Created: 3/1/2022

Do Anthropogenic Stressors Affect Distribution of Alligator Snapping Turtles (*Macrochelys temminckii*) In Texas?: Preliminary Study Design

Kelly Garcia[1], Mandi Gordon[2], Eric Munscher[3], Arron Tuggle[3], Carl Franklin[4], Viviana Ricardez[4], and George Guillen[1,2]

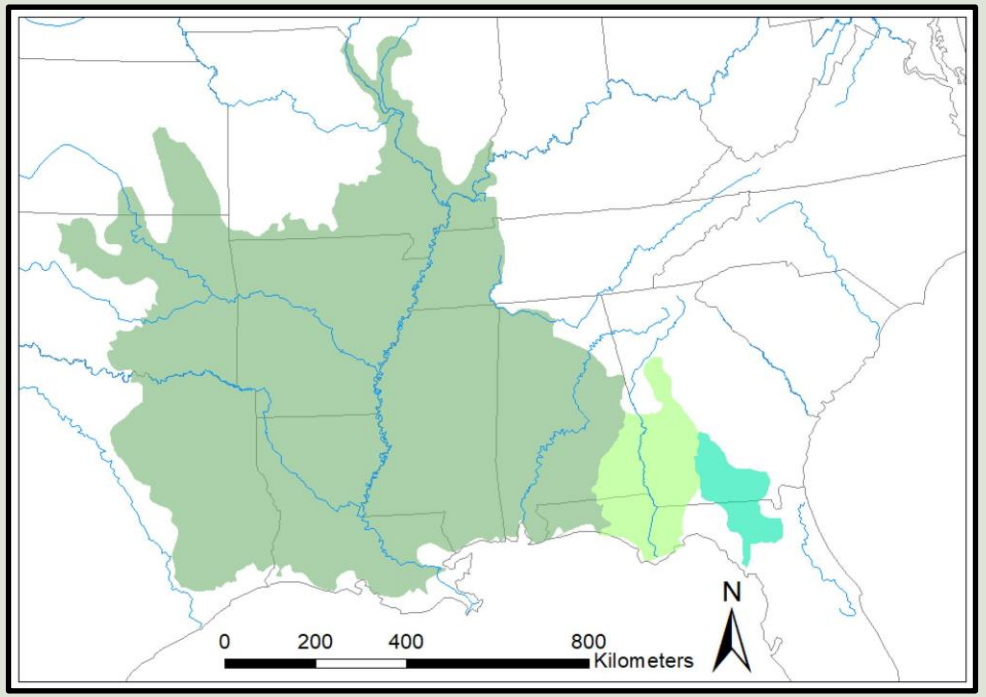
[1]University of Houston-Clear Lake, College of Science and Engineering
[2]Environmental Institute of Houston
[3]SWCA Environmental Consultants, Houston, Texas
[4]Texas Turtles, Grand Prairie, Texas

Background

- Alligator snapping turtle (*Macrochelys temminckii*) = AST
- Largest freshwater turtle in North America (Pritchard, 1989).
- Found primarily in rivers and their tributaries, swamps, oxbow lakes, channels (USFWS, 2021).
- Associated with cover from structure and vegetation canopy (Pritchard, 1989).
- Lure prey with tongue: fish, crawfish also small reptiles, mammals, and birds (Elsey, 2006)

Background

- Range historically includes 14 states in the Gulf of Mexico drainages (USFWS, 2021)
    - Presence currently unknown in Indiana and Kansas.
- Protected in Texas as a threatened species due to uncertainties about status and distribution.
- 2021 USFWS Species Status Assessment (SSA) recommended inclusion in Section 4(d) rule of Endangered Species Act.



Three main genetic lineages of ASTs (USFWS, 2021)

Anthropogenic Factors Influencing Viability

(USFWS, 2021)

Bycatch

The accidental catch of an AST when intending to catch another species.

Poaching & Illegal Harvest

Intentional collection or killing of an AST for meat or pet trade.

Climate Change

Increasing temperatures produce fewer female hatchlings (temperature-dependent sex determination).

