Spot-Tailed Earless Lizard Update: January 2017


Photo by Mike Duran

Travis LaDuc
UT Austin
Brad Wolaver
UT Austin
Mike Duran
The Nature Conservancy
Ben Labay
UT Austin
Jon Paul Pierre
UT Austin
Ian Wright
UT Austin
Gautam Surya
UT Austin
Cody Shank
UT Austin
Roel Lopez
Texas A&M
Wade Ryberg
Texas A&M
Toby Hibbitts
Texas A&M
Matt Fujita
UT Arlington
Corey Roelke
UT Arlington

Thursday, January 26, 2017

BIODIVERSITY COLLECTIONS
THE UNIVERSITY OF TEXAS AT AUSTIN

BUREAU OF ECONOMIC GEOLOGY

The Nature Conservancy
Protecting nature. Preserving life.™

TEXAS A&M IRNR
Institute of Renewable Natural Resources

Goals and Agenda

Update of scientific progress since Sept. 2016

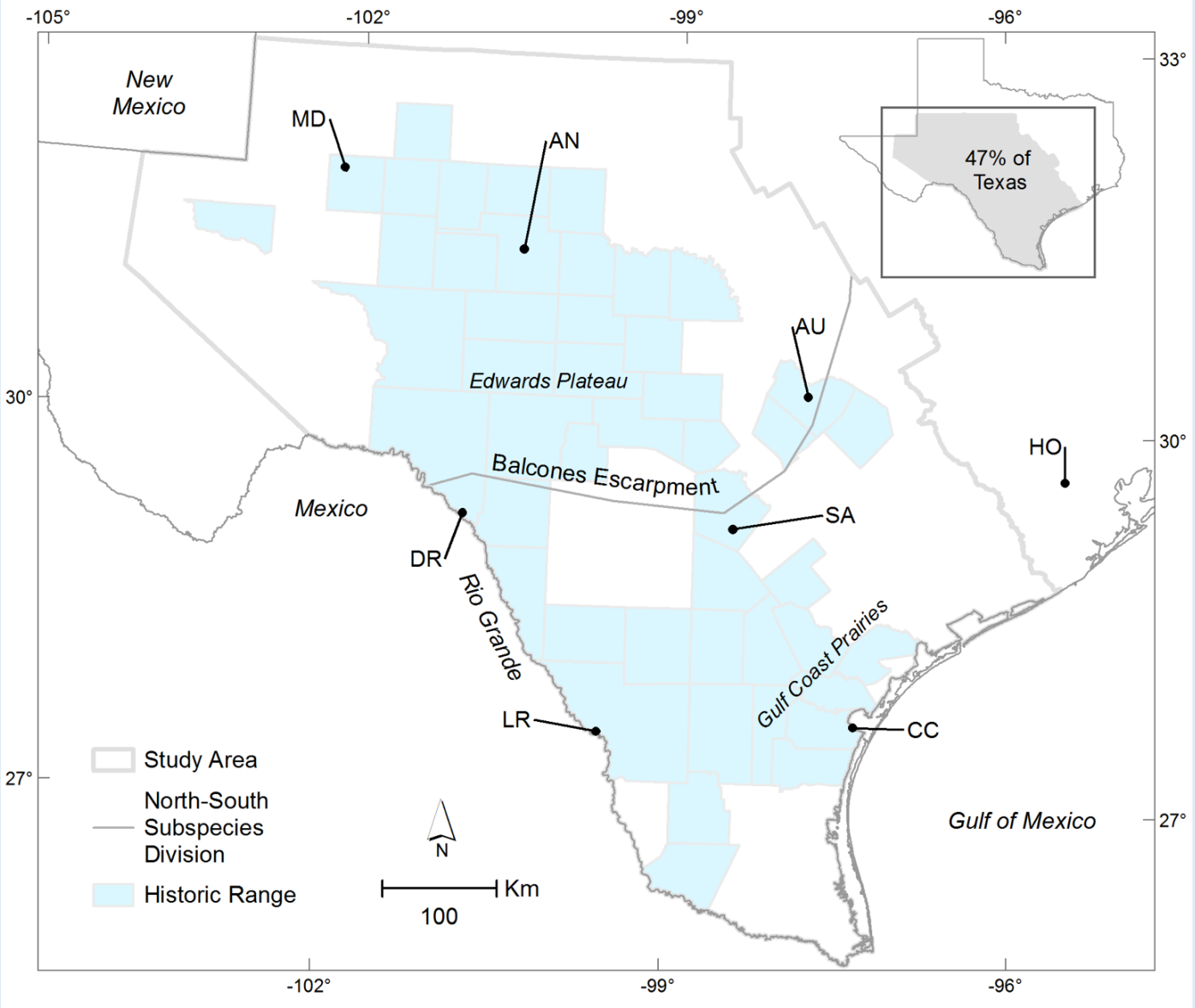
Discussion of ongoing research

Findings So Far

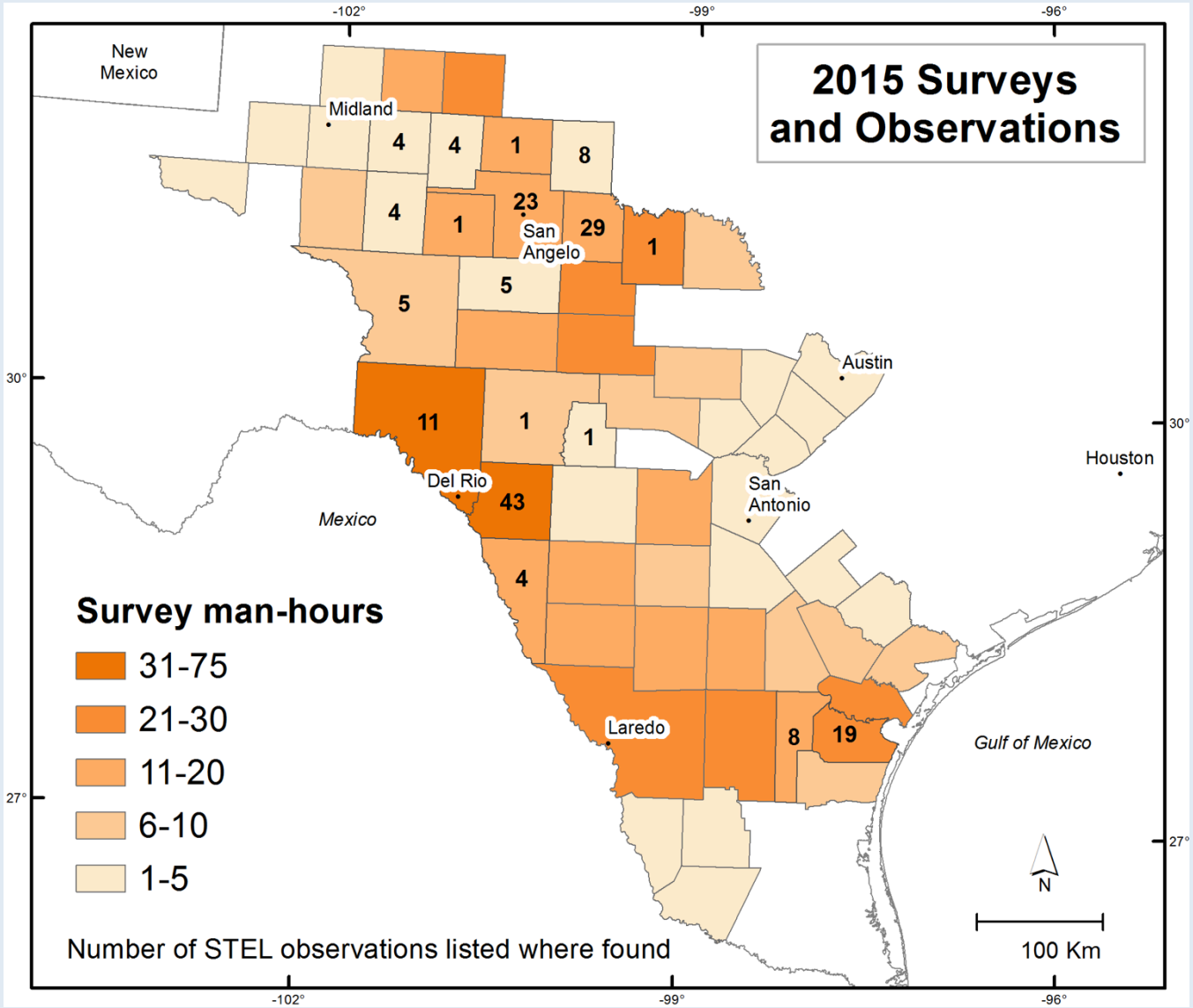
1. Field data update for 2016
2. Insect survey update
3. Genetics status
4. Habitat modeling
    1. Status
    2. Road bias
    3. Ground-truthing

