Inland fishes of Texas: taxonomic updates, conservation status, and threats

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CHECKLIST

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

Drainage basin checklists and dichotomous keys for inland fishes of Texas

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Supplemental Material

Drainage Basin Keys

Brazos River 2
Canadian River 12
Colorado and Lavaca Rivers 18
Guadalupe and San Antonio Rivers 29
Nueces River 40
Red River 48
Rio Grande and Pecos River 62
Sabine and Neches Rivers 73
Trinity and San Jacinto Rivers 85

Overview

- Statewide vs drainage basin checklists and keys
- Freshwater vs inland
- Excluded:
  - native transient border fishes
  - non-native fishes without self-sustaining populations
    - Brown Trout
  - recent name revisions (waiting for 2023? AFS - ASIH book)

Family	Species	Common Name	Native	Ext/exp	USFWS	SGCN		Canadian	Red	Sabine & Neches	Trinity & San Jacinto	Brazos	Colorado & Lavaca	Guadalupe & San Antonio	Nueces	Rio Grande & Pecos
Petromyzontidae	Ichthyomyzon castaneus	Chestnut Lamprey	X						X	X						
	Ichthyomyzon gagei	Southern Brook Lamprey	X						X	X	X					
Acipenseridae	Scaphirhynchus platorynchus	Shovelnose Sturgeon	X			X			X							
Polyodontidae	Polyodon spathula	Paddlefish	X			X			X	X	X					
Lepisosteidae	Atractosteus spatula	Alligator Gar	X			X			X	X	X	X	X	X	X	X
	Lepisosteus oculatus	Spotted Gar	X						X	X	X	X	X	X	X	X
	Lepisosteus osseus	Longnose Gar	X						X	X	X	X	X	X	X	X
	Lepisosteus platostomus	Shortnose Gar	X						X							
Amiidae	Amia calva	Bowfin	X						X	X	X	X	X			
Hiodontidae	Hiodon alosoides	Goldeye	X			X			X							
Anguillidae	Anguilla rostrata	American Eel	X			X			X	X	X	X	X	X	X	X
Clupeidae	Dorosoma cepedianum	Gizzard Shad	X					X	X	X	X	X	X	X	X	X
	Dorosoma petenense	Threadfin Shad	X					X	X	X	X	X	X	X	X	X
Cyprinidae	Campostoma anomalum	Central Stoneroller	X					X	X		X	X	X	X	X	X
	Campostoma ornatum	Mexican Stoneroller	X			X										X
	Carassius auratus	Goldfish							X	X	X	X	X	X	X	X
	Ctenopharyngodon idella	Grass Carp						X	X	X	X	X	X	X	X	X
	Cyprinella lepida	Plateau Shiner	X			X								X	X	

