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Species Distribution Modeling for the Western Chicken Turtle (*Deirochelys reticularia miaria*) in Texas

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*WCT=Western Chicken Turtle



Western Chicken Turtle Ecology

- ◇ Occur in Louisiana, Arkansas, Missouri, Oklahoma, and Texas
- ◇ Associated with inhabiting shallow, ephemeral wetlands^{1,9}
- ◇ Suggested they depend on the landscape-matrix quality^{2,3,4}
- ◇ Discrete nesting season (late spring to summer)^{5,6,7,8}
- ◇ Prolonged aestivation period (mid-July to February)^{5,9}
- ◇ Threatened by wetland loss and fragmentation due to urbanization²

- ◇ **Conservation status:**
 - ◇ Petitioned to be included as Threatened under ESA in 2011
 - ◇ USFWS currently developing a Species Status Assessment
 - ◇ Species of Greatest Conservation Need in Texas



References:

- 1: Buhlmann et al. 2008
- 2: Ryberg et al. 2017
- 3: Quesnelle et al. 2015
- 4: Semlitsch & Bodie, 2003
- 5: McKnight et al. 2015
- 6: McKnight et al. 2018
- 7: Carr & Tolson, 2017
- 8: Bowers et al. 2022
- 9: Bowers et al. 2021

