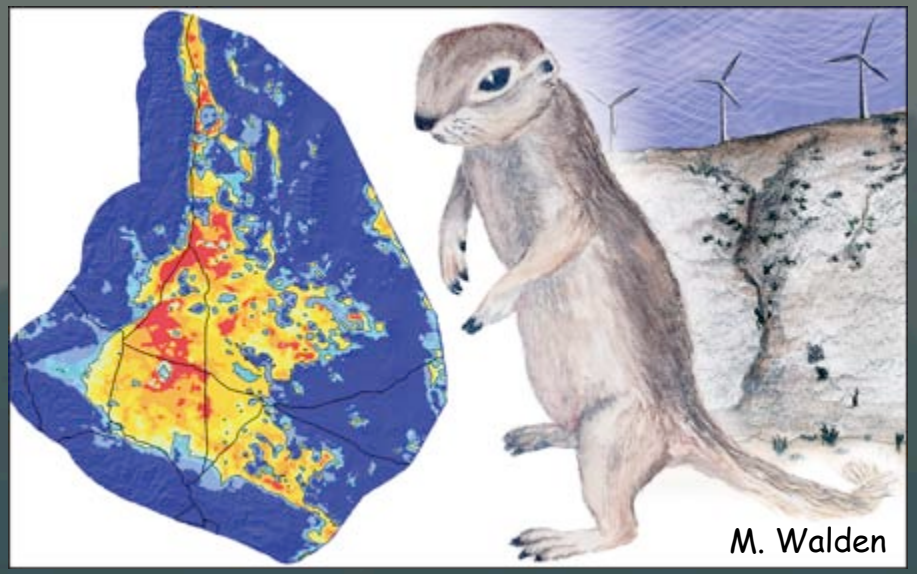
Is there room for all of us? Renewable energy and *Xerospermophilus mohavensis*



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USGS

Issues

Restricted distribution

Extensive impacts of human development in the west Mojave Desert

- Direct habitat losses to road and construction mortalities
- Cumulative impacts of landscape level disturbances
  - off-highway vehicles use
  - agriculture
  - military operations
- Reduced populations and habitat connectivity of suitable habitat

MGS was listed as threatened under the CESA in 1984

2011, a petition for federal listing of the species was deemed not warranted by the USFWS

Additional development is imminent, yet a comprehensive overview of MGS status in relation to land use is not available.

USGS

Concepts adapted from the desert tortoise habitat model

Quantitative and Spatially explicit model
(compared to expert opinion models)

Relate species occurrence to environmental predictors thought to influence or define the suitability of habitat for the species

Frequently built with presence-only data (as absence data for most species are often unavailable)

SDMs provide a relative index of habitat suitability that can be predicted on a landscape scale.

USGS

Species Distribution Models have been used for

Design of conservation and monitoring programs

Evaluating effects of management actions

Recovery planning

Controversies? (Burmese Python Model)

USGS

Objectives

Develop a Species Distribution Model for MGS using the best available information and up-to-date methods

Use modelas a basis for analyzing MGS in relation to climate change, landscape genetics, and habitat connectivity

All in relation to Renewable Energy in the Western Mojave Desert

USGS

Study Area 53,621 km^2

99% of the entire study area below 2500 m

precipitation ranges 100 - 350 mm / year

Compiled locality records for the MGS

1) California Natural Diversity Data Base (CNDDB)
2) Mojave Desert Ecosystem Program
3) Trapping and survey work

P. Leitner & D. Delaney unpubl. Data

After aggregating samples for the grid

440 observations of MGS for modeling

USGS

From 86 different models combinations we selected a model with 4 environmental covariates to best represent habitat

The environmental covariates in the best model included:

surface texture -	46.6 %
surface albedo -	25.4 %
mean winter climatic water deficit	16.3 %
Precipitation -	11.6%

USGS

Fig. 2. Limiting covariates (surface texture, brown; albedo, blue; climatic water deficit, green; precipitation, yellow) for Mohave ground squirrel. The limiting covariate for a given grid cell was identified as the covariate providing the greatest increase in habitat suitability for that grid cell if the covariate value was adjusted to its mean of the entire study area.