Habitat Alteration

Dredging, riparian vegetation removal, channelization, adjacent land use changes.

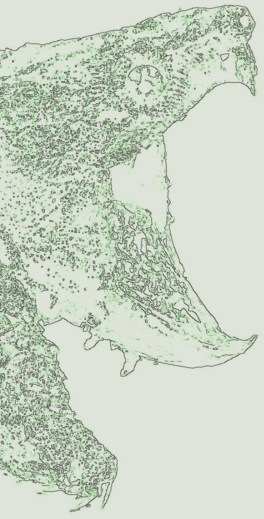


Photo credits:

1. Reddit: u/Quackalacky 2. Chron.com 3. Tishomingo NFH via USFWS 4. O'Driscoll et al., 2010

Thesis Questions

USFWS 2021 SSA Request for information:

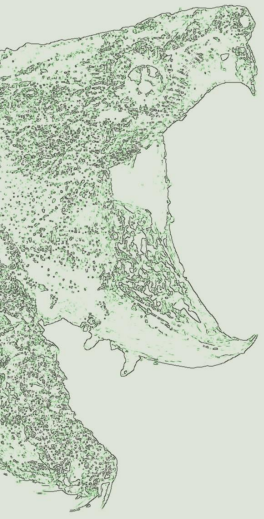
(2) Information on threats to the species, particularly information on:

(a) Frequency of hook ingestion and entanglement associated with recreational or commercial fishing, effects on individual survival, and any population impacts;

(b) Magnitude of poaching and any population impacts from poaching; and

(c) Nest and hatchling predation rates and effects on recruitment and any population impacts.

(3) The spatial distribution and extent of threats to this species. Notably, we seek any information on areas within the species' range where these threats may overlap and potentially act synergistically or antagonistically as well as where there may be a complete absence of threats.



Study Objectives

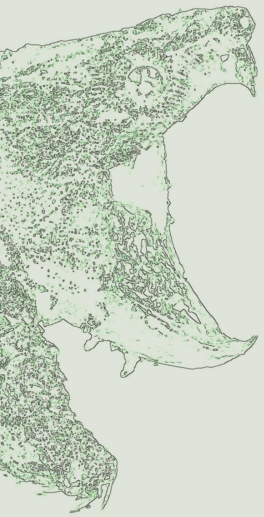
1. Identify types and locations of potential anthropogenic stressors in Texas.
2. Determine the magnitude and impacts of the most likely stressors on AST populations.
3. Examine technique for detecting and identifying metallic foreign bodies in AST captures.