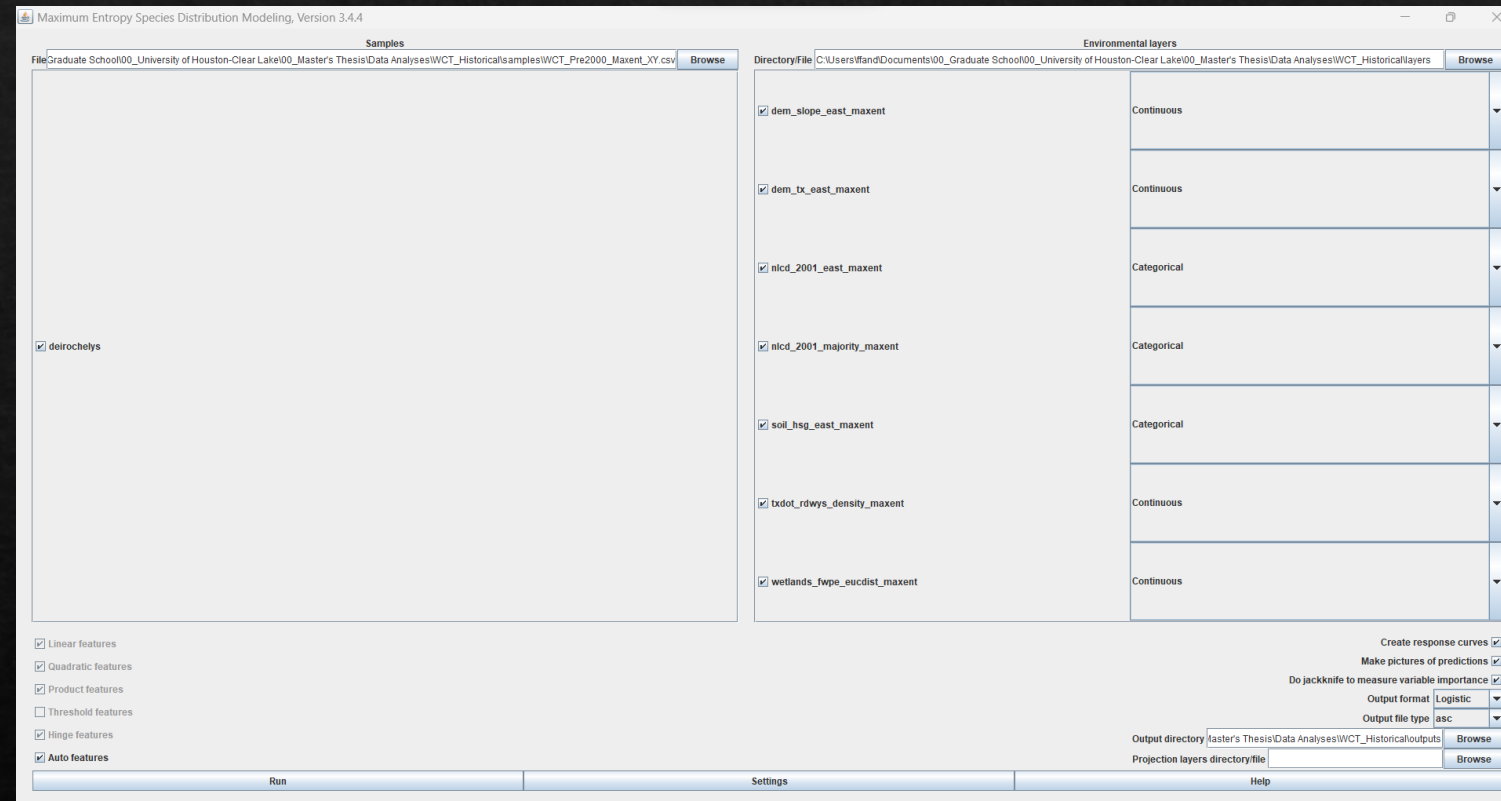
Study Summary & Results

- ◆ **Goal:** Estimate the current distribution of WCT and habitat associations
- ◆ **Field Methods:** Combination of 14 protocols and associated habitat data collection
- ◆ **Data Analysis:** Species distribution modeling
- ◆ **Results:**
 - ◆ Conducted sampling for three years (2020-2022)
 - ◆ 66 sites in 33 counties
 - ◆ Presence confirmed during 50 events
 - ◆ WCT presence confirmed at 12 locations in 10 counties across all methods
 - ◆ 24 counties in TX have historic detections or confirmed/potential detections from this study
 - ◆ Small-scale habitat: sites with wetlands classified as Freshwater Emergent or Freshwater Pond had the highest potential for and proportion of WCT detections



Species Distribution Modeling (SDM): An Overview

- ◇ Predict the potential distribution of a species on a geographic scale based on the relationship between occurrence records and environmental co-variates^{1,2}
- ◇ Relies on landscape-scale spatial datasets^{1,2}
- ◇ **MaxEnt**: program that uses algorithms to produce a probability distribution indicative of habitat suitability^{1,2,3,4}



MaxEnt Application Window

References:

