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Manihot walkerae: Contributing to the Future Conservation Plans of this Endangered Endemic Species in Texas and Mexico

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ABSTRACT

- Walker's Manihot (*Manihot walkerae*) is an endangered species that is endemic to the Tamaulipan thornscrub ecoregion, which includes portions of South Texas and northeastern Mexico.
- Our objective was to construct a habitat model for *M. walkerae* to identify areas that are potentially suitable for future reintroduction.
- The protected areas assessed for suitability in South Texas were Texas Park and Wildlife Department lands and tracts from the U.S. Fish and Wildlife Service's South Texas Refuge Complex.
- In Mexico, these areas included Natural Protected Areas (federal and state), Biosphere Reserves, Priority Terrestrial Regions, and Areas of Importance for Bird Conservation (AICAS).
- Several protected areas in Texas have high suitability values (>0.7) and could be used for reintroduction of *M. walkerae* in the future, such as portions of LRGV NWR.
- In Mexico however, no protected areas are found inside of predicted suitable habitat for *Manihot walkerae*.

INTRODUCTION



- Fig 1.** Walker's Manihot, *Manihot walkerae* Croizat, is a federally endangered species endemic to the Tamaulipan Thornscrub ecoregion (TTE) in South Texas and northeastern Mexico.
- It is a perennial herbaceous plant of the spurge family characterized by its palmate five-lobed leaves, white flowers, and circular dehiscent fruits.
- It is related to *Manihot esculenta*, or Cassava.

QUESTION & HYPOTHESIS

- Question:** Do the already established protected areas in Texas and Mexico have suitable habitat for *Manihot walkerae*?
- Hypothesis:** We hypothesize that there are protected areas in Texas and Mexico with suitable habitat for *Manihot walkerae*.

METHODS

- Using MaxEnt** we input 19 rarefied occurrences for *Manihot walkerae* along with 14 not highly correlated biotic and abiotic environmental variables (**Fig. 2-4**).
- 50 replicates were produced at a random test percentage of 30.
- The 50 replicates were visualized in ArcGIS and a consensus model was constructed using the raster calculator spatial analyst tool (**Fig. 5**).
- Protected areas assessed for suitability** in South Texas were Texas Park and Wildlife Department lands (e.g., state parks and wildlife management areas) and tracts from the U.S. Fish and Wildlife Service's South Texas Refuge Complex.
- Mexico: Natural Protected Areas (federal and state), Biosphere Reserves, Priority Terrestrial Regions, and Areas of Importance for Bird Conservation (AICAS).
- Protected areas with high suitability values (> 0.7) were considered suitable for the future reintroduction of *M. walkerae*.