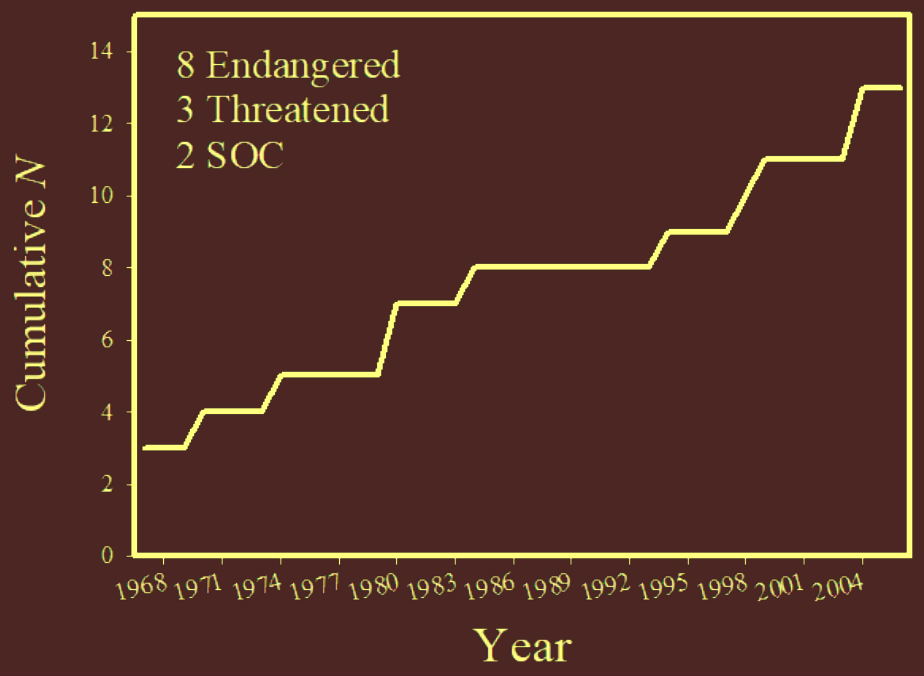
Results

- Total inland fishes: 196

- Non-native inland fishes: 25

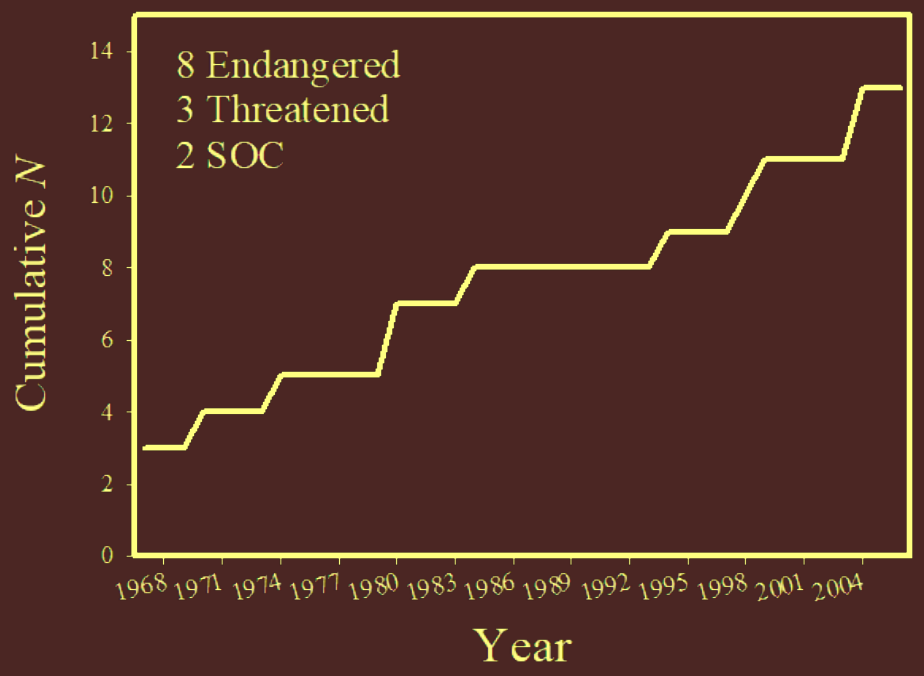
- Native inland fishes: 171
  - 6 (3%) reported extinct/extirpated
  - 13 (8%) listed as USFWS T&E
  - 59 (35%) listed as Species of Greatest Conservation Need (SGCN)

Conservation Status



- Assessments:
  - Compare listing of T&E/SGCN species through time
  - Number of imperiled species increasing?

Conservation Status



- Listing is not a perfect process
  - Information and interest biases for some species
  - Lags in listing process
  - Inconsistent criteria

USFWS – Species Status Assessments (SSA)

Issues and Perspectives

Development of a Species Status Assessment Process for Decisions under the U.S. Endangered Species Act

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- Using the "3R" concept:
  - Redundancy
  - Resiliency
  - Representation

Greater consistency!

USFWS – Species Status Assessments (SSA)

- Thorough and time intensive
- Less information/interest biases?
- What is enough redundancy, resiliency, representation?
- Application to identifying and listing SGCN species?
  - Common language between state and federal levels
  - Rapid process to consider a larger group of organism (context for “enough”)

Fisheries-October 2019

FEATURE

Rapid Assessment for Identifying Species of Greatest Conservation Need: Towards a Unified Approach

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U.S. Fish and Wildlife Service scuba divers search San Marcos River, Texas for the Fountain Darter *Etheostoma fonticola*. Fountain Darter is an endangered species of fish. Photo credit: Ryan Hagerty, U.S. Fish and Wildlife Service

