

# A Species Distribution Model of the Red-Spotted Toad

Jared Johnson, Dr. Fabio Suzart de Albuquerque

College of Integrative Sciences and Arts, Arizona State University, Polytechnic



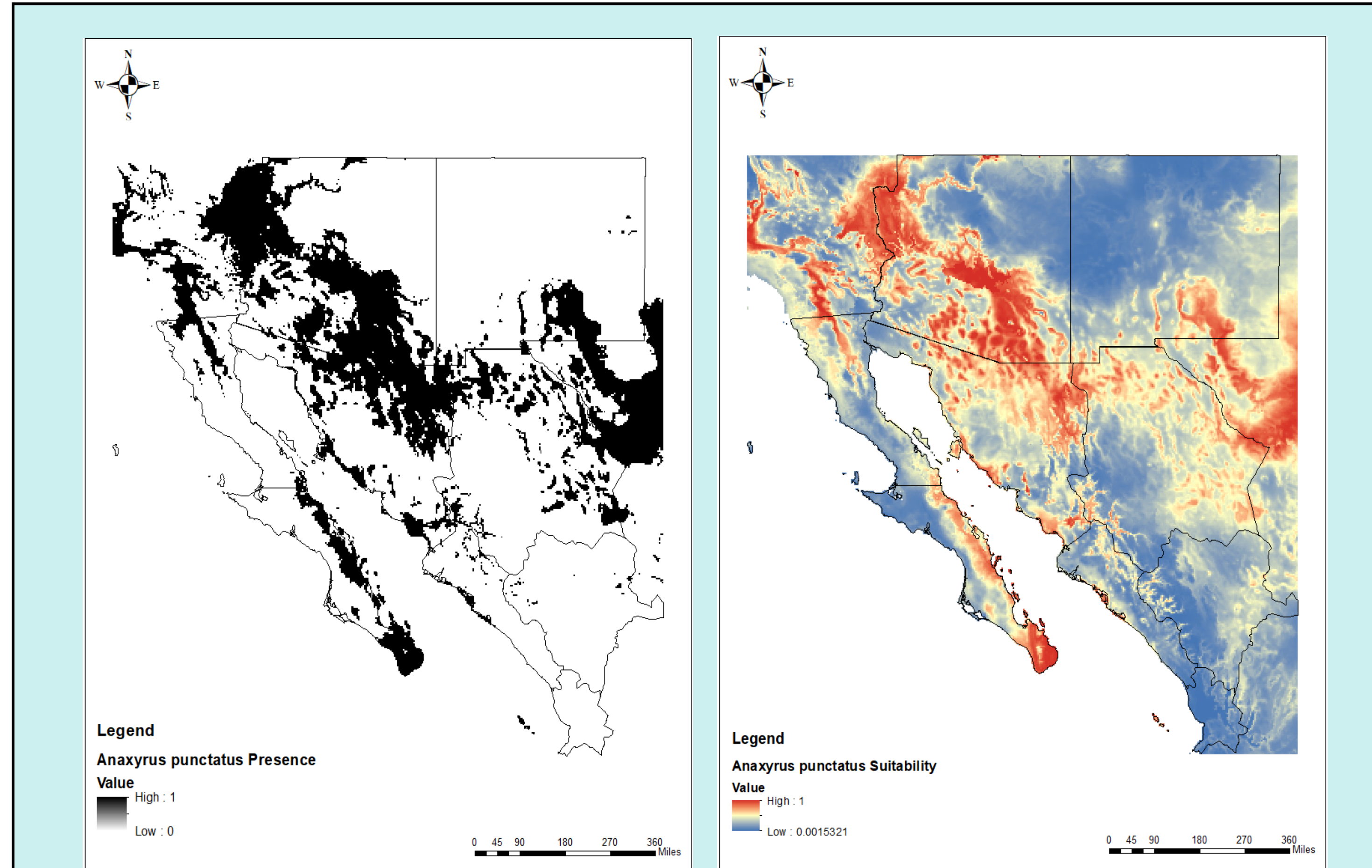
## Introduction and Objectives

- A species distribution model (SDM) is a tool that combines species occurrence data with environmental variables to create predictive models of species presence and suitability across landscapes and time<sub>1</sub>
- Objectives
  - Depict predicted presence of Red-Spotted Toad
  - Depict predicted suitability of Red-Spotted Toad
  - Determine the relationship between Red-Spotted Toad and environmental variables

## Methods

- Species occurrence data was obtained from The Global Biodiversity Information Facility (gbif.org)<sub>3</sub>
- 19 Environmental variables were obtained from WorldClim<sub>2</sub>
- All data processing, variable selection, and modeling was performed in R<sub>5</sub>
- Map depictions of predicted presence and suitability were created in ArcGis