1: Elith et al. 2011

2: Merow et al. 2013

3: Stratmann et al. 2016

4: Ryberg et al. 2017

WCT Distribution Modeling

- ◆ **WCT Occurrence Sources**

- ◆ **Environmental Co-variates:**

- ◆ Elevation & Slope

- ◆ Land cover



- ◆ Soil class



- ◆ Distance between freshwater emergent and pond wetland types



- ◆ Road density



- ◆ **Models produced:**

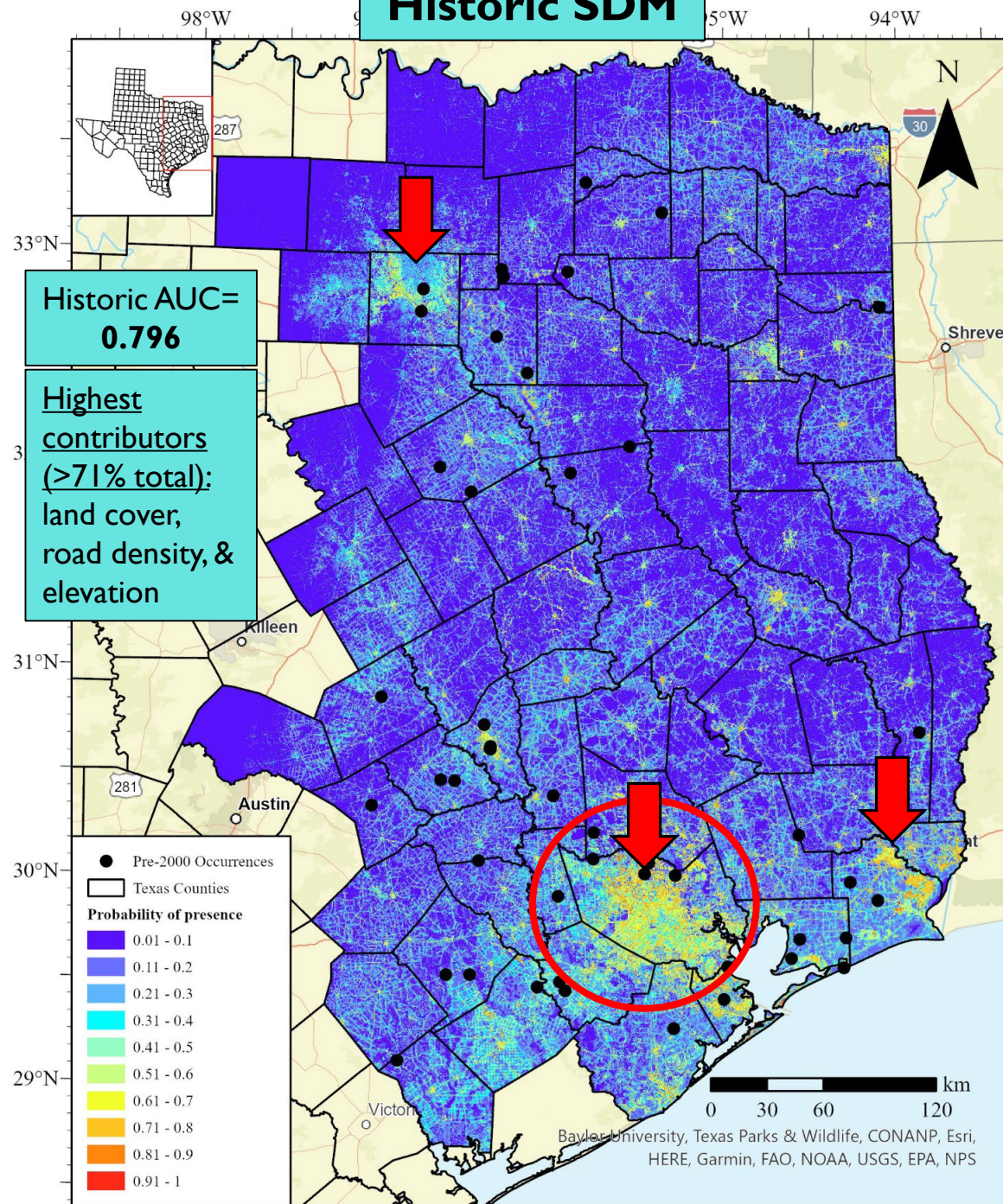
- ◆ Historic: WCT occurrences prior to 2000 ($n=47$)

- ◆ Current: WCT occurrences after 2000, including detections from this study ($n=47$)

