New Tools for Environmental Flow Information

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Texas Parks and Wildlife Department

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Texas Waters Webinars

TEXAS PARKS & WILDLIFE

Poll #1

Environmental flows refer to:

A. Freshwater inflows to bays and estuaries

B. Instream flows in springs, rivers, streams, and bayous

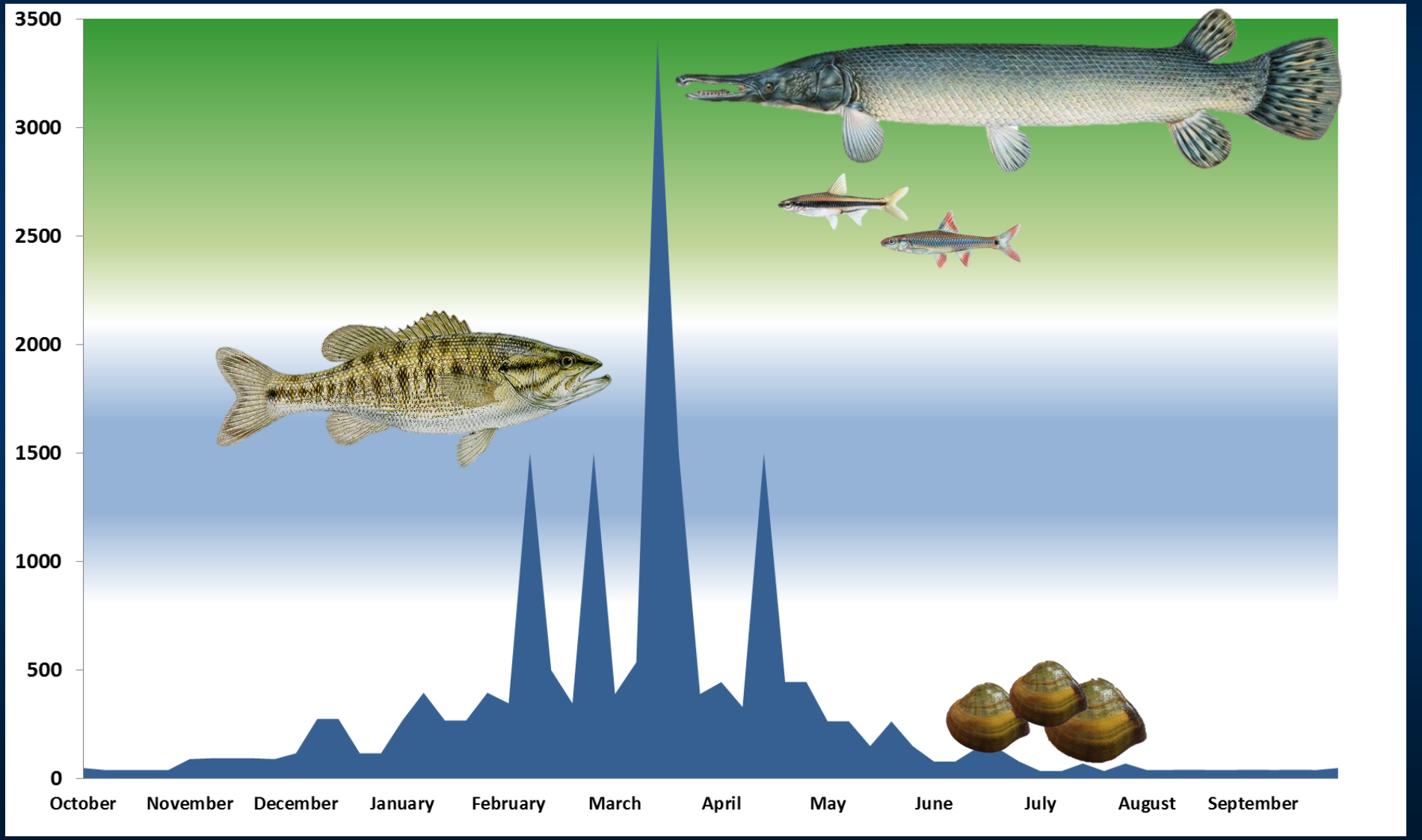
C. Water levels in lakes, oxbows, aquifers