+ possible additional research…

Study Area

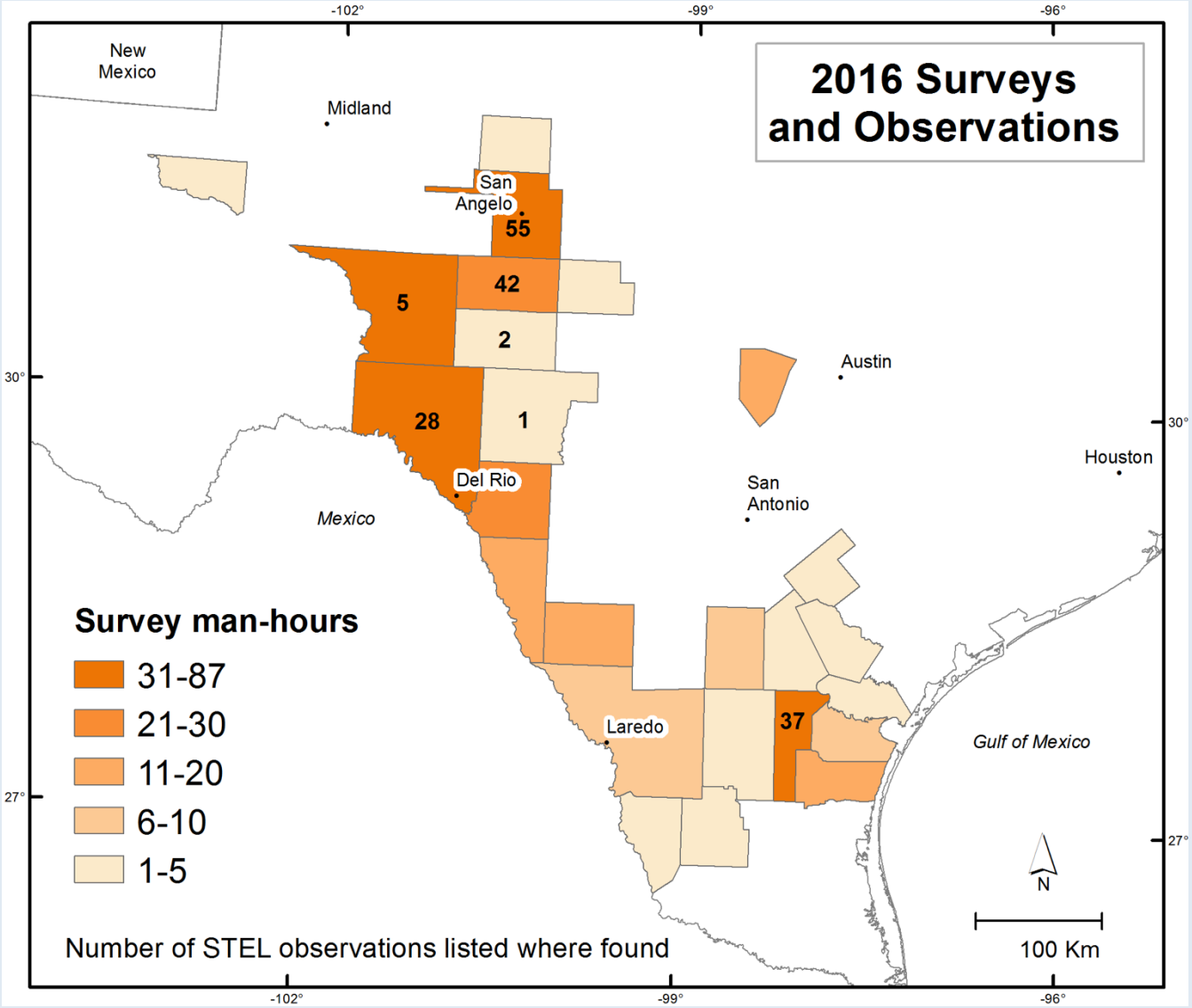

-105°
-102°
-99°
-96°
33°
30°
27°
New Mexico
MD
AN
AU
HO
47% of Texas
Edwards Plateau
Balcones Escarpment
Mexico
SA
DR
Rio Grande
LR
Gulf Coast Prairies
CC
Gulf of Mexico
Study Area
North-South Subspecies Division
Historic Range
N
Km
100

2015 Surveys



- April 22 – Sept 24
- 274 surveys in 57 counties
- 18 counties with positive *H. lacerata* surveys
- 174 *H. lacerata* observed

2016 Surveys



- April 6 – Sept 28
- 171 surveys in 28 counties
- 53 surveys in 7 counties with positive *H. lacerata* surveys
- 170 *H. lacerata* observed
- 91 animals marked; 2 recaptures

2016 Surveys

- **171 surveys** (April 6 – August 26)
  - 52 walking; 18 lizards seen (0.04 lizards/hr)
  - 119 driving; 152 lizards seen (0.30 lizards/hr)

- **28 counties** across historical range
  - Areas of 2015 sightings
  - Historical range where no 2015 sightings

- **170 *Holbrookia lacerata* sighted**
  - No new counties with *H. lacerata* from 2015 (save Sutton Co.)
  - Juveniles observed in every unit

2016 Surveys

- **Mark-recapture**:
  - 91 individuals identified (all photographed, 61 toe-clipped)
  - Two recaptures
  - Combination road and walking surveys

Diet / Insect Surveys

Diet data obtained from 129 specimens

Results: **lizards are diet generalists**

- Chase down and eat ground- and low-vegetation-dwelling beetles, grasshoppers, and spiders
- Suggests open patches of ground between low-lying vegetation important
- Visual tracking and capture of prey

Diet / Insect Surveys

Diet: prey volume

redacted – unpublished data

redacted – unpublished data

Diet / Insect Surveys

2016 diet availability study

Specimen diet study results allowed for focused insect sampling methods in 2016 field work
Two field sites: Del Rio [SW] and Barnhart [N]
All material identified; final report by end of January 2016
Relative proportions of insect orders seen in the field roughly equivalent to proportions seen in diet of lizard specimens

***Holbrookia lacerata* is a diet generalist**

Genetics – TAMU 2015

redacted – unpublished data

Genetics – 2015/16

TAMU

- Results presented December 2015
- 70+ samples; two genes: one nuclear, one mitochondrial
- Manuscript to be submitted this spring

UT-Arlington

- Field work (Section 6): new samples + 2015 samples
- New genetic work underway (nex-gen sequencing)
  - 100+ *H. lacerata* samples
  - 30+ samples for 3 additional *Holbrookia* species