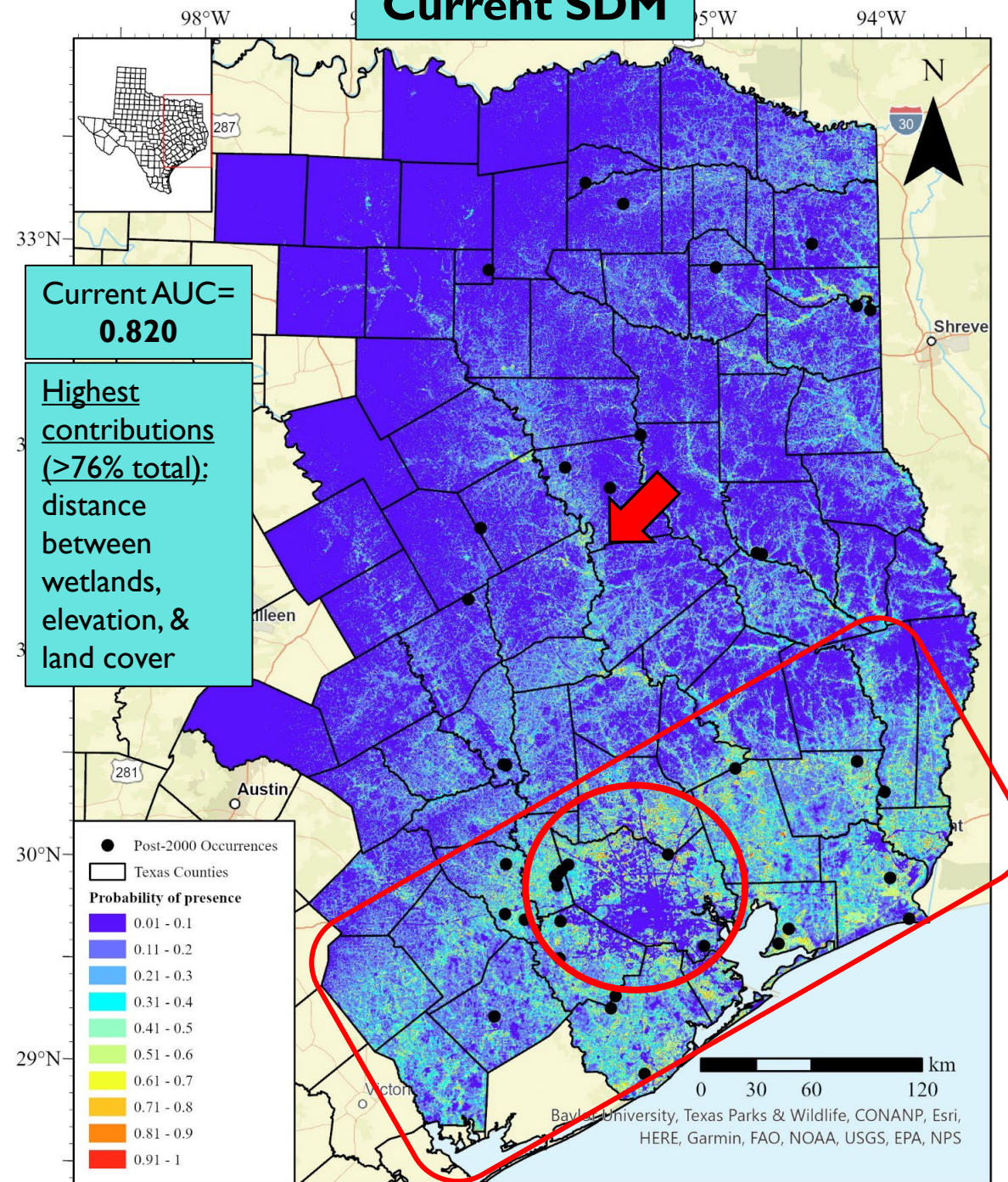
- ◆ Detection: only confirmed WCT detections from this study ($n=12$)