Study Objectives

1. Identify types and locations of potential anthropogenic stressors in Texas.

Hypothesis

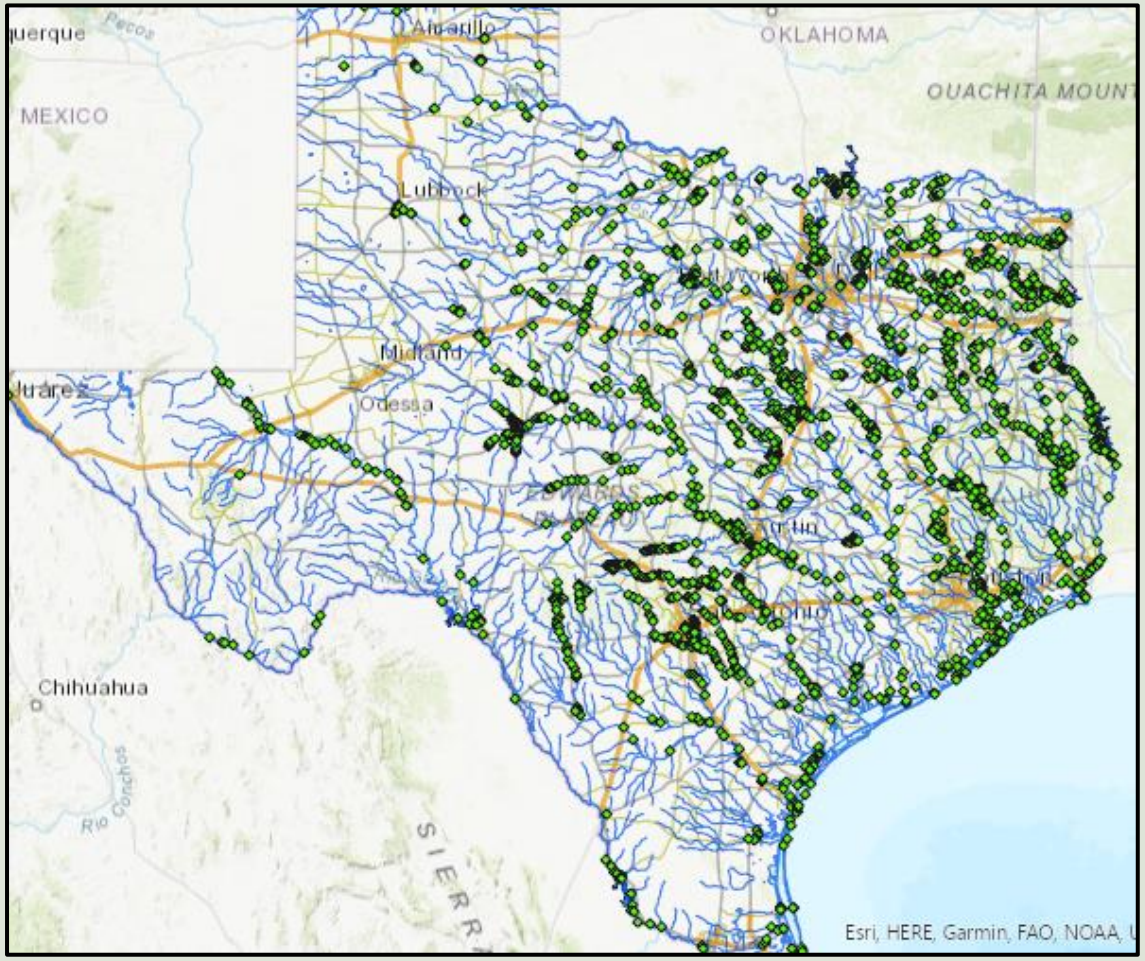
- Anthropogenic disturbances are widespread across AST range.



Methods

Use online resources and maps to identify anthropogenic disturbances in AST range.

- Measure proximity to sample sites



Public Boat Ramps via TPWD's interactive GIS maps

Study Objectives

2. Determine the magnitude and impacts of the most likely stressors on AST populations.

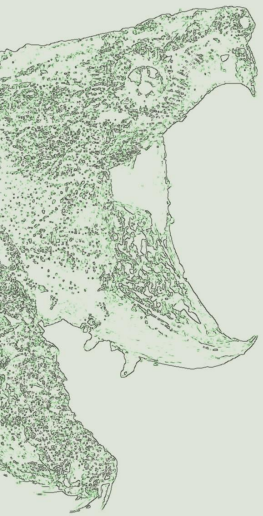
Hypothesis

- Proximity to potential anthropogenic stressors will negatively impact AST CPUE (catch per unit effort).

Methods

- Sites across eastern Texas river basins (Brazos River basin to Louisiana border)
- Baited hoop traps (Rudolph, 2002)
- Site and trap data
  - Habitat, water quality, trot/limb lines and other fishing evidence
- Catch data
  - Sex, morphometric data, PIT tag and notch
- AST Catch per unit effort

CPUE = (# ASTs captured) / (Total trap hours)