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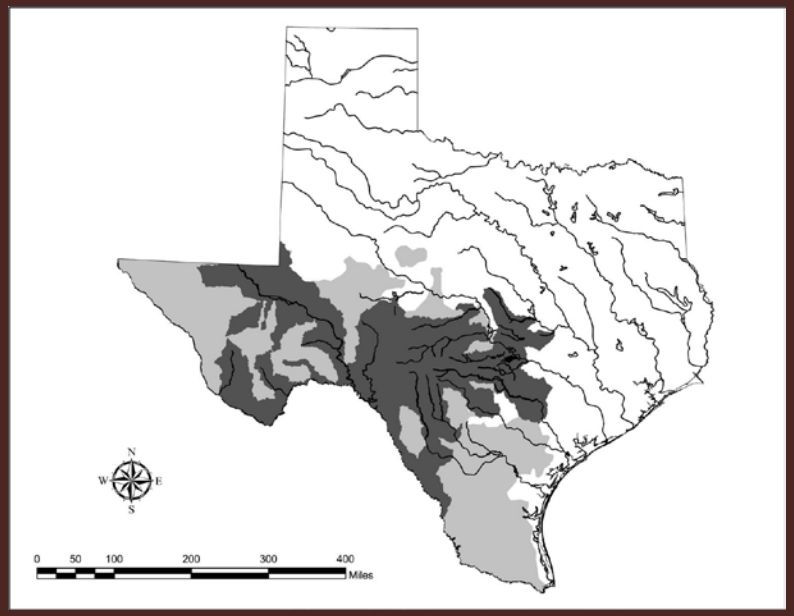
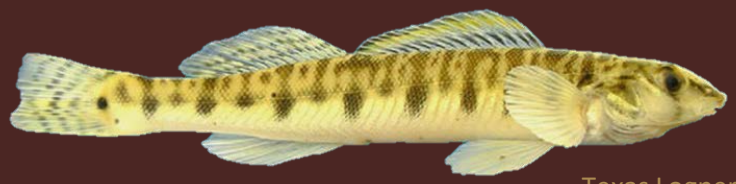