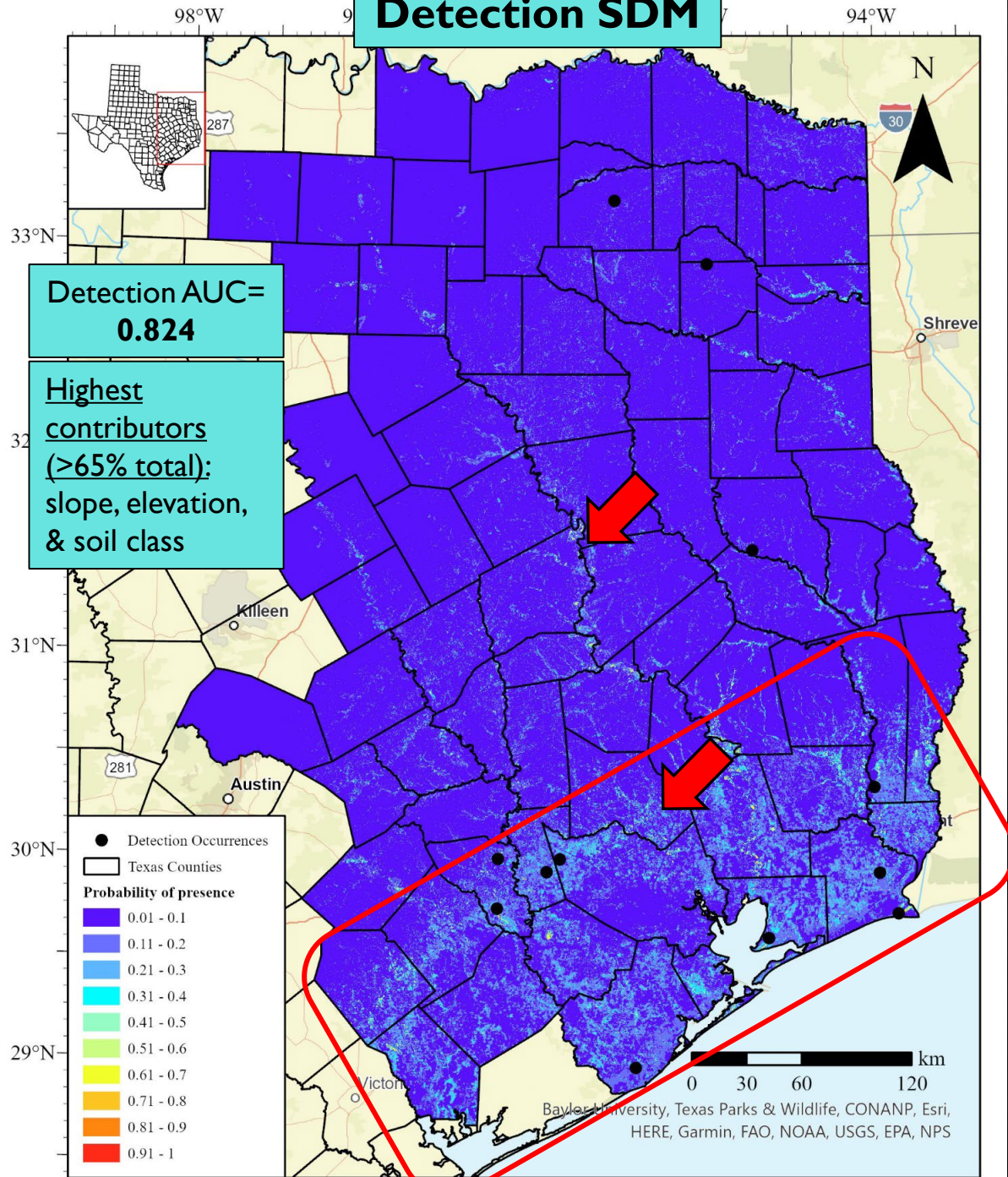
Historic SDM



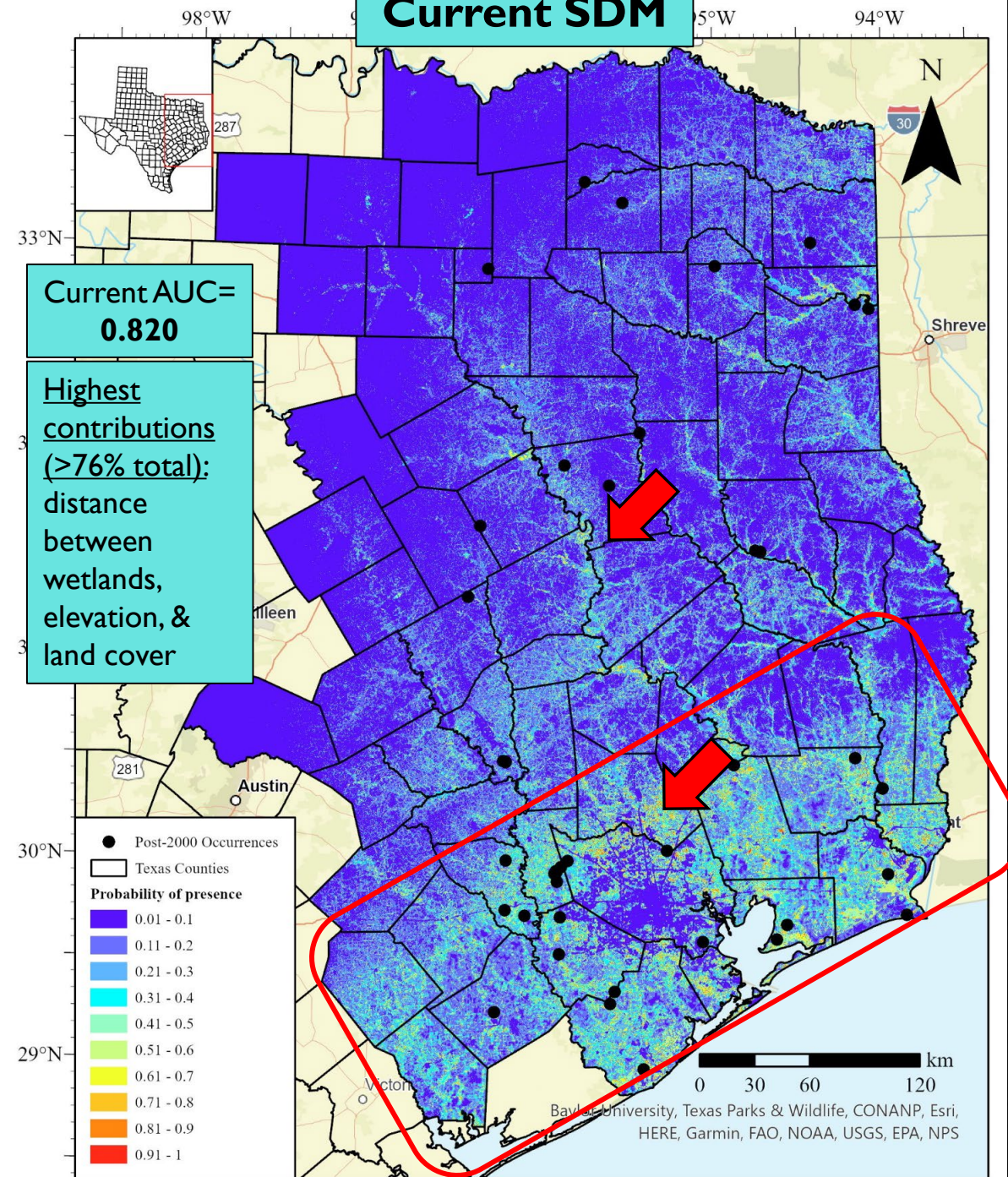
Current SDM



Detection SDM



Current SDM



Future Recommendations for Landscape-Scale Analyses

- ◆ Climate change projections (eco-forecasting)
- ◆ Accounting for sample bias using targeted group sampling
- ◆ Habitat fragmentation modeling
- ◆ Habitat heterogeneity within the estimated WCT home range



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- ◆ State & Federal Permitting, Institutional Protocols, and Access Permissions: Texas Parks and Wildlife Department Scientific Permit for Research SPR-0504-383; UHCL Institutional Animal Care & Usage Committee protocol 