Habitat Model: Background

- Models in general can be used either to **predict** or to **explain**
- The purpose of the model helps inform the choice of predictor variables, selection of survey data, model algorithm, and other decisions that affect model output
- In this case, we are more interested in **prediction - specifically, spatial prediction.**

Habitat Model: Uncertainty

- Survey data
  - Bias and autocorrelation
- Choice of predictor variables
  - Type of variables used
  - In case of climate, emissions spectrum and circulation model
- Modelling algorithm used
- Choice of threshold value used to classify habitat

Habitat Model: Status

- What is status of updating with survey 2016 data?

  Incorporation of 2016 survey data complete

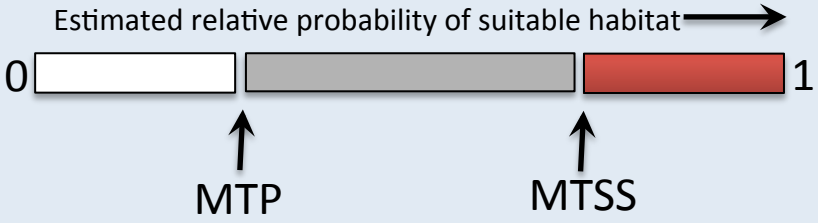
  Addition of environmental layers - (running this week)
    CTI - compound topological index*
    2016 POLARIS SOIL DATA - Fills SSURGO soil data gaps*

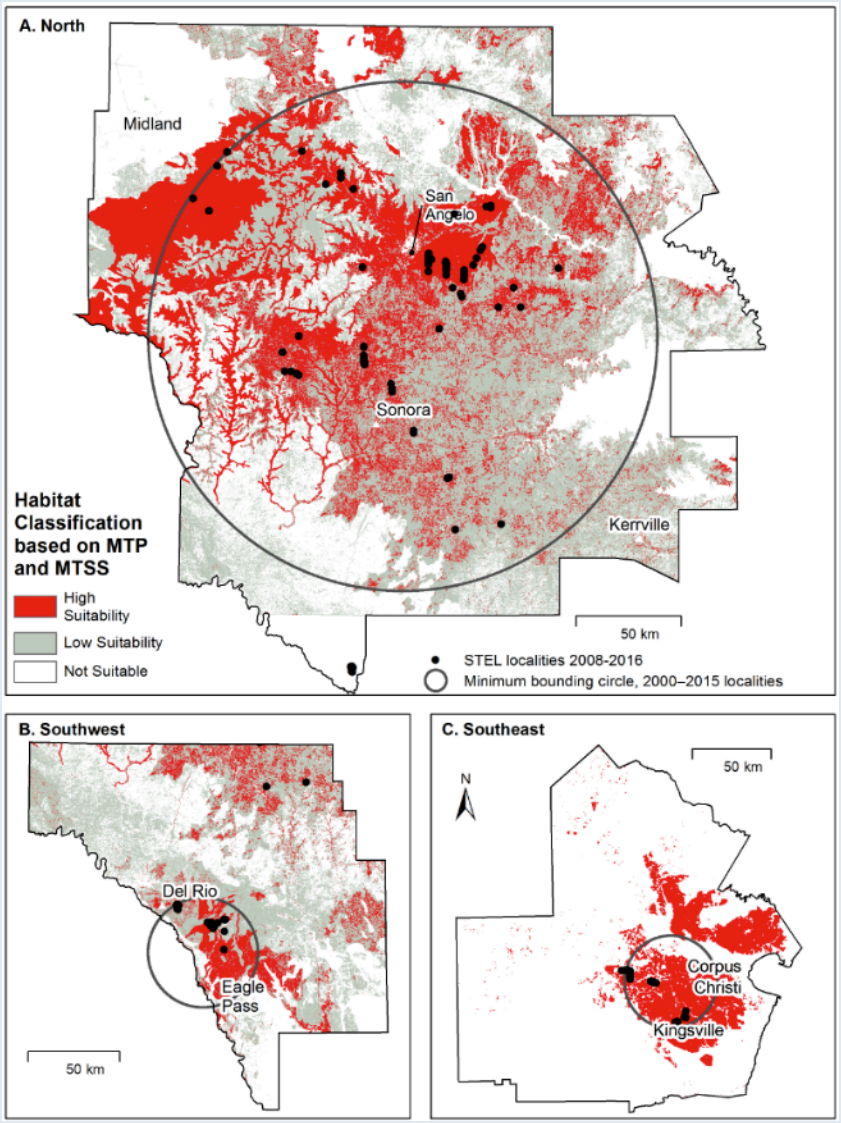
*CTI - Gessler et al. 1995; POLARIS - Chaney et al. 2016