Species Tables



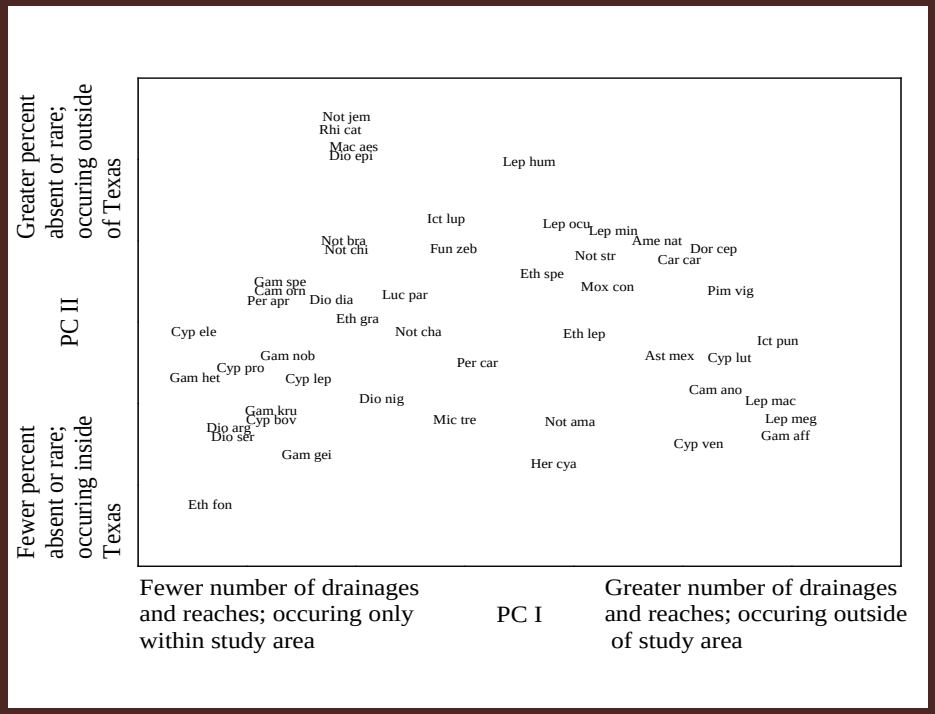
Texas Logperch

Drainage	Reach	Date of First Collection	Relative Abundances	Date of Relative Abundances	Abundance Scale	Citation
Brazos	Lampasas River	1952	0.1	2010	Rare	Labay 2010
	San Gabriel	1972	0.1	2010	Rare	Labay 2010
Colorado	South Concho	1984	0	1999	Absent	Hubbs 2004
	Llano Upper Reach	1956	4.4	2012	Rare	Curtis 2012
	Llano Middle Reach	1956	5.3	2012	Occasional	Curtis 2012
	Llano Lower Reach	1956	0.3	2012	Rare	Curtis 2012
	North Llano	1956	0.6	2012	Rare	Curtis 2012
	James River	1956	0	2012	Absent	Curtis 2012
	Barton Creek	2008	0.3	2008	Rare	Labay et al. 2011
	Onion Creek	1961	0	1988	Absent	Linam et al. 2002
	San Saba	1948	1.5	2009	Rare	Higgins 2009
	Pedernales	1952	1.1	2009	Rare	Shattuck 2010
	Live Oak Creek	1998	0	2010	Absent	Shattuck 2010
Guadalupe	Upper Guadalupe	1925	1.3	2009	Rare	Perkin and Bonner 2011
	Upper San Marcos	1949	1.4	2015	Rare	Behen 2013
	Blanco	1955	0.1	2007	Rare	Bean et al. 2007
	Cypress Creek	1952	0	2007	Absent	Bean et al. 2007
San Antonio	Medina	1858	0	2014	Absent	Ruppel, unpublished 2015
	Upper San Antonio	1996	0	2015	Absent	Craig et al. in Review
Nueces	Nueces	1967	0	2015	Absent	Craig, unpublished 2016
	Frio	1979	0	2015	Absent	Craig, unpublished 2016

Summary of Species Tables

Table 1. (Continued)

Species	Drainages	Reaches	Percentage of extant reaches where rare	Percentage of total reaches where absent	Independent drainages in Texas	Found outside of Texas
Greenthroat Darter *Etheostoma lepidum*	4	26	85	23	2	1
Orangethroat Darter *Etheostoma spectabile*	4	18	80	44	2	1
Guadalupe Darter *Percina apristis*	1	4	100	50	0	0
Texas Logperch *Percina carbonaria*	5	21	92	43	1	0
Rio Grande Cichlid *Herichthys cyanoguttatus*	6	30	96	10	1	1


Greater percent absent or rare; occuring outside of Texas
PC II
Fewer percent absent or rare; occuring inside Texas
Not jem
Rhi cat
Mac aes
Dio epi
Lep hum
Ict lup
Lep ocu
Lep min
Ame nat
Dor cep
Car car
Not bra
Not chi
Fun zeb
Not str
Eth spe
Gam spe
Gam otn
Per apr
Dio dia
Luc par
Mox con
Pim vig
Eth gra
Cyp ele
Not cha
Eth lep
Ict pun
Gam nob
Cyp pro
Per car
Ast mex
Cyp lut
Gam het
Cyp lep
Cam ano
Dio nig
Lep mac
Gam kru
Cyp bov
Mic tre
Not ama
Lep meg
Dio arg
Dio ser
Gam aff
Cyp ven
Gam gei
Her cya
Eth fon
Fewer number of drainages and reaches; occuring only within study area
PC I
Greater number of drainages and reaches; occuring outside of study area

Species	Code	Final Score	Rank	USFWS	IUCN	SGCN
Cyprinodon elegans	Cyp ele	-1.20	1	X	EN	X
Notropis jemezanus	Not jem	-1.10	2		LC	X
Rhinichthys cataractae	Rhi cat	-1.09	3		LC	X
Gambusia heterochir	Gam het	-1.07	4	X	VU	X
Macrhybopsis aestivalis	Mac aes	-0.98	5		LC	X
Dionda episcopa	Dio epi	-0.97	6		LC	X
Percina apristis	Per apr	-0.97	7		LC	X
Campostoma ornatum	Cam orn	-0.92	8		LC	X
Gambusia speciosa	Gam spe	-0.92	9		DD	
Cyprinella proserpina	Cyp pro	-0.89	10		VU	X
Dionda argentosa	Dio arg	-0.77	11		NT	X
Notropis braytoni	Not bra	-0.75	12		NE	X
Dionda serena	Dio ser	-0.73	13		LC	X
Notropis chihuahua	Not chi	-0.73	14		NE	X
Gambusia nobilis	Gam nob	-0.70	15		EN	X
Dionda diaboli	Dio dia	-0.66	16	X	EN	X
Etheostoma fonticola	Eth fon	-0.64	17	X	EN	X
Gambusia krumholzi	Gam kru	-0.60	18		VU	
Cyprinodon bovinus	Cyp bov	-0.60	19	X	VU	X
Cyprinella lepida	Cyp lep	-0.55	20		EN	X
Etheostoma grahami	Eth gra	-0.49	21		VU	X
Ictalurus lupus	Ict lup	-0.37	22		DD	X