D. All of the above

Environmental Flows

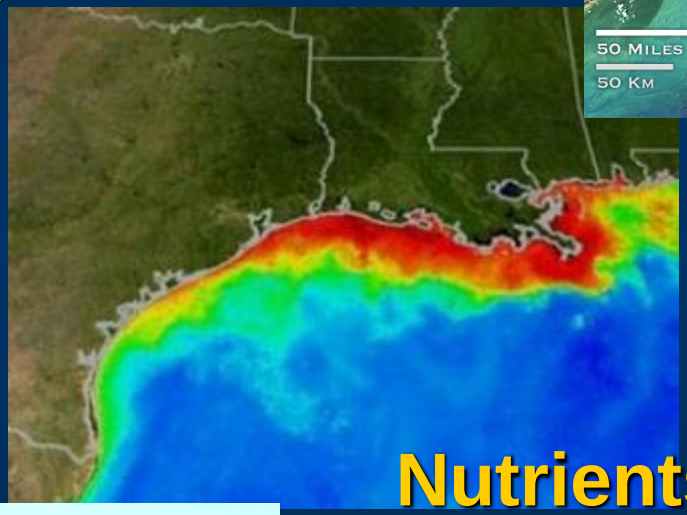
- Instream Flows – water flowing in a stream
- Freshwater Inflows – river water that flows into a bay or estuary
- Water Levels – elevations to support fish and wildlife in reservoirs, aquifers, wetlands, estuaries, etc.