METHODS

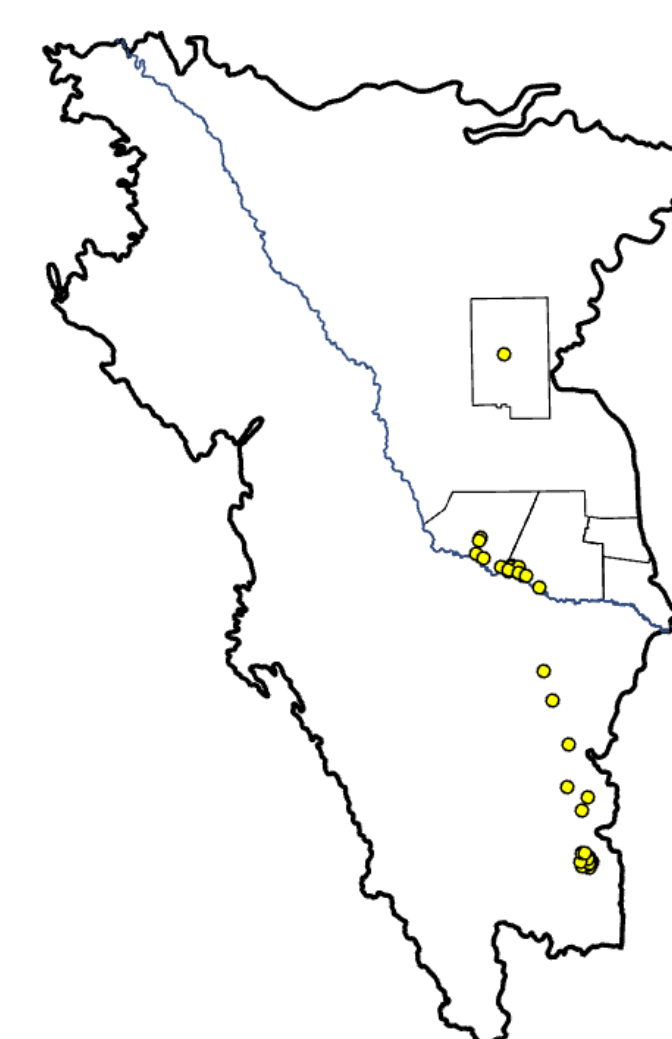


Fig 2. Known distribution for *Manihot walkerae*

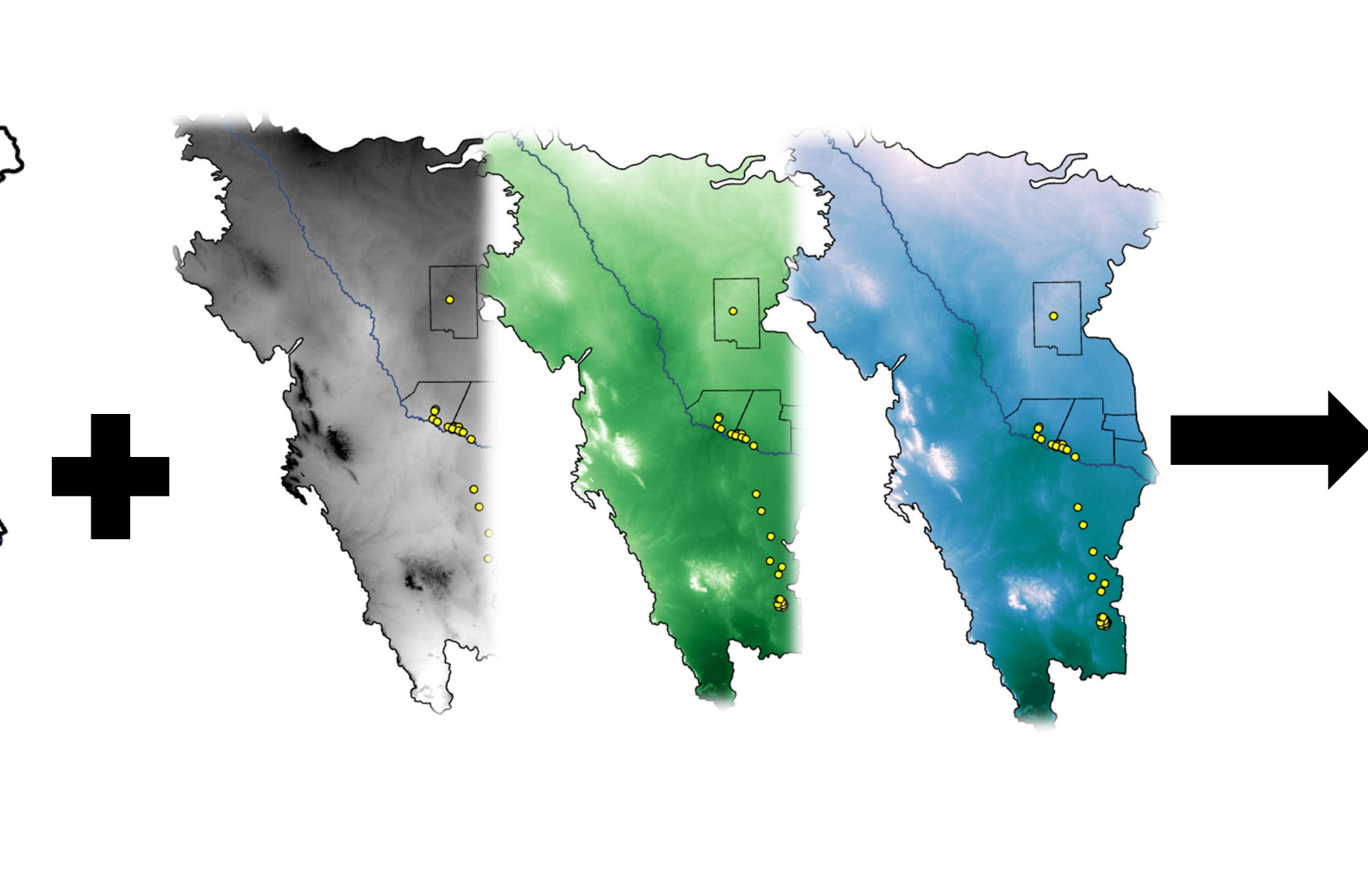