Habitat Model: Results

- 3 Hab. categories: No, Low, High
- Defined by 2 thresholds:

- **MTP** (minimum training presence)
  Lowest probability associated with a record
- **MTSS** (max. training sensitivity + specificity)
  Modeled habitat captures all survey locations Balances “presence” & “pseudo-absence”



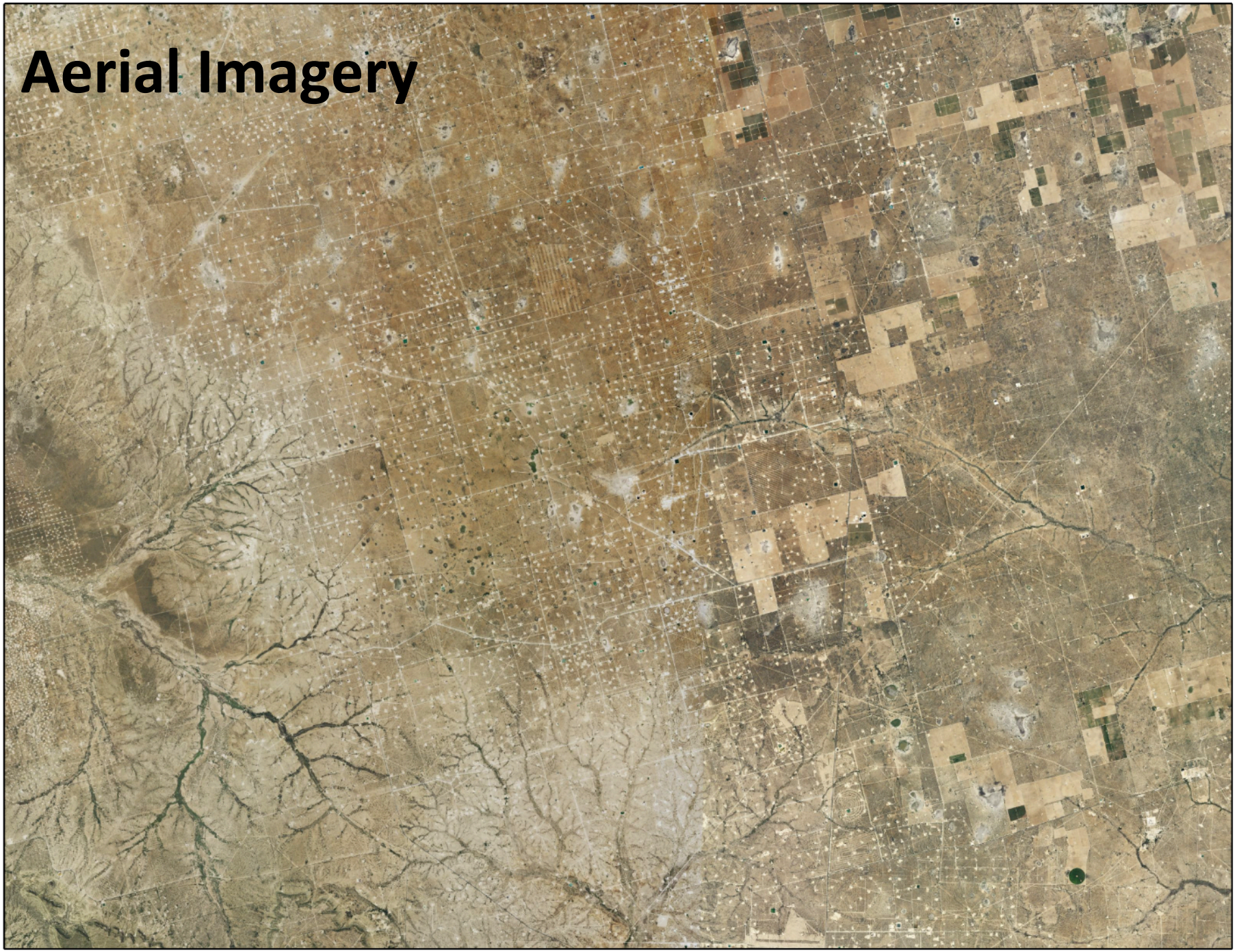


As of January 2017.

Habitat Model: Questions

- **Road Bias**? - addressed with Model's algorithmic bias-grid approach* (best practice for countering sampling bias)
- **Why not add climate data?**
  Desired completely mechanistic model for spatial prediction
  Data too coarse considering population ranges
  Needed a dedicated model approach
- Why not model **entire species historical range**?
  Geographic & genetically distinct populations with different threats
- **Ground Truthed** EMS data?
  TPWD product with 14,000+ groundtruth data points

*Stolar & Nielson 2014


Aerial Imagery


Habitat Model
High Suitability
Low Suitability
Not Suitable

% Sand in Soil

Habitat Model: Future Climate

- **Goal:** To predict the change in the range of STEL over time

- In order to do this, need data that can be projected into the future
  - Things like elevation, for example, will not change over 50 years
  - Things like vegetation may change, but hard to predict

- Most commonly used set of predictors – BIOCLIM suite of climate variables
  - 19 variables derived from temperature and precipitation data
  - Spatially interpolated between weather stations

- Consulted with climate scientist Dr. Katharine Hayhoe at Texas Tech, and confirmed appropriateness of methods and environmental layers used.

Habitat Model: Future Climate

- 4 typical emissions scenarios used:
  RCP2.6, RCP4.5, RCP6 and RCP8.5*
  - Correspond to a spectrum from smaller to larger carbon emissions
  - We are already likely ahead of rcp26

- Future climate projections also depend on the particular global circulation model used
  - Hadley center model (HadCM3) the most commonly utilized by researchers