Instream Flow Regimes & Patterns



Inflows to Estuaries

Salinity Gradients

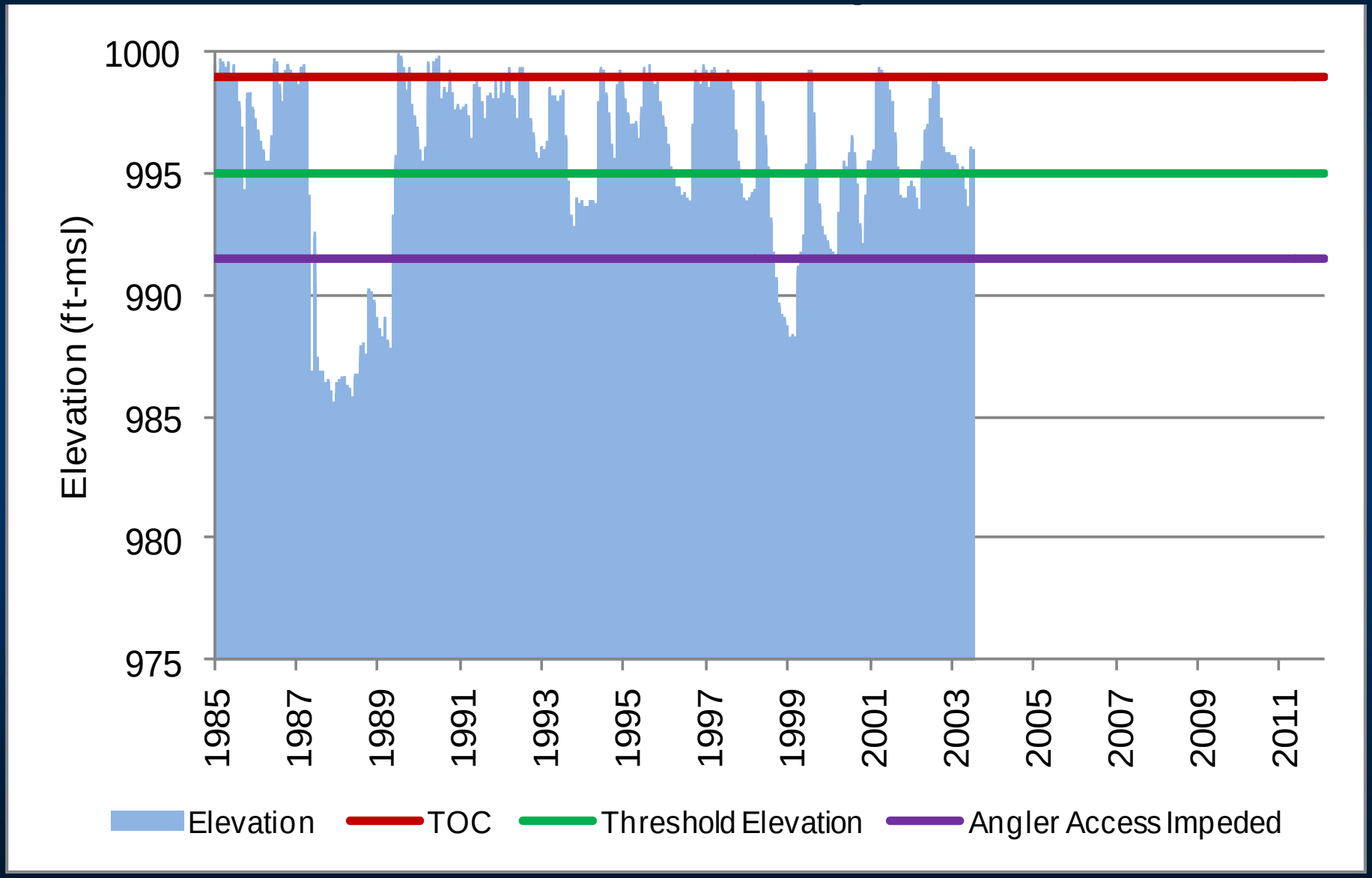


Nutrients

Wetlands

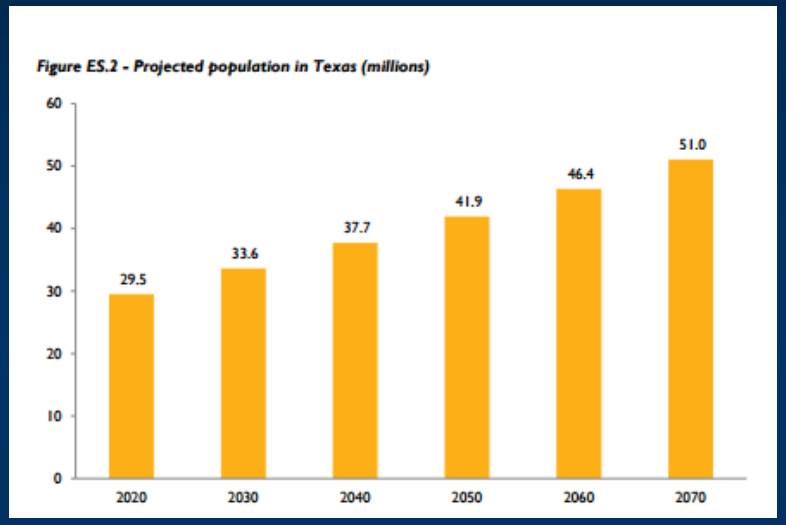
Flows which create and sustain estuaries