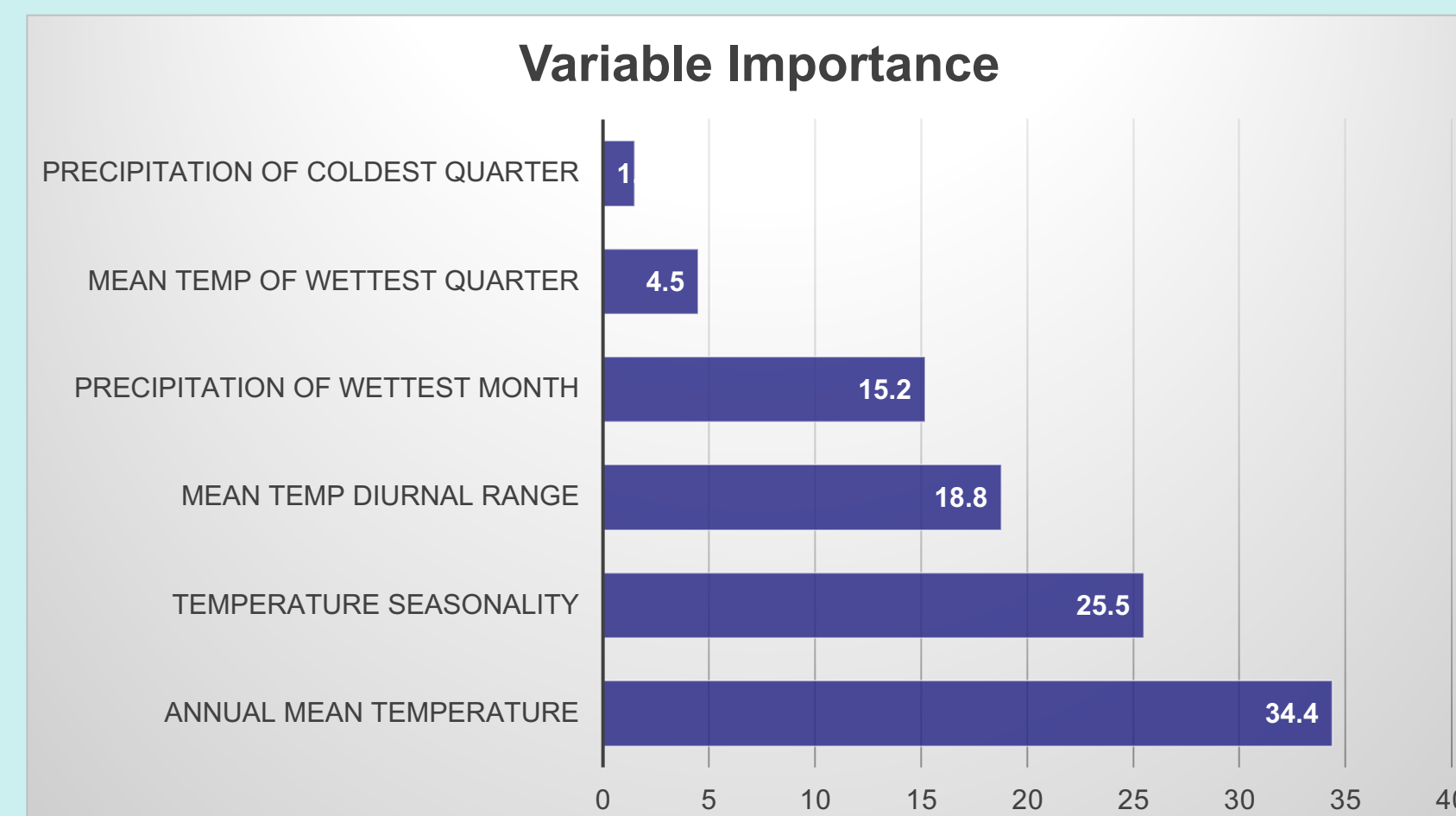
## Results



**Figure 1.** A depiction of the predicted presences of Red-Spotted Toad (*Anaxyrus punctatus*) across the landscape

**Figure 2.** A depiction of the predicted suitability of Red-Spotted Toad (*Anaxyrus punctatus*) across the landscape

**Table 1.** Variable importance for predicted presence and suitability models of Red-Spotted Toad (*Anaxyrus punctatus*)



## Results

- Predicted presence of Red-Spotted Toad compares to maps of predicted Suitability for the species
- The most important variables to the model were linked to temperature
- Annual mean temperature was the most important variable to the model with 34.4%
- Temperature seasonality and mean temperature diurnal range were the next most important variables to the model

## Conclusions

- My results exemplify the relationship between Red-Spotted Toad occurrence and temperature
- Temperature and other energy related variables have been identified as drivers for amphibian richness<sub>4</sub>, which is cause for concern for how amphibian suitability may be negatively impacted by climate change

## Literature Cited

1. Elith, J., & Leathwick, J. R. (2009). Species distribution models: ecological explanation and prediction across space and time. *Annual review of ecology, evolution, and systematics*, 40, 677-697.
2. Fick, S.E. and R.J. Hijmans, 2017. WorldClim 2: new 1km spatial resolution climate surfaces for global land areas. *International Journal of Climatology* 37 (12): 4302-4315.
3. GBIF.org (27 September 2023) GBIF Occurrence Download <https://doi.org/10.15468/dl.9dj9ha>
4. Hawkins, B. A., Field, R., Cornell, H. V., Currie, D. J., Guégan, J. F., Kaufman, D. M., ... & Turner, J. R. (2003). Energy, water, and broad-scale geographic patterns of species richness. *Ecology*, 84(12), 3105-3117.
5. R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.