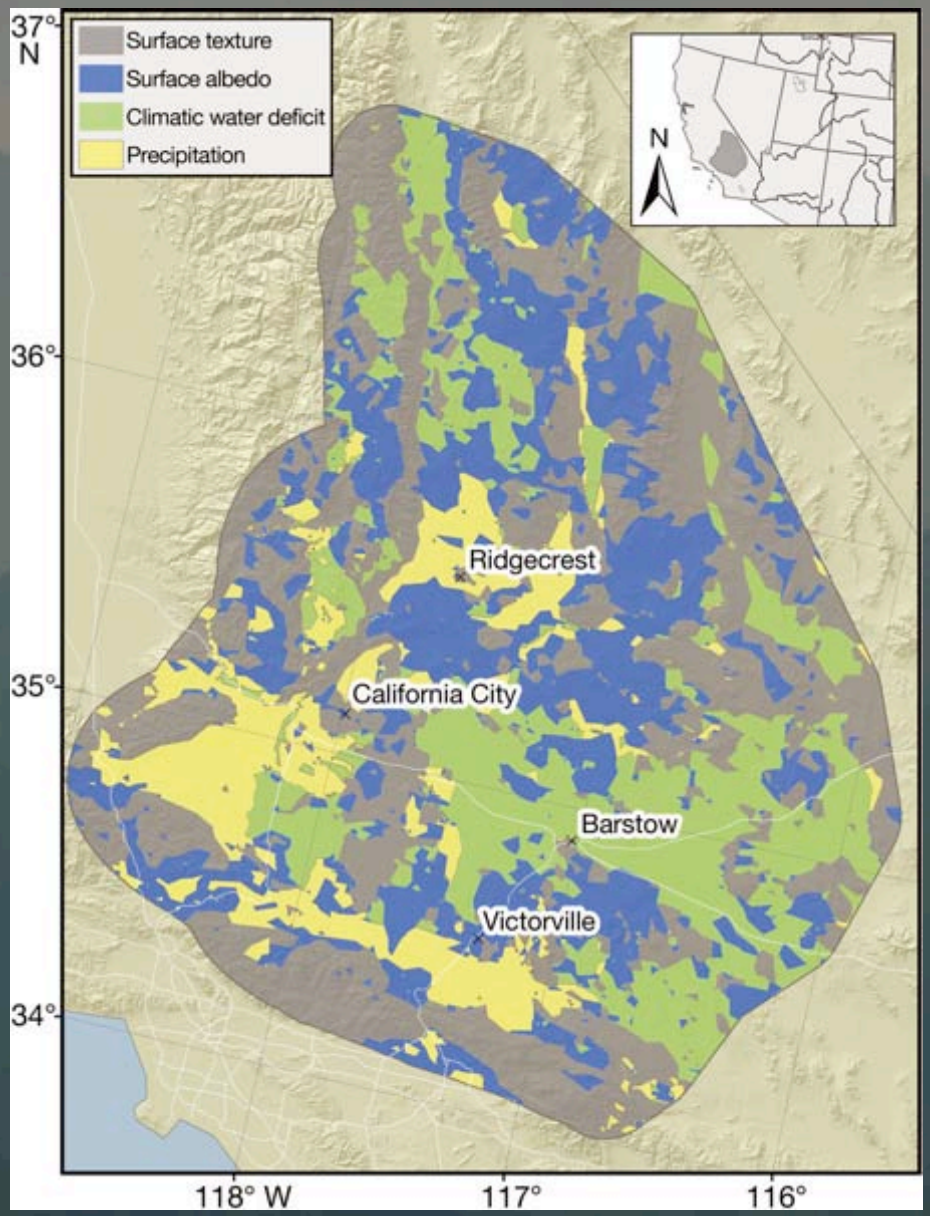

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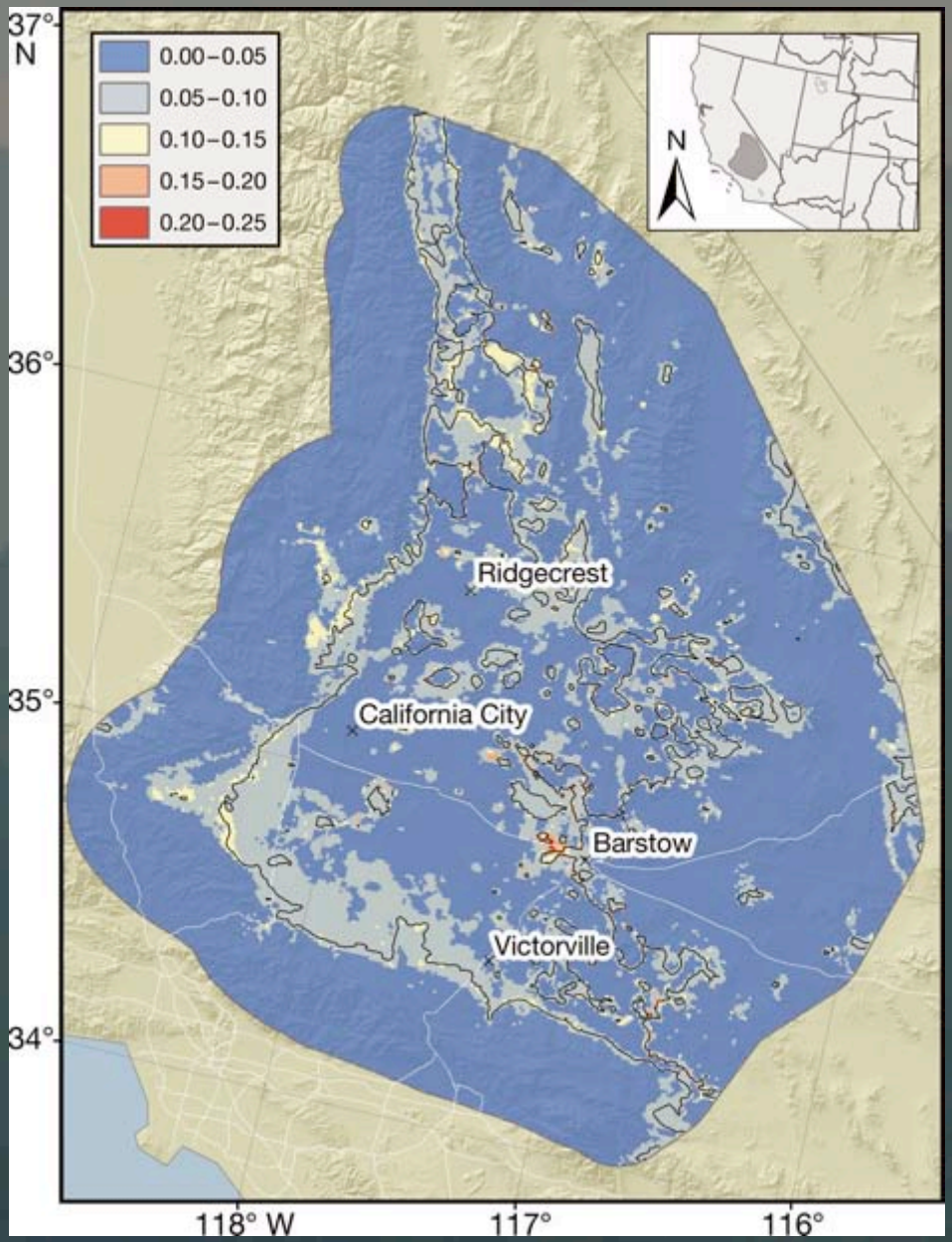
Fig. 3. Model standard deviation map. Warmer colors represent areas with high standard deviations. The model was based on 440 input localities. Modeling was conducted at a scale of 1 km (raster cell size = 1000 m). The threshold between suitable and unsuitable habitat is shown as a black contour. Roads (white lines) and selected cities are shown for reference



