Flat-tailed Horned Lizard Monitoring in the Yuma Desert
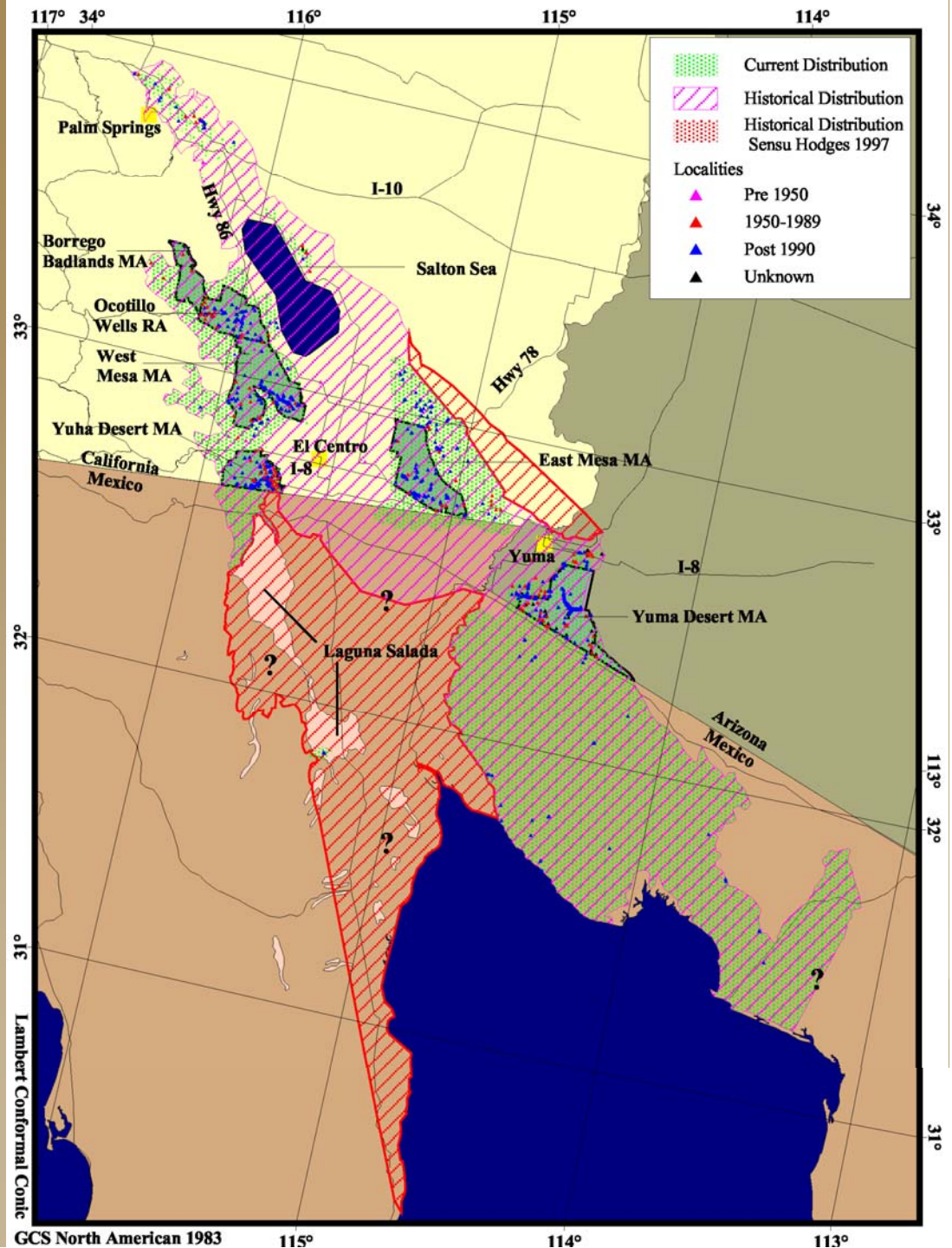

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Introduction

◆ Range contraction in the western US due largely to land conversion

◆ Candidate for ESA listing in 1993

◆ Voluntary Range- wide management Strategy initiated in 1997 created 5 management areas to monitor trends and preclude listing

◆ Proposed listing reinstated in 2003, and 2009

Introduction

- ◆ Arizona Game and Fish Department began demographic monitoring in 2008 to support conservation strategies defined by the Flat-tailed Horned Lizard Interagency Coordinating Committee

- ◆ Goal of monitoring is to identify population trends, threats, and approaches to support self-sustaining populations of FTHL

Study Area

- 2 9-ha Monitoring Plots in the Yuma MA
  - Plots selected on basis of known existence of FTHL habitat and records of FTHL presence