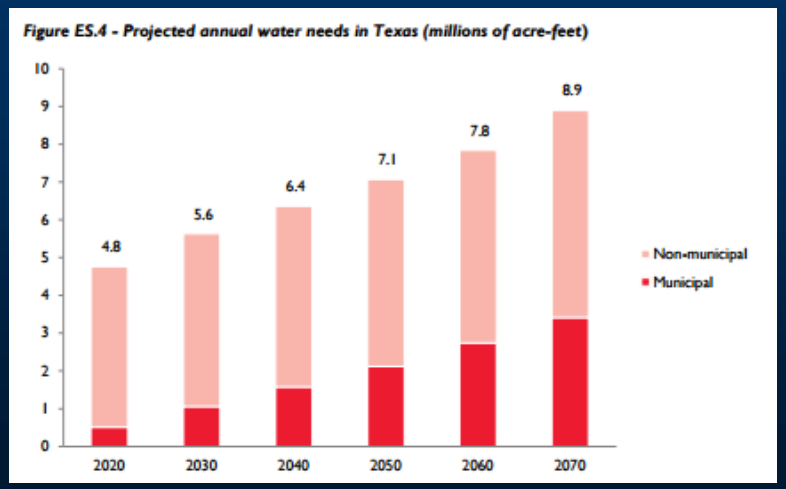
Reservoir Water Levels



Water Needs Increasing

Texas Population and Water Demand Projections*



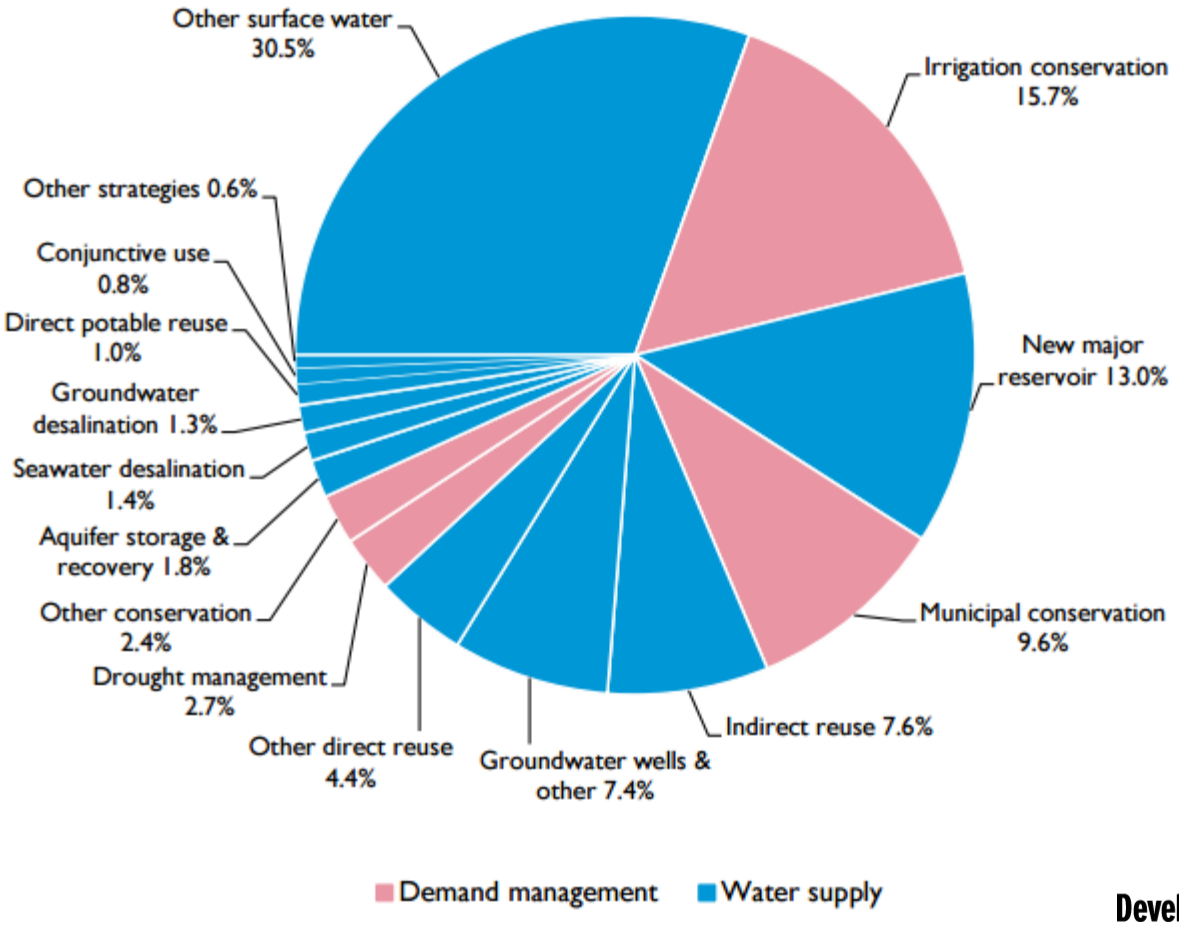


- Population increase of 20 million+ (2020-2070)
- Human water needs will nearly double between 2020 and 2070
- Municipal demands show four-fold increase