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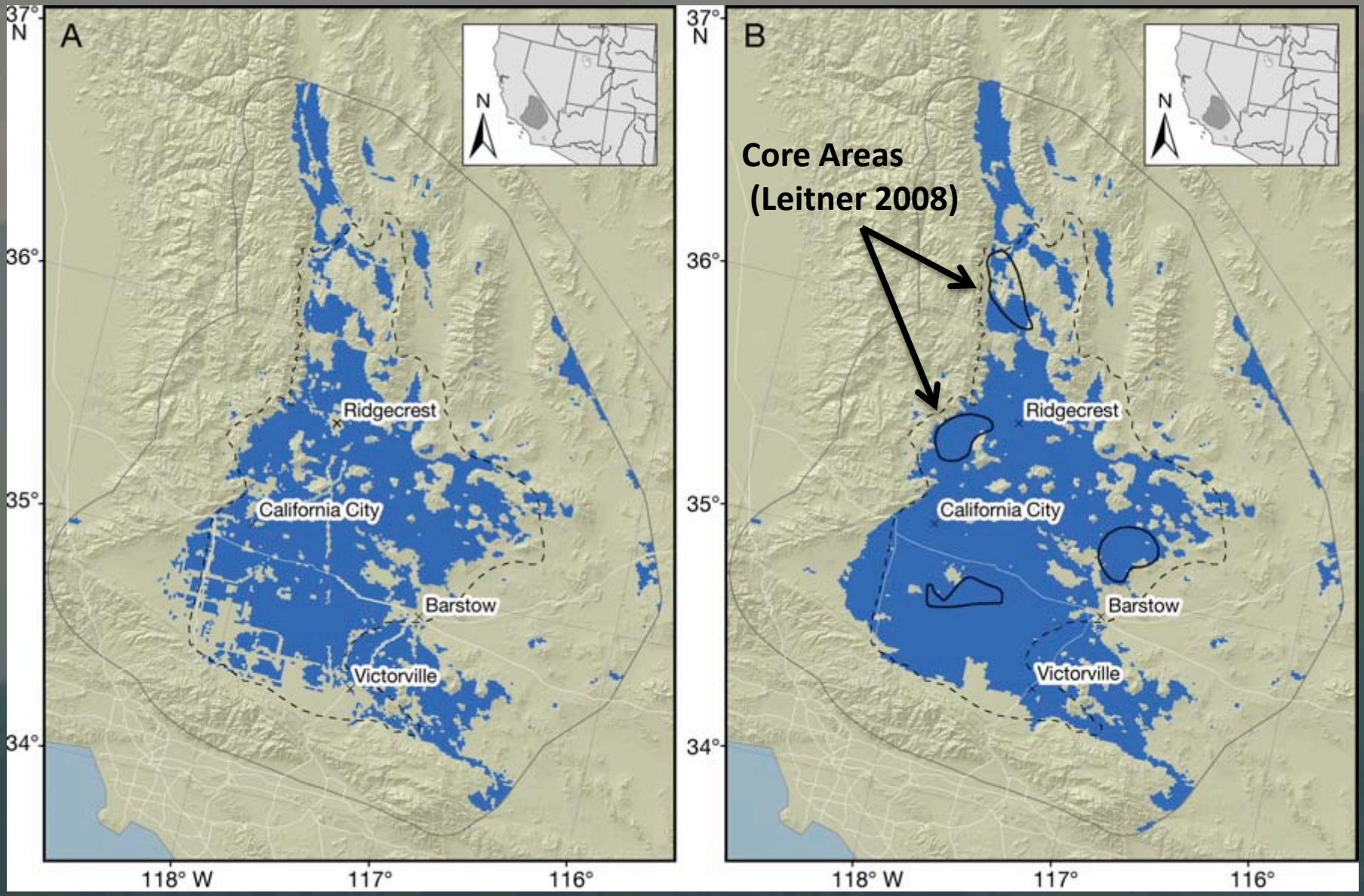
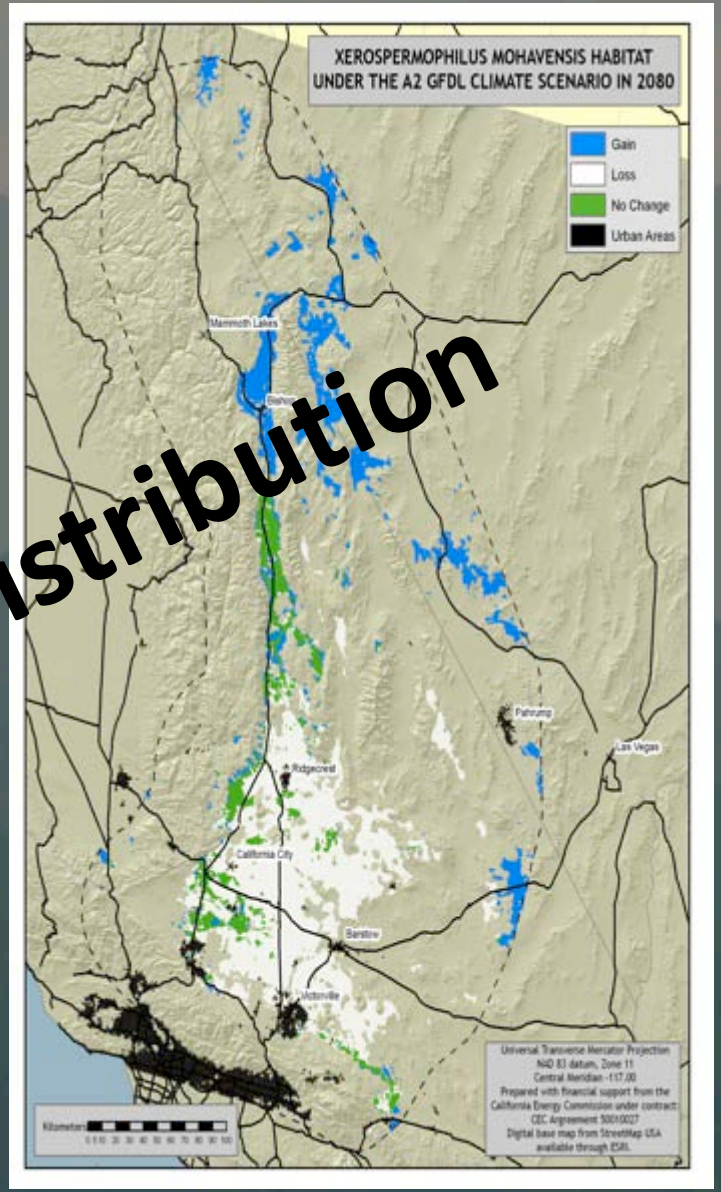