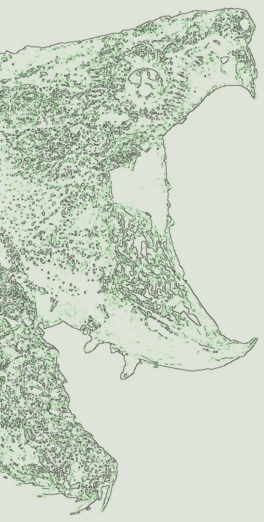


Study Objectives

3. Examine technique for detecting and identifying metallic foreign bodies in AST captures.

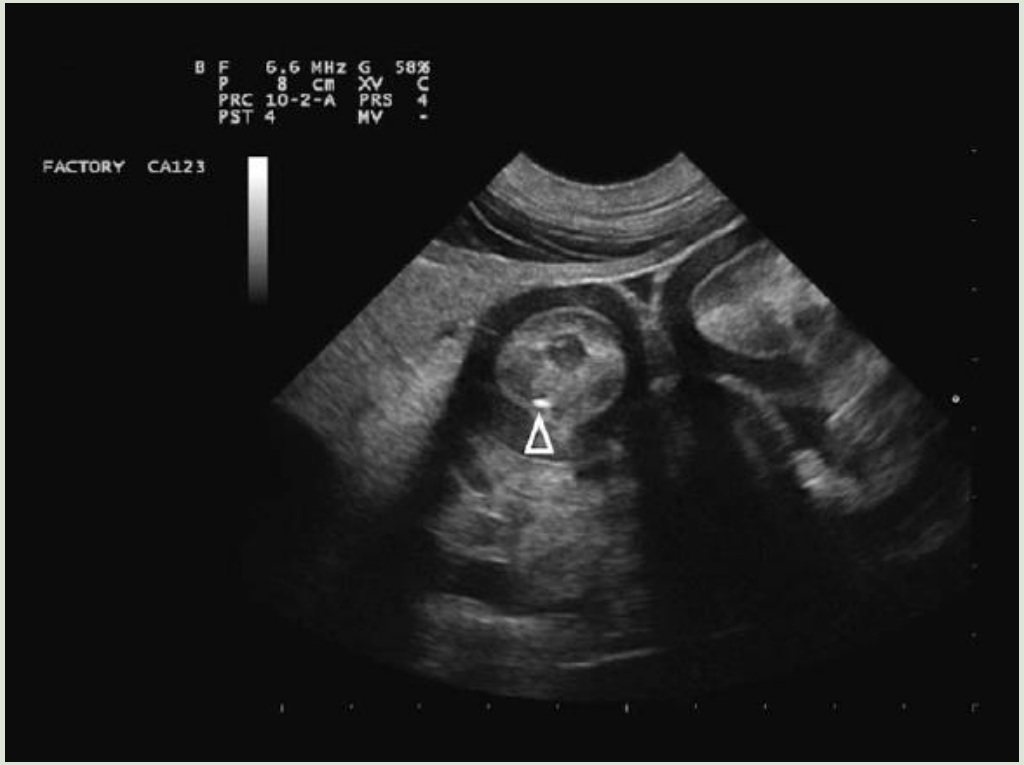
Hypothesis

- Technique will aid in detection of metallic foreign bodies.
- Proximity to certain anthropogenic disturbances will positively correlate with the number of foreign metallic bodies detected in captured individuals.



Methods: Thesis

- Metal detect all AST catches for presence of metallic foreign bodies.
- Ultrasound to confirm presence and identity of object.



Metal fishing hook in a loggerhead turtle (Franchini et al., 2018)

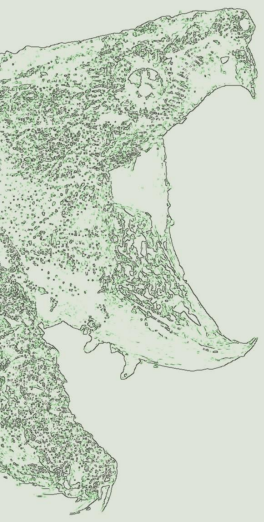
Potential Analyses

Generalized linear models (GLMs) and correlations

- Compare CPUE at each site to proximity to potential stressors.
- Compare proximity to fishing access points with occurrences of hook ingestion.