0320.001.R1; Texas Parks and Wildlife Department Aerial Wildlife Monitoring permit M-2885; special use and land access permits issued by Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, U.S. Department of Agriculture Forest Service, River Authorities
- ◆ WCT Online Reporting Tool participants

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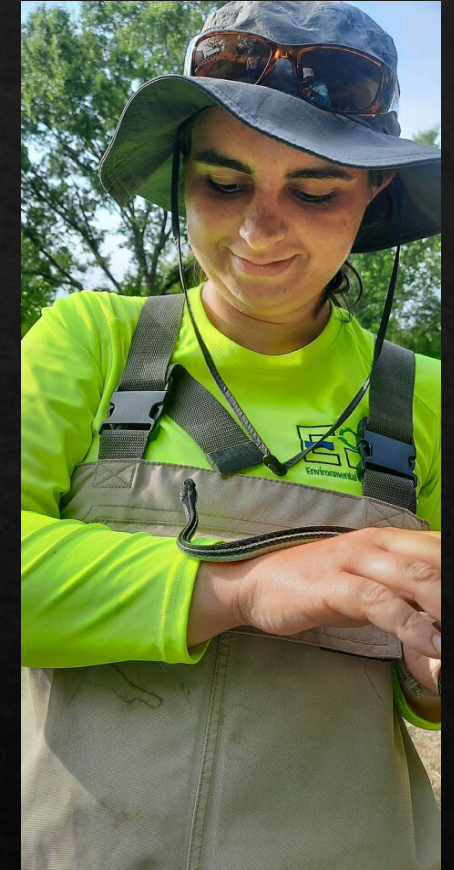
Thank You! Questions?



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WCT Study Final Report (EIH → Research → Publications):

<https://www.uhcl.edu/environmental-institute/research/publications/documents/23-001-distribution-habitat-association-western-chicken-turtle-final-report.pdf>