Species	Code	Final Score	Rank	USFWS	IUCN	SGCN
Gambusia geiseri	Gam gei	-0.35	23		LC	
Lucania parva	Luc par	-0.35	24		LC	
Fundulus zebrinus	Fun zeb	-0.25	25		LC	
Notropis chalybaeus	Not cha	-0.18	26		LC	X
Dionda nigrotaeniata	Dio nig	-0.17	27		LC	X
Lepomis humilis	Lep hum	-0.15	28		LC	
Percina carbonaria	Per car	0.17	29		LC	
Lepisosteus oculatus	Lep ocu	0.19	30		NE	
Etheostoma spectabile	Eth spe	0.21	31		LC	
Micropterus treculii	Mic tre	0.22	32		NT	X
Notropis stramineus	Not str	0.40	33		LC	
Lepomis miniatus	Lep min	0.42	34		LC	
Moxostoma congestum	Mox con	0.54	35		LC	
Etheostoma lepidum	Eth lep	0.57	36		NT	
Ameiurus natalis	Ame nat	0.65	37		LC	
Notropis amabilis	Not ama	0.75	38		LC	X
Herichthys cyanoguttatus	Her cya	0.79	39		LC	
Carpiodes carpio	Car car	0.79	40		LC	
Dorosoma cepedianum	Dor cep	0.86	41		LC	
Astyanax mexicanus	Ast mex	1.01	42		LC	
Pimephales vigilax	Pim vig	1.11	43		LC	
Cyprinella lutrensis	Cyp lut	1.29	44		LC	
Campostoma anomalum	Cam ano	1.32	45		LC	
Cyprinella venusta	Cyp ven	1.39	46		LC	
Ictalurus punctatus	Ict pun	1.46	47		LC	

Thoughts

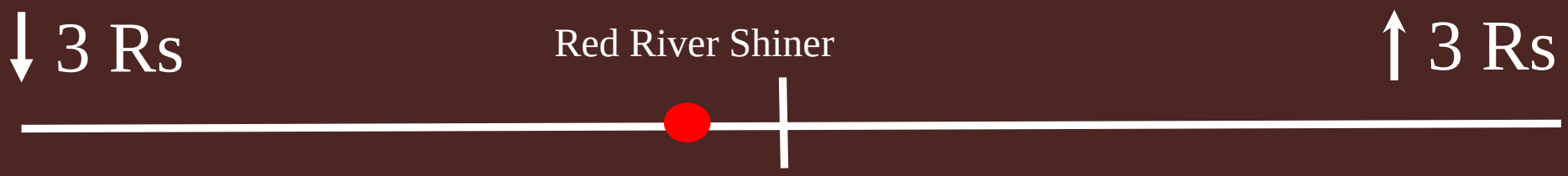
- Fairly rapid, transparent, and quantitative assessments
- Less biases (considered all species and not just the ones thought to be imperiled)
- Not an “imperiled species” list—threats not quantified
- Use the process to guide SGCN committee

Conservation status?

- For 50 fishes in 3 ecoregions of Texas
  - Relationship between 3Rs and imperiled status/extinction risks?