*RCP = Representative Concentration Pathways

= Four greenhouse gas (CO_2-equivalent) concentration trajectories

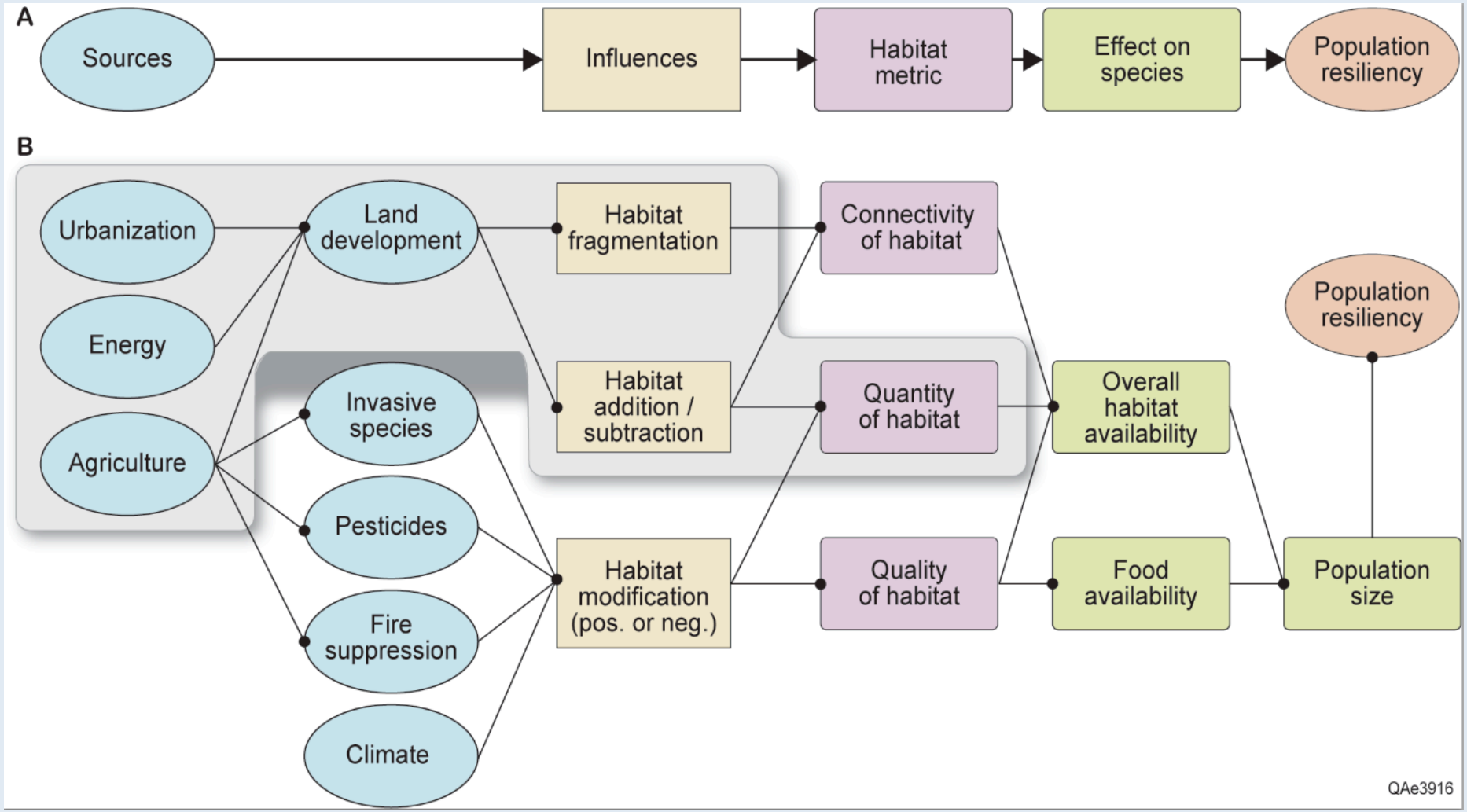
What do we need to learn?

Threat assessment

- What types of habitat does the species utilize?
  we have general characterization, needs refinement

- Refine potential causal effects of landscape-scale changes on the species

Influence Diagram



Upcoming Work

- Landscape alteration: Future oil and gas in Eagle Ford and Permian Basin
- Conservation assessment and connectivity analysis
- Future climate change habitat model
- PVA: Develop scenarios for population viability assessment (PVA)

Future Directions

- Future vegetation model based on climate forecasts
- Telemetry: Assess causal links of land cover/vegetation types on species
- Re-vegetation study: Historic oil and gas landscape alteration (i.e., inform possible conservation actions)
- Continued mark-recapture/surveys
- Assess changes in land cover: 1984—present with 2x/mo. LANDSAT

Questions?

Thanks for your comments

BIODIVERSITY COLLECTIONS
THE UNIVERSITY OF TEXAS AT AUSTIN

BUREAU OF ECONOMIC GEOLOGY

The Nature Conservancy
Protecting nature. Preserving life.™

TEXAS A&M IRNR
Institute of Renewable Natural Resources