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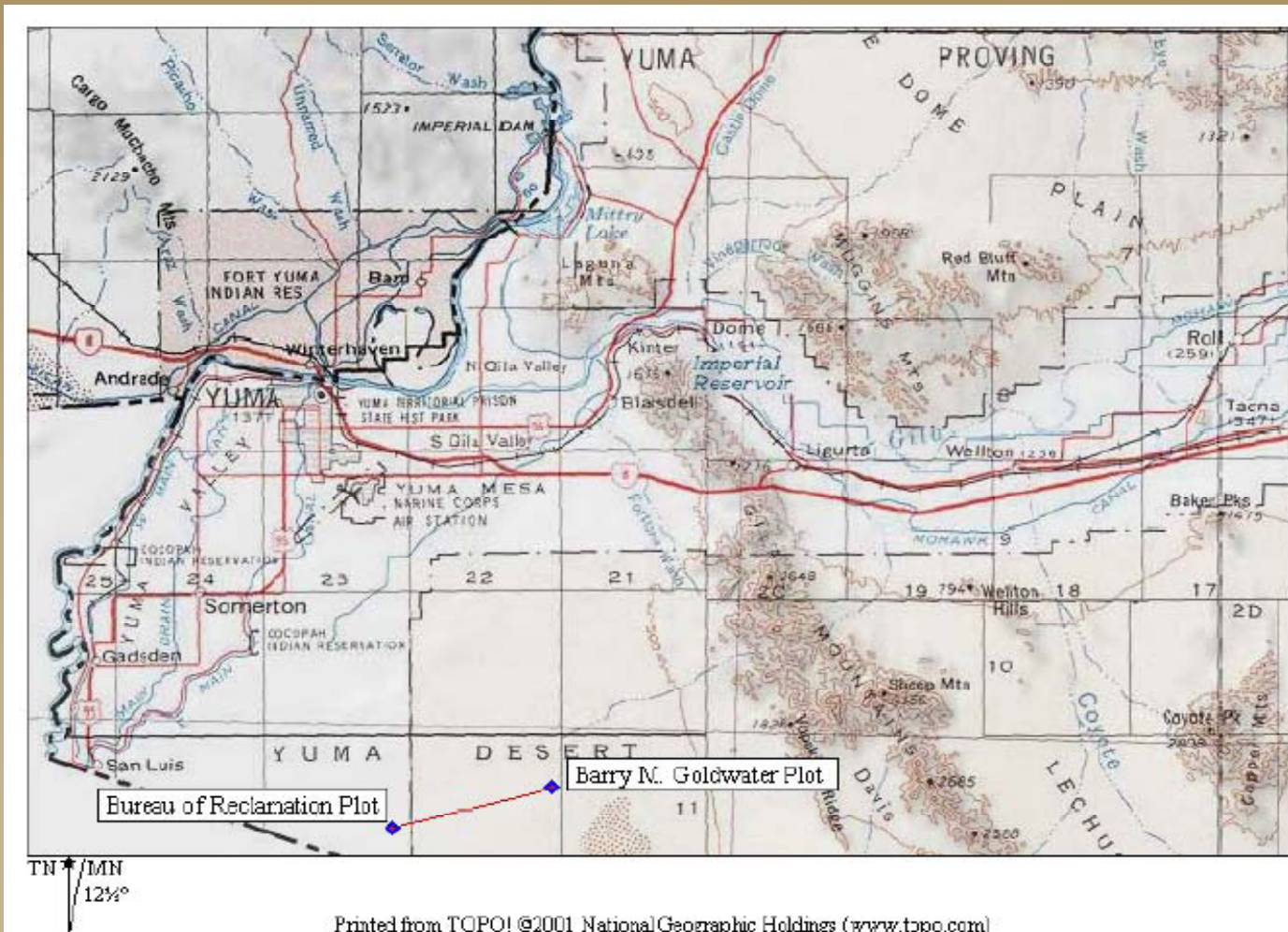
Methods

- Surveys conducted during four 5-day sessions from August through September in 2008 and 2009

- Each plot surveyed during two sessions resulting in a total of 10 "capture occasions" per plot

- Capture occasion defined as when a plot is entirely searched once

Methods

◆ Survey conducted by 4 to 6 surveyors with teams of two or three covering 4.5 ha (1/2 of plot)

◆ Surveyors searched for FTHL on foot along transects spaced 20 – 30 m apart

Methods

◆ All adults were marked using a Passive Integrative Transponder (PIT) tags for individual identification upon recapture

◆ Juveniles were externally marked to identify recapture

Methods

◆ **Data Analysis**

– Encounter histories were developed for each captured individual

◆ e.g. 0100110001

– Individual encounter histories were used to estimate abundance (N) of each plot using closed-capture models in program MARK

Finding FTHL – Easy?