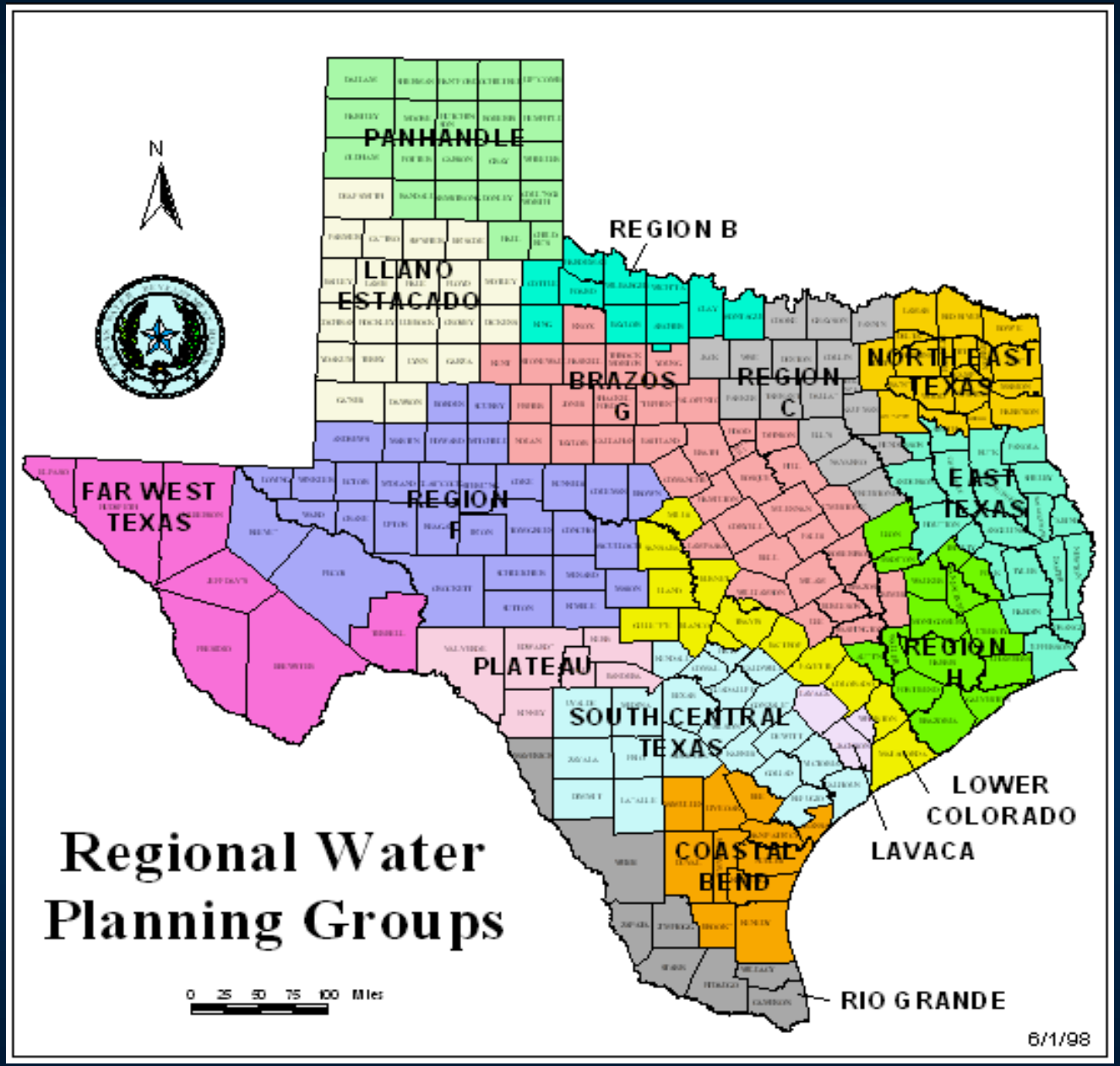
*2017 State Water Plan (TWDB 2016)

Relative Volume of Recommended Water Management Strategies 2070

Figure ES.7 - Share of recommended water management strategies by strategy type in 2070



Texas Water Development Board


N
PANHANDLE
REGION B
LLANO ESTACADO
BRAZOS G
REGION C
NORTH EAST TEXAS
EAST TEXAS
FAR WEST TEXAS
REGION F
PLATEAU
REGION H
SOUTH CENTRAL TEXAS
LOWER COLORADO
LAVACA
COASTAL BEND
RIO GRANDE
Regional Water Planning Groups
0 25 50 75 100 Miles
6/1/98

Poll #2

Which state agency regulates surface water permitting?