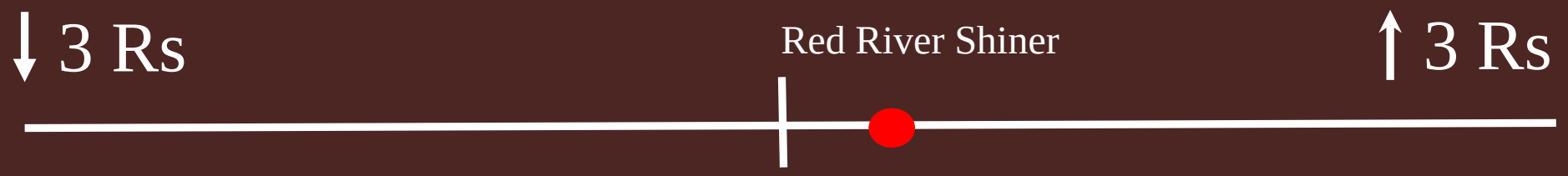
- Estimate other fishes/aquatic organisms?
  - Can use our scores to assess in other drainages

Ex: Red River Shiner– 1 independent drainage, 10 reaches, absent in 10% of reaches, rare in 20% of reaches



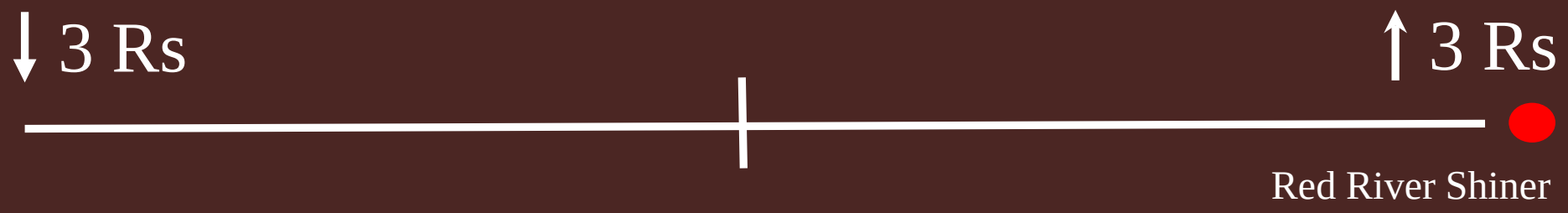
Final scores; 50 fishes

Conservation status?



Final scores; SGCN fishes

Conservation status?



Final scores; T&E fishes

Threats (individuals, populations,

Interactive Effects of Environmental Variability and Military Training on Stream Biota of Three Headwater Drainages in Western Louisiana

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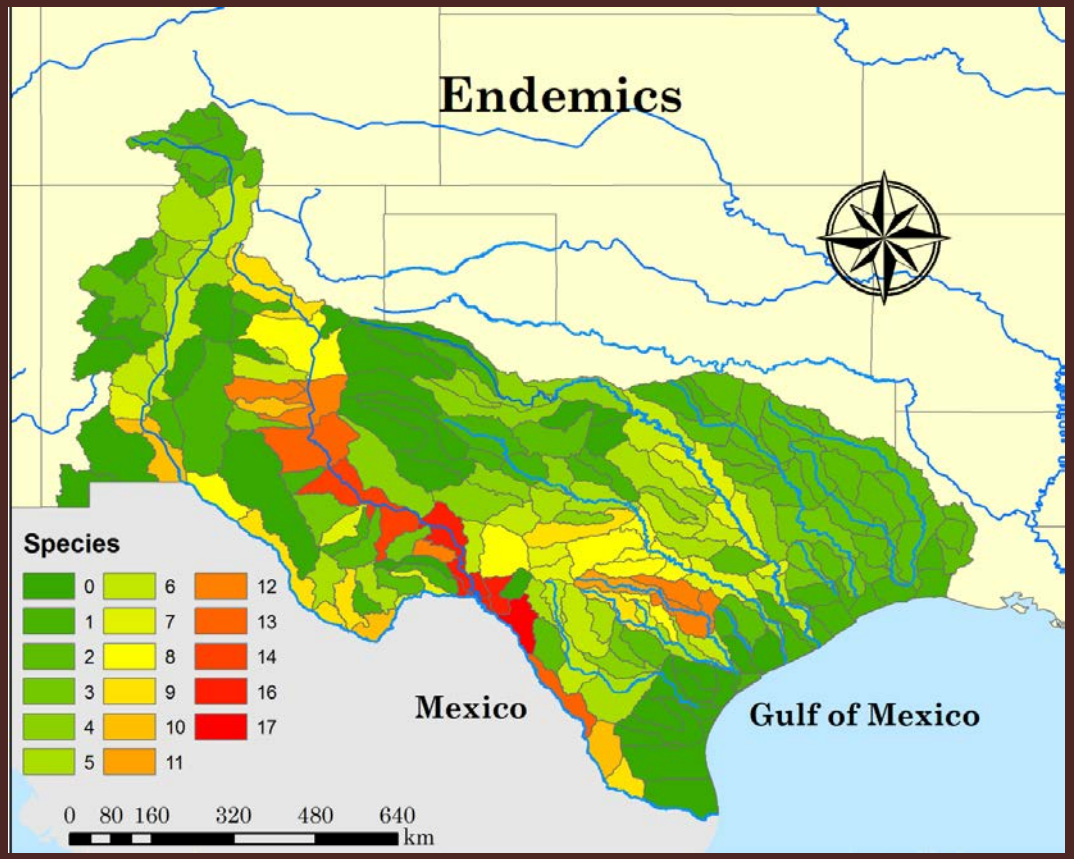
Threats (individuals, populations, communities)