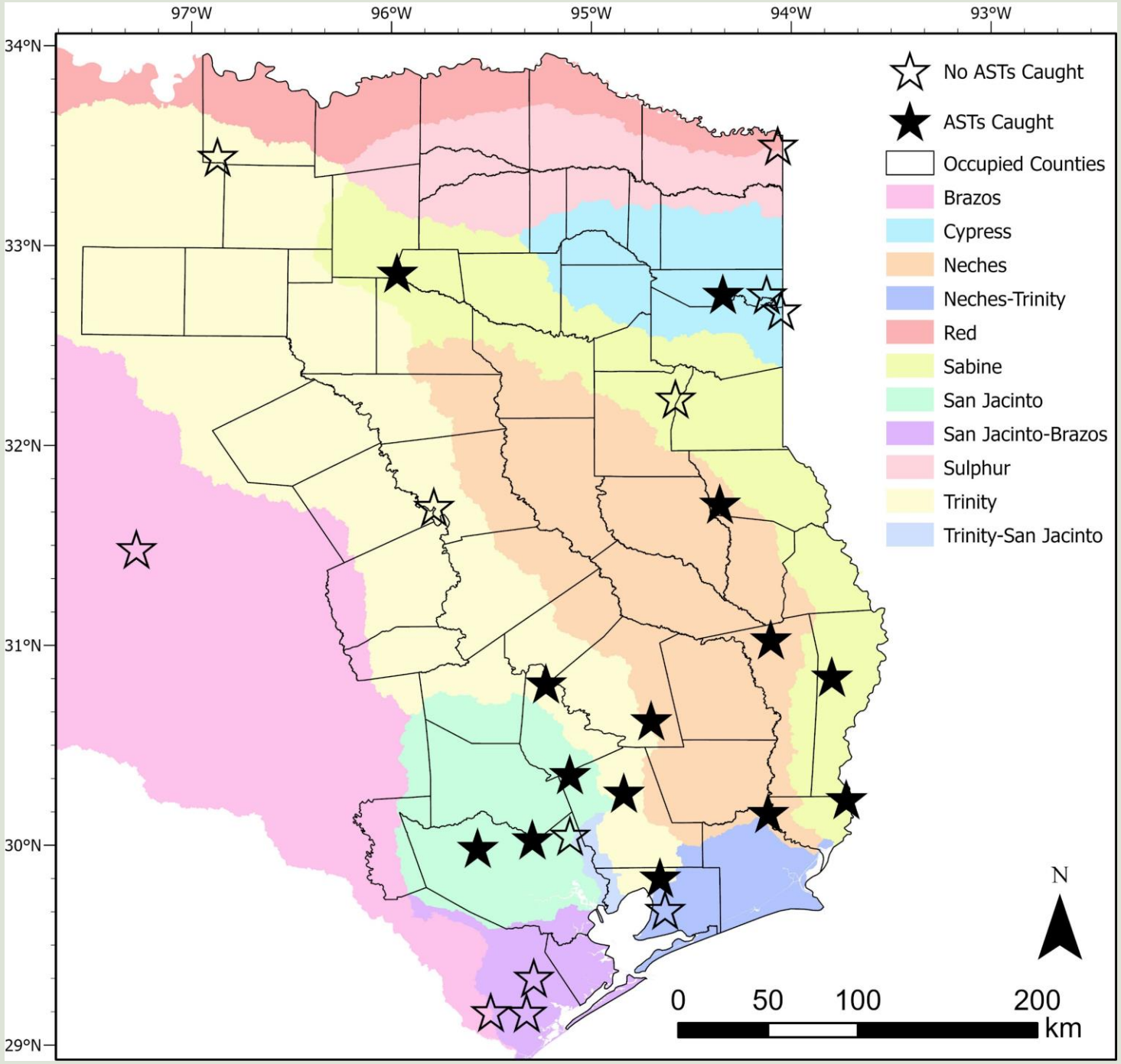
Multivariate occupancy modeling

- Estimate presence based on CPUE, proximity to potential anthropogenic stressors, and suitable habitat factors.