A. Texas Parks and Wildlife Department

B. Texas Commission on Environmental Quality

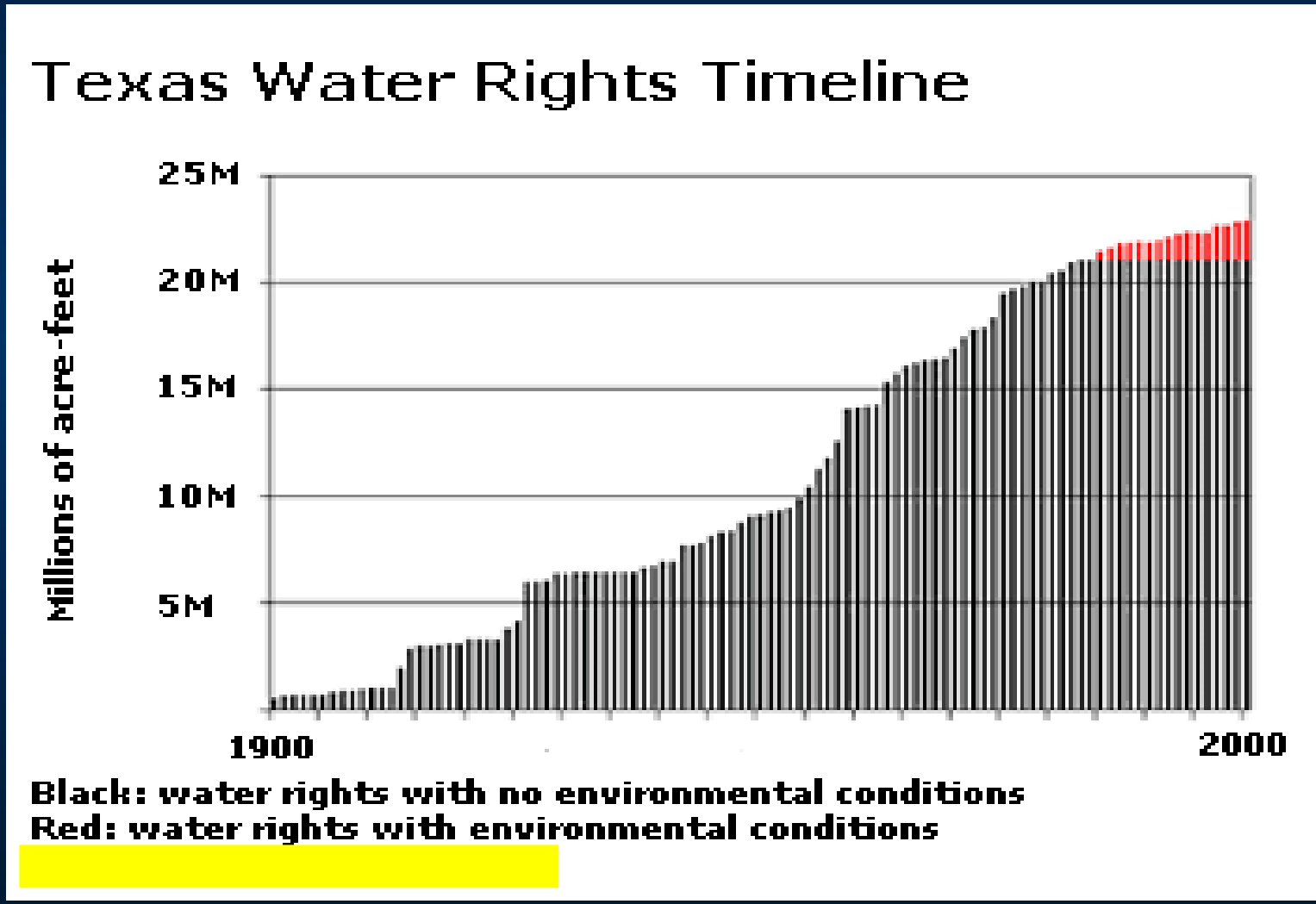
C. General Land Office

D. Texas Water Development Board