- Time


Endemics
Species
0
1
2
3
4
5
6
7
8
9
10
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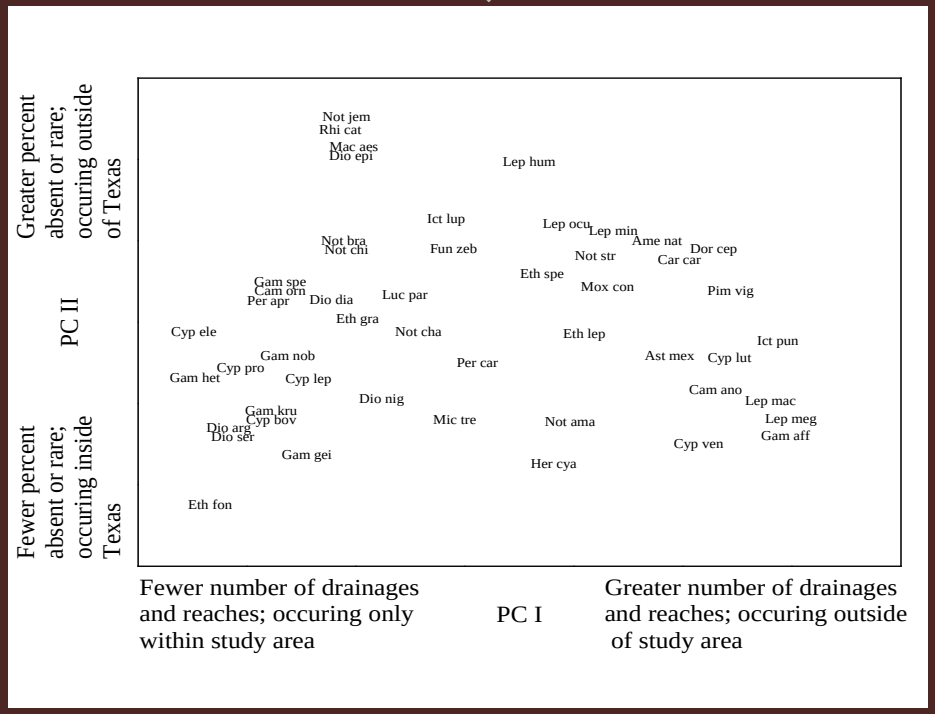
12
13
14
16
17
Mexico
Gulf of Mexico
0 80 160 320 480 640
km

Threats (individuals, populations, communities)

- Time
- Water quality
- Water pollution—endocrine disruptors
- Water pollution—microplastics
- Dredging
- Non-native competitors
- Non-native predators
- Non-native parasites
- Invasive native competitors
- Invasive native predators
- Invasive native parasites
- Sport fish stocking
- Aquarium releases
- Disease
- Habitat destruction
- Habitat modification
- Fragmentation
- Water quantity (flow regulation)
- Dewatering of surface waters
- Groundwater depletion
- Overharvest
- Illegal harvest
- Landscape alteration
- Urbanization
- Forestry practices
- Row crop practices
- Rangeland practices
- Fire
- Riparian alteration
- Channel alteration
- Anthropogenic Climate change
- Recreational activities
- Desertification

Quantify Threats



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