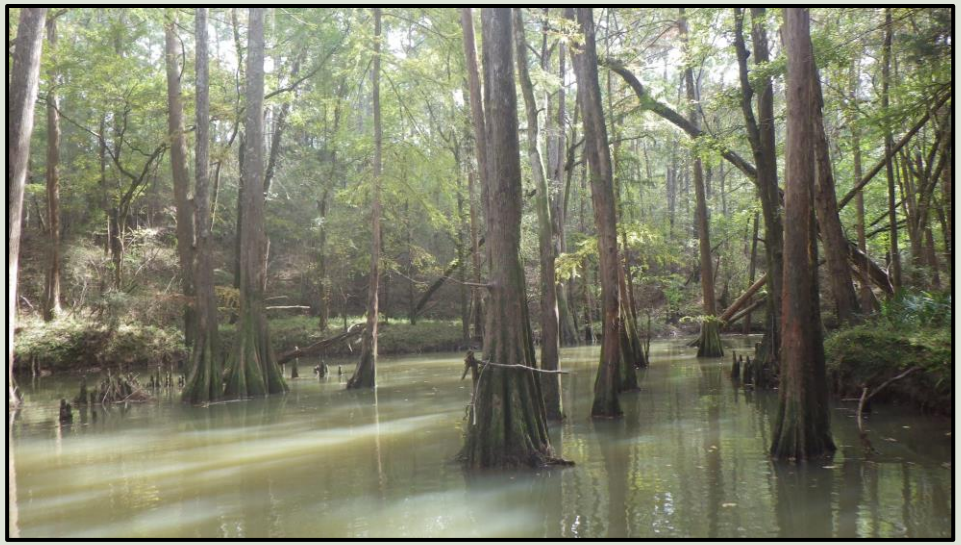
Preliminary Results

- 51 ASTs (to date)
- 5 river basins
- ASTs captured: 14
  No ASTs captured: 12



Next Steps

Test hook detection method → **Continue literature review** → **Review analysis and modeling methods** → **Sample through 2023**



Conservation Implications

Results applicable to range-wide conservation efforts:

- Designating “critical habitat” areas
- Required reporting
- Regulations on trap and hook types

Contribute to USFWS five-year review and update of SSA in 2026.

Naples Florida Weekly, 2016

References

1. Ewert, M.A., D.R. Jackson, and C.E. Nelson. 1994. Patterns of temperature-dependent sex determination in turtles. Journal of Experimental Zoology 270:3–15.
2. Elsey, R. M. (2006). Food Habits of Macrochelys temminckii (Alligator Snapping Turtle) from Arkansas and Louisiana. Southeastern Naturalist, 5(3), 443–452. https://doi.org/10.1656/1528-7092(2006)5[443:FHOMTA]2.0.CO;2
3. Franchini, D., Valastro, C., Ciccarelli, S., Caprio, F., Lenoci, D., & Di Bello, A. 2018. ULTRASONOGRAPHIC DETECTION OF INGESTED FISHING LINES IN LOGGERHEADS (*CARETTA CARETTA*). *Journal of Wildlife Diseases*, *54*(4), 680–690. https://doi.org/10.7589/2017-12-302
4. Gordon, M, D.R. Bontrager, J. Kittle, J. Oakley, E. Munscher, A. Tuggle, T. Sankey, and G. Guillen. 2021. Baseline study of Alligator Snapping Turtle (*Macrochelys temminckii*) population viability in Texas watersheds, Interim Report FY21-22. (Report No. EIH21-005). Prepared for the Texas Comptroller of Public Accounts (Contract 20-6997BG). 65 pages.
5. Pritchard, P. 1989. *The Alligator Snapping Turtle: Biology and Conservation*. Milwaukee Public Museum.
6. Rudolph, C. 2002. *Historical and Local Processes Determining the Current Status of Macroclemys Tesmminckii: The Alligator Snapping Turtle in Texas*. Texas Parks and Wildlife.
7. U.S. Fish and Wildlife Service. 2021. Species status assessment report for the alligator snapping turtle (*Macrochelys temminckii*), Version 1.2. March 2021. Atlanta, GA.