Methods

◆ Data Analysis cont'd

– A suite of models were developed *a-priori* specifying various forms of variation in capture probability (p)

1) Constant p throughout sampling – $p(.)$

2) Calculate p separately for each day of sampling – p (t). Accounts for variation in p due to differences in weather and observer acuity throughout sampling sessions.

3) Capture effect – $p(c)$ – individuals that have been captured previously have different probability of being recaptured. (Note: 2009 models that included a capture effect produced nonsensical estimates, so they were not considered in the final analysis).

Methods

– Data Analysis cont'd

- ◆ Models were evaluated using Akaike's Information Criterion in an information-theoretic framework. Estimates from "competing" models (i.e. within 3 AIC values) were averaged

- ◆ Separate analyses were conducted for 2008 and 2009

- ◆ Separate analyses conducted for adults only and for all individuals

Methods

– Data Analysis cont'd

- Abundance estimates were extrapolated to estimate density:

  $$D = N/Area$$

- Calculated "effective" study area by adding a boundary strip to study plots

- Strip size = average maximum distance recaptured individuals "moved"

Results

AIC rankings

•All analyses showed at least some support for the prediction that capture probability varied throughout sampling days

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Results

◆ 2008

Abundance	N All	SE	95% CI	N Adults	SE	95% CI
Bureau of Reclamation	29	3.65	22 - 36	18	2.73	15 - 23
Barry M Goldwater	58	5.94	46 - 69	41	4.82	32 - 51
Total	87		68 - 105	59		47 - 74

Density (corrected)	D All	95% CI	D Adults	95% CI
#/hectare	4.4	3.4-5.3	3.0	2.4 – 3.7

Results

◆ 2009

Abundance	N All	SE	95% CI	N Adults	SE	95% CI
Bureau of Reclamation	88	9.18	70 - 106	25	4.14	17 - 33
Barry M Goldwater	207	17.01	174 - 241	46	6.28	33 - 58
Total	295		244 - 347	71		50 - 91

Density (corrected)	D All	95% CI	D Adults	95% CI
#/hectare	14.9	12.3-17.5	3.6	2.5 – 4.6

Discussion

◆ Apparent increase in FTHL density between 2008 and 2009
  – Large number of juveniles

Density (#/hectare)	D All	95% CI	D Adults	95% CI
2008	4.4	3.4 - 5.3	3.0	2.4 – 3.7
2009	14.9	12.3 - 17.5	3.6	2.5 – 4.6

Discussion

- Density estimates of adults were comparable to those reported at other FTHL MAs:
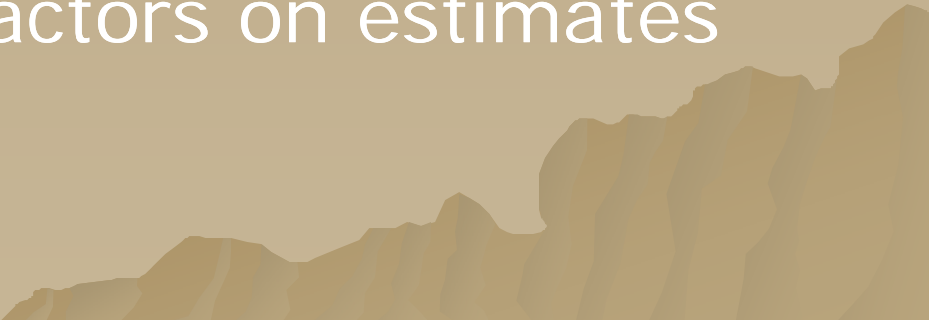
  – e.g. Mesa MA – 1.50 - 4.78 adults/ha

Density (#/hectare)	D All	95% CI	D Adults	95% CI
2008	4.4	3.4 - 5.3	3.0	2.4 – 3.7
2009	14.9	12.3 - 17.5	3.6	2.5 – 4.6

- These densities likely do not reflect the density across the Yuma MA

Discussion

- Probability of capturing FTHL in our study was low ($p=.10$ in 2008, $p=.15$ in 2009) in our study area, although similar to those reported for FTHL elsewhere, and did result in precise estimates

- Regardless, improvement in p (more searchers, more transects?) would improve confidence of estimates

Future Plans

◆ Continue to monitor FTHL abundance and density throughout the Yuma MA

◆ Use more complex models to estimate FTHL recruitment, survival, immigration, emigration, and identify their effect on the population

◆ Model the influence of habitat variables, other environmental factors on estimates

Questions ???