Fig 3. Environmental variables

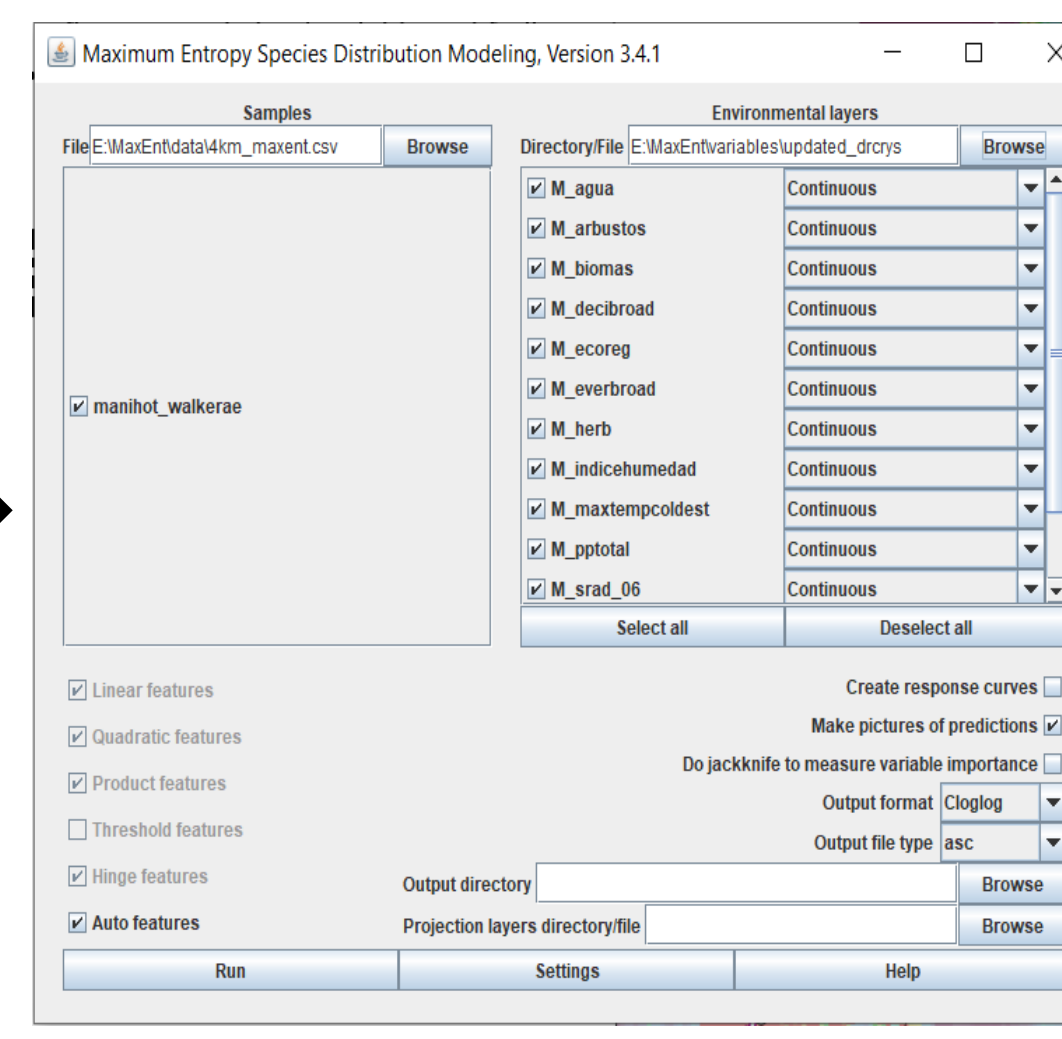


Fig 4. MaxEnt Interface

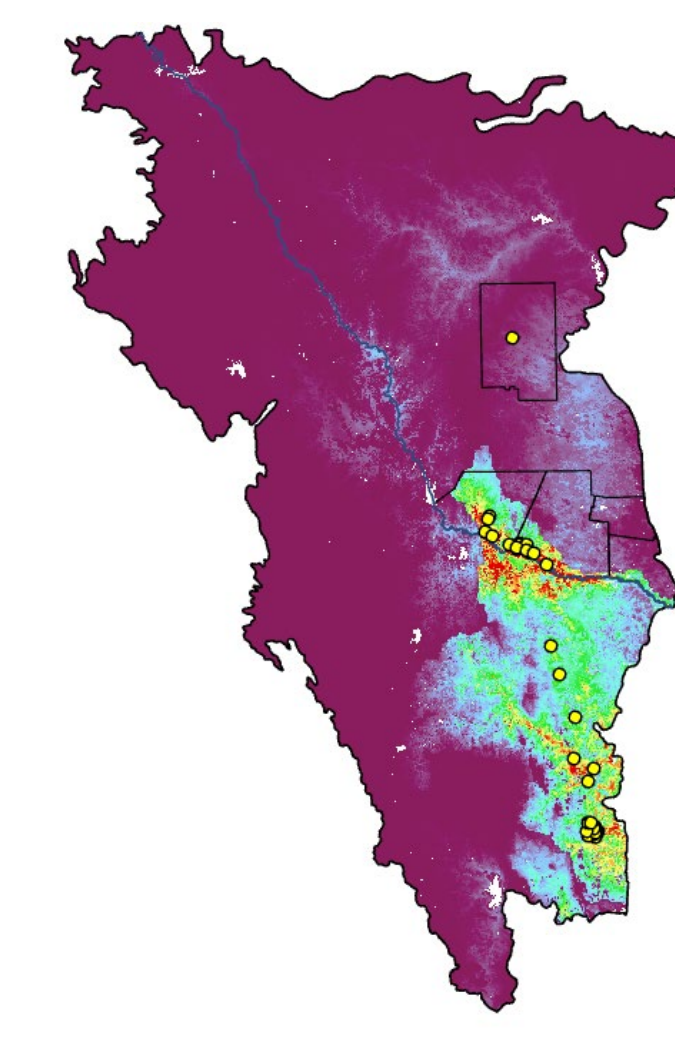