High Impact Scenario

Historic Habitat Suitability
No Urban /Agricultural Impact



Not For Distribution

Impacts of Climate Change and Renewable Energy

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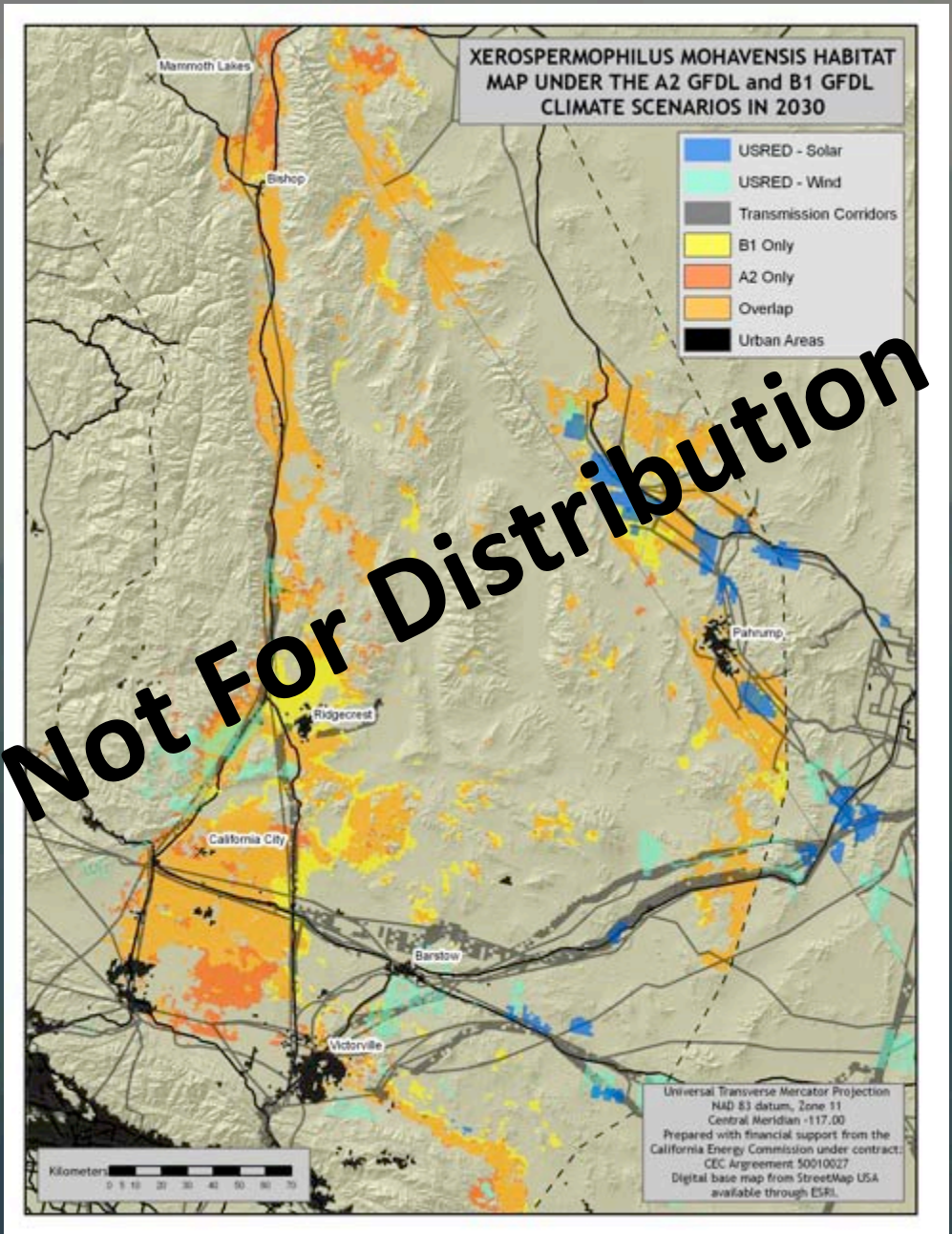
Mohave ground squirrel (*Xerospermophilus mohavensis*) habitat under the GFDL A2 (red) and B1 (yellow) climate scenarios with overlap (orange) in 2030. Solar (dark blue) and wind (light blue) USRED is shown along with transmission corridors (grey).