Acknowledgements

- **Field personnel**: Countless graduate students, interns, technicians, staff members, volunteers, and stakeholders
- **Key personnel:** Connor Adams, J.J. Apodaca, David Bontrager, Brandi Giles, Cindy Jones, Jaimie Kittle
- **Funding source:** Texas Comptroller of Public Accounts
- **Permitting & Site Access:**
  - TPWD scientific research permits SPR-0321-026
  - UHCL Institutional Animal Care and Usage Committee
  - NWR & WMA Special Use permits
  - Private landowners, stakeholders, and other agencies

Ongoing research funded by:

Texas Comptroller of Public Accounts

Research Partners

Texas Parks & Wildlife

U.S. Fish & Wildlife Service

TSA turtle survival alliance

Texas A&M University Commerce

Texas Turtles

SFA

tra

ANRA

US Army Corps of Engineers

Harris County Precinct 4 Commissioner R. Jack Cagle

Tangled Bank Conservation

North Texas Municipal Water District

SWCA Environmental Consultants

Brazos River Authority

The Ethician Foundation

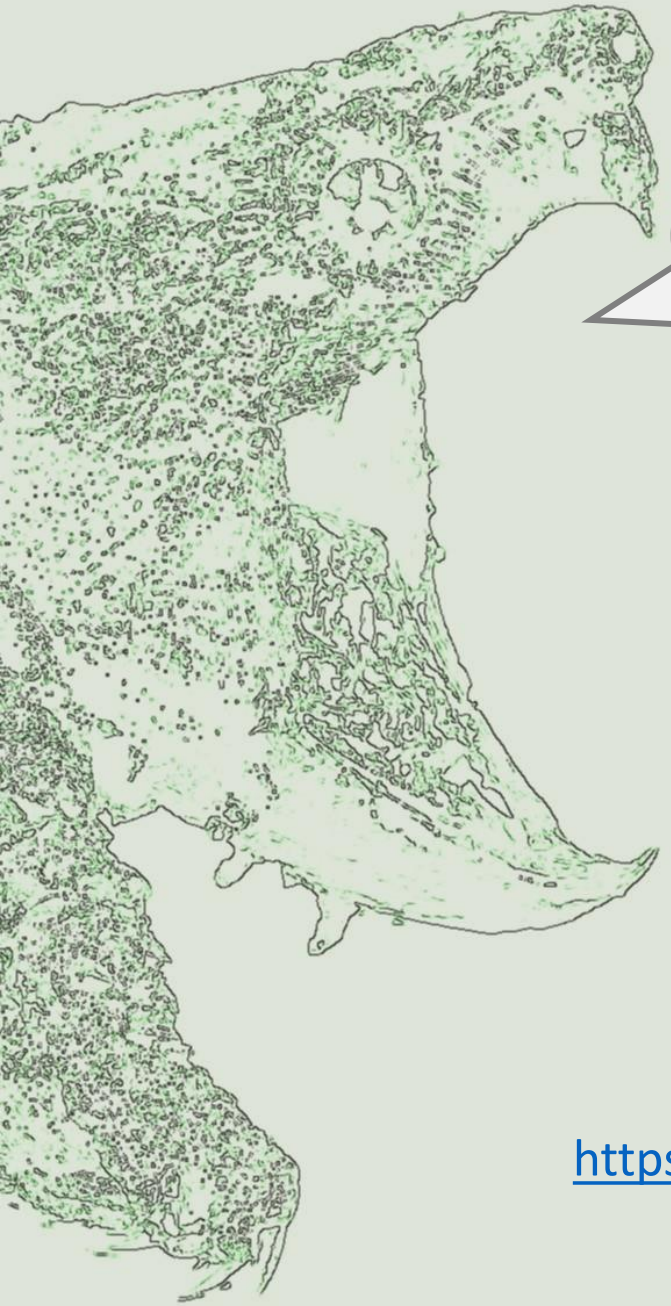
LNVA Lower Neches Valley Authority

Texas Forestry Association

trwd Tarrant Regional Water District

Texas Forest Landowners Council

5+ private landowners



Thank you!

Comments and suggestions are welcome

- Email: GarciaKe@UHCL.edu

https://www.uhcl.edu/environmental-institute/research/current-projects/2021-alligator-snapping-turtle