Fig 5. Model of potential suitable habitat

RESULTS

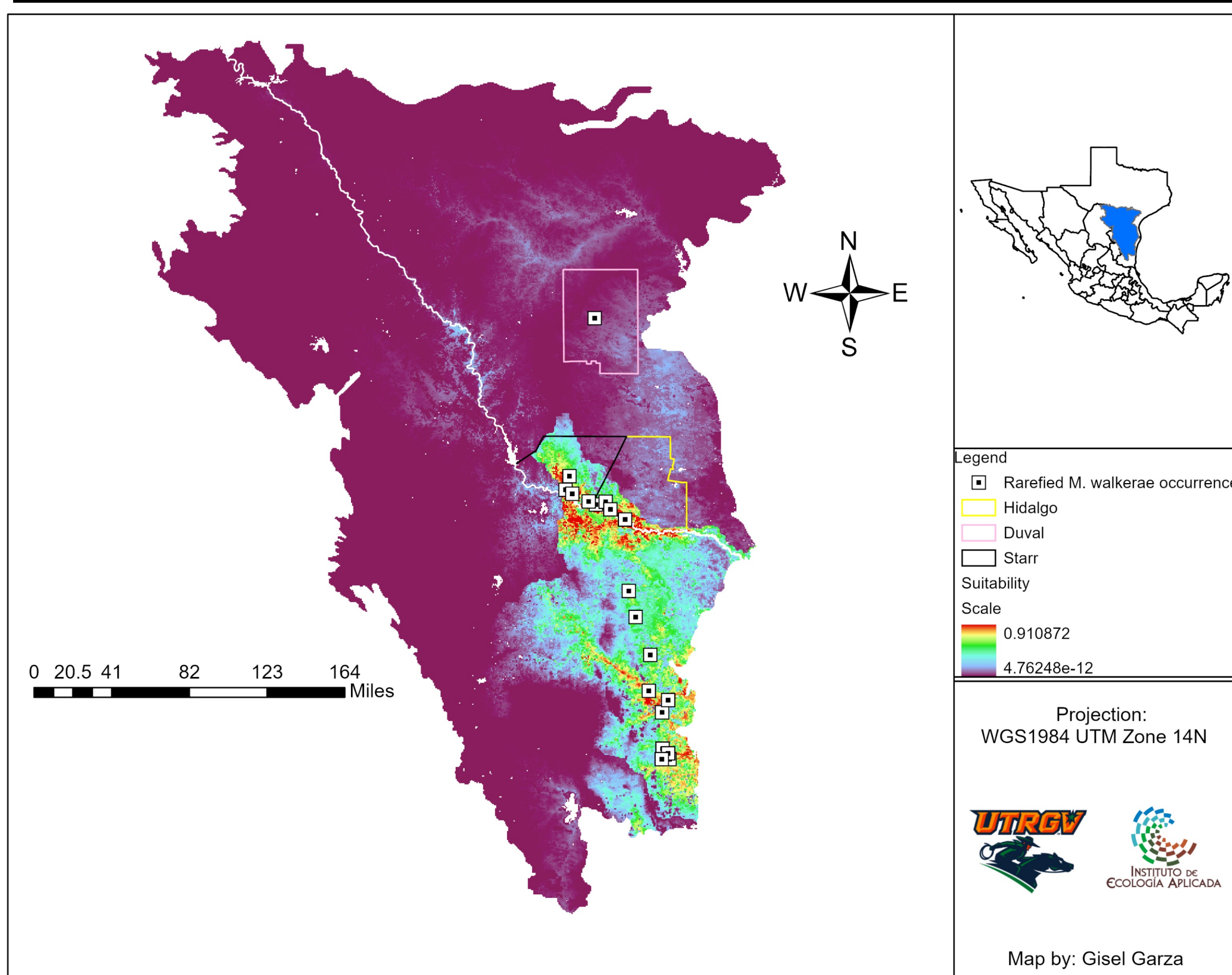


Fig 6. A consensus map displaying the potential suitable habitat for *M. walkerae*. Warm colors (red) denote highly suitable habitat while cold colors (blue) display unsuitable habitat. AUC: 0.93.

