoises
- Drought affects sampling, but effects are partially incorporated into analyses

Drought in the Mojave Desert



Tortoise Listed

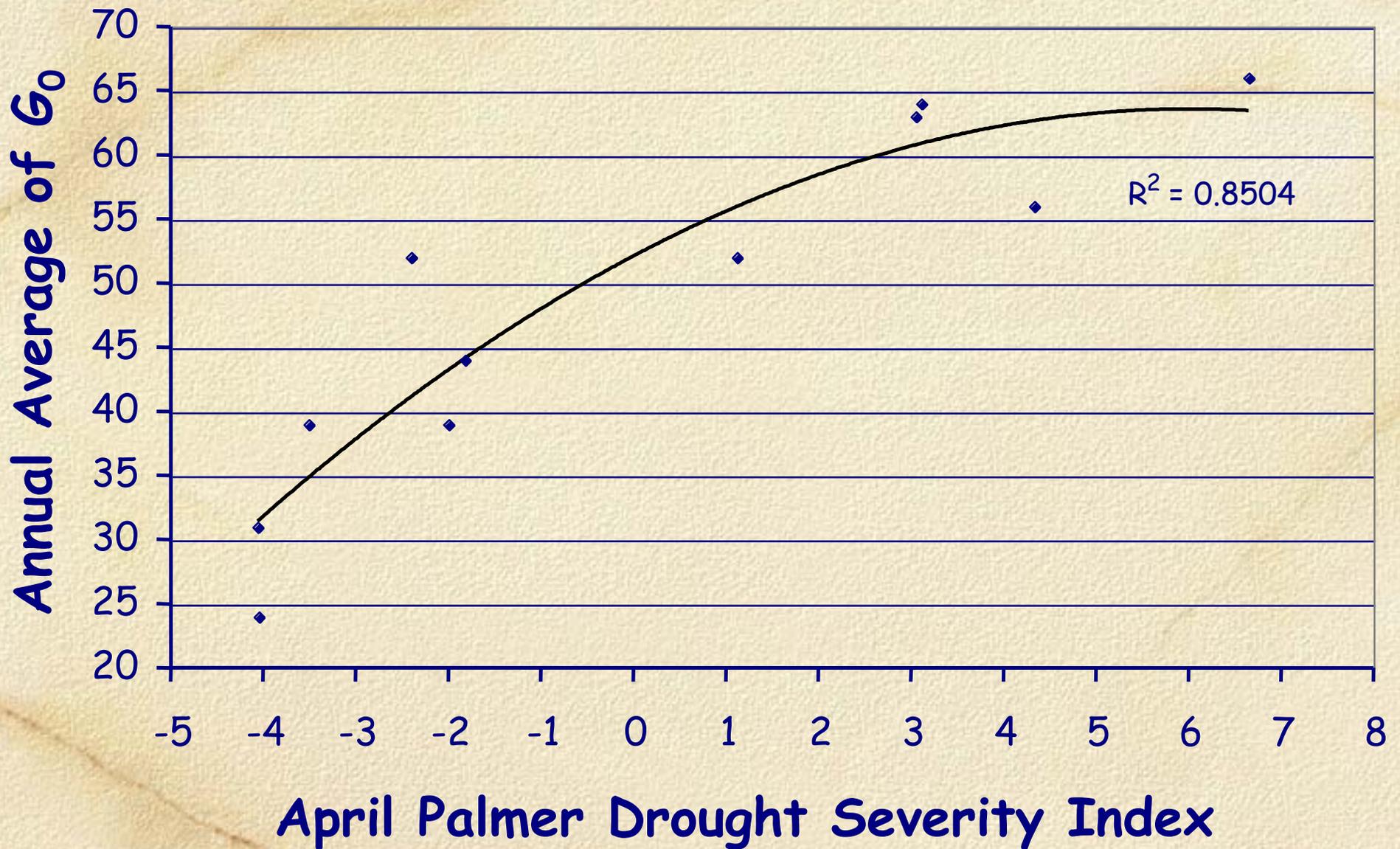
Range-wide Monitoring Begins



Palmer Drought Severity Index

California - Division 07: 1895-2005 (Monthly Averages)

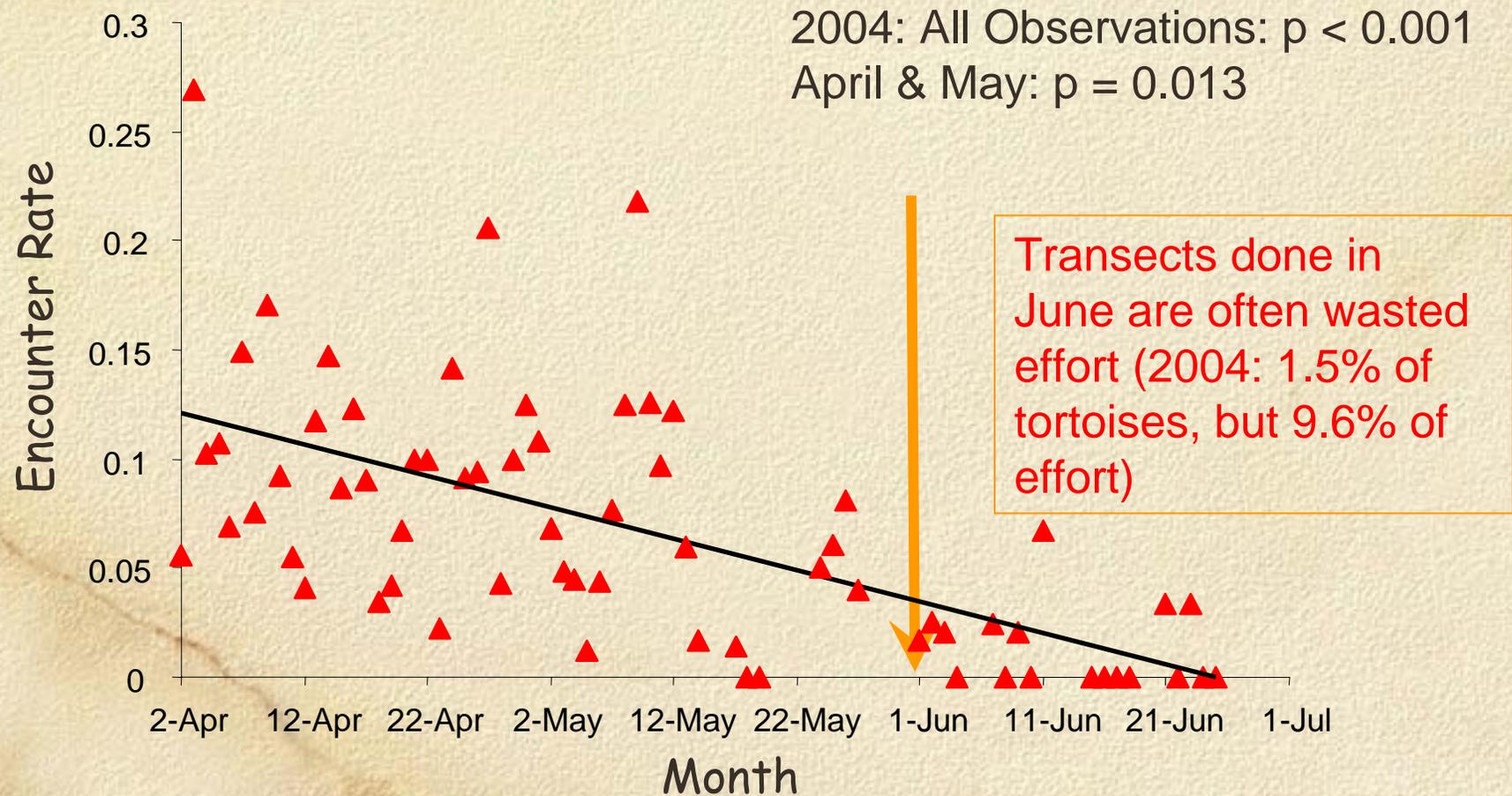
G_0 and April Drought Index



Data from Corn unpublished data

Data Analyses

- Transects in June are generally unproductive
- Dropped from analysis in 2001 & 2004; kept in 2003 analysis (no June transects on 2002)
- Date used as covariate in all years



Conclusions

- Transect sampling is being used to monitor tortoises with density estimates provided by Distance.
- Current level of variation allows for likely detection of 2-3% per year STEADY ANNUAL growth rate
- Tortoise populations aren't expected to increase at more than 1% and process is likely stochastic
- Spatial and other alternative analyses being explored with the same data