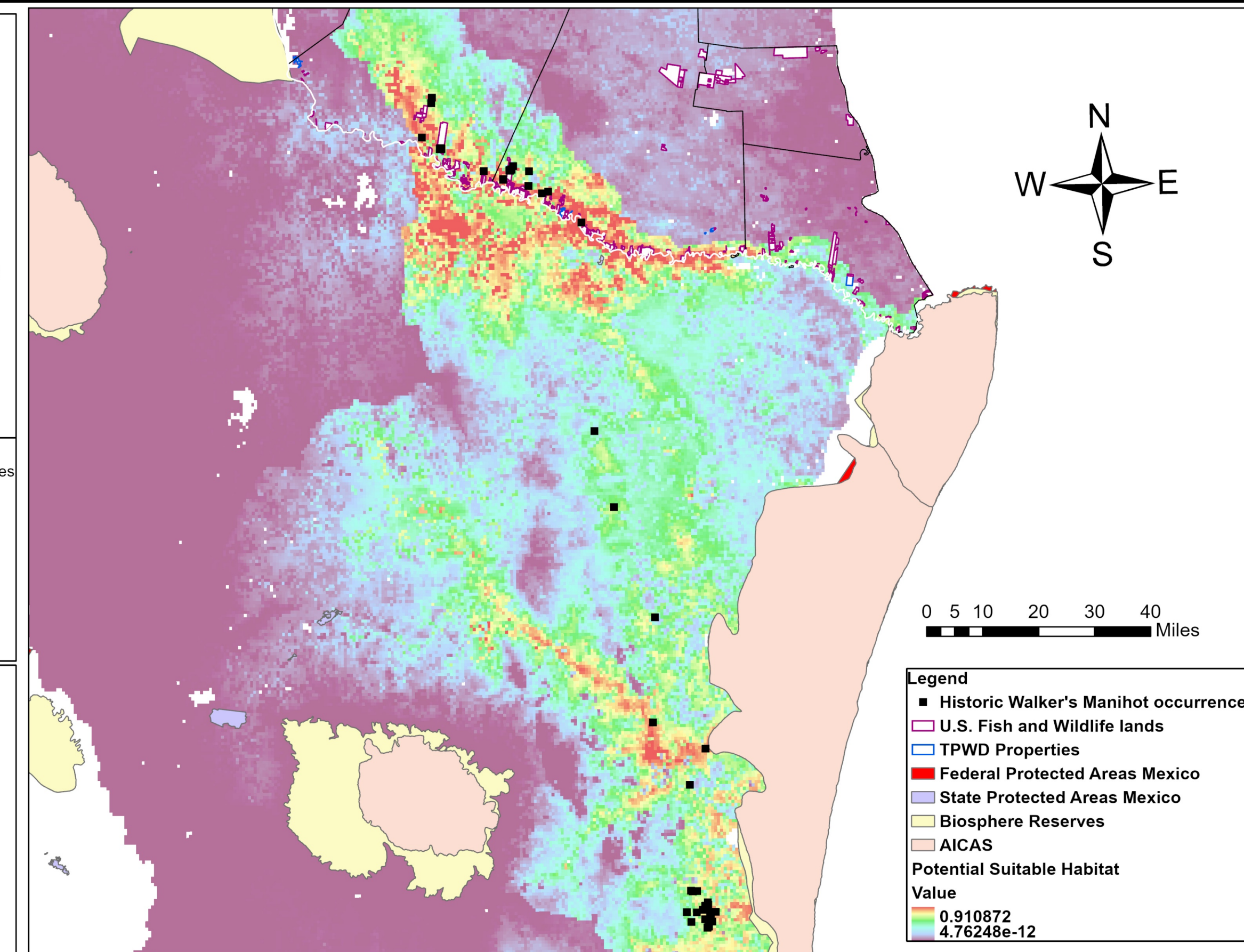


Fig 7. Protected areas in Texas and Mexico overlapped with the potentially suitable habitat model. There are some protected areas in Mexico that border *M. walkerae* suitable habitat but there are none directly within it.

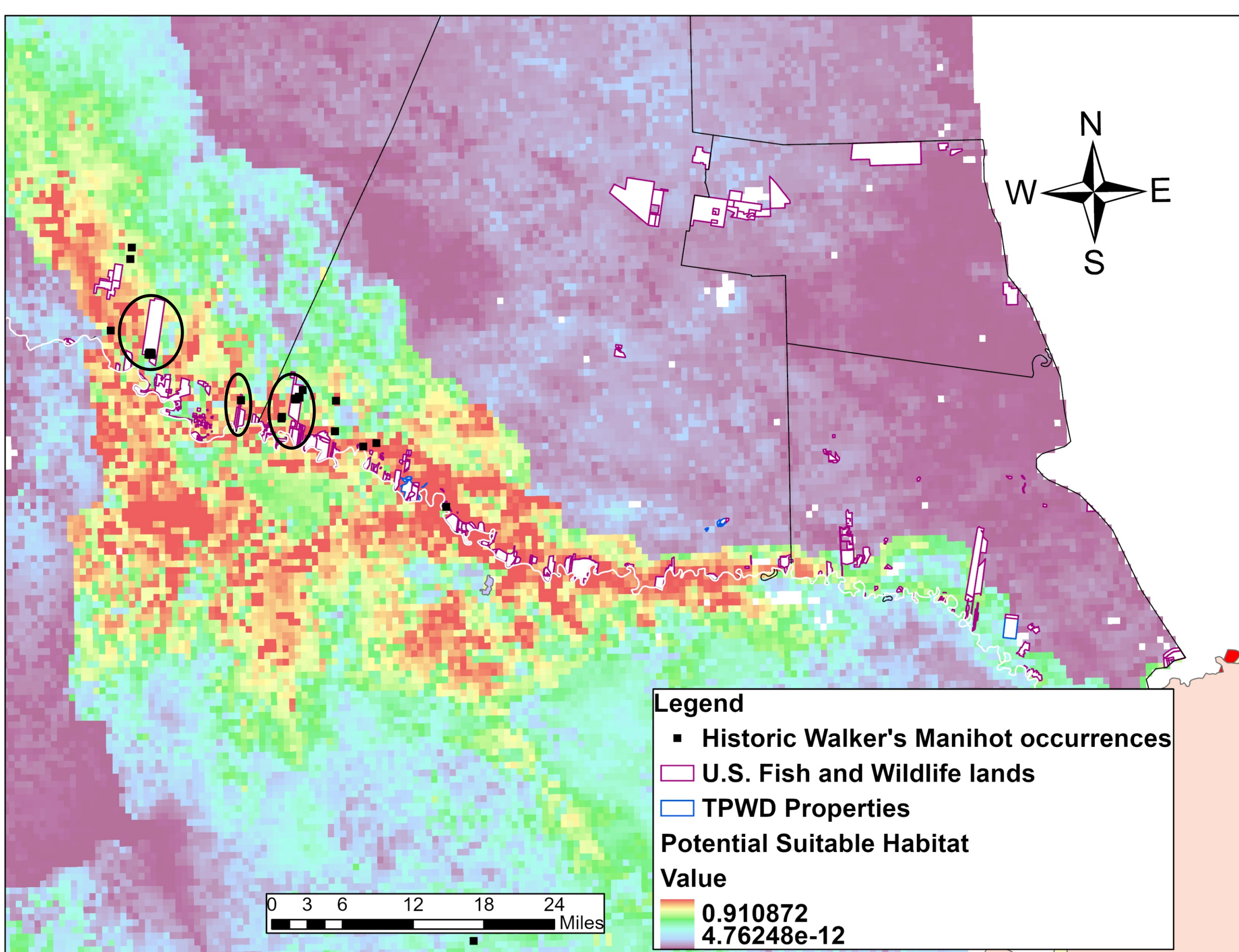


Fig 8. Close up of suitability of protected areas in Texas. There are three protected areas with known *M. walkerae* populations that are shown to be highly suitable for this species in (black circles).

We found that in Texas the results support our hypothesis that established protected areas have suitable habitat for *Manihot walkerae* (Fig 8. black circles circle protected areas with potential suitable habitat).

In Mexico however, no established protected areas have suitable habitat for *Manihot walkerae* (Fig 7).

CONCLUSIONS/DISCUSSION

- The AUC for the consensus model 0.93 is close to 1 indicating that this map can be a reliable tool when looking for *M. walkerae* populations.
- The consensus model produced confirms that historical occurrences are found within predicted potential highly suitable areas. This excludes the northernmost occurrence in Duval county.
- There are three protected in Texas with known *M. walkerae* occurrences that have highly suitable habitat.
- In Mexico the Laguna Madre Biosphere Borders *Manihot walkerae* suitable habitat (Fig 7).
- There is no protected area in Mexico with known *Manihot walkerae* populations with most occurring in private property.
- We recommend that mutual conservation agreements with private landowners where *M. walkerae* is found are made to protect this species in both Texas and Mexico.
- Given that in Mexico *Manihot walkerae* is not protected under the official standard NOM-059-SEMARNAT-2010 (NOM059) designating *M. walkerae* as endangered in Mexico is a priority.

FUTURE WORK

- Ongoing work is looking at the potential risk factor that land use/ land cover change has on this species.
- Areas that are depicted as highly suitable will be explored when searching for unknown populations.
- With concurrent studies being done on population dynamics, germination success of *M. walkerae* and species interactions, the objective is to contribute to the long-term conservation of *M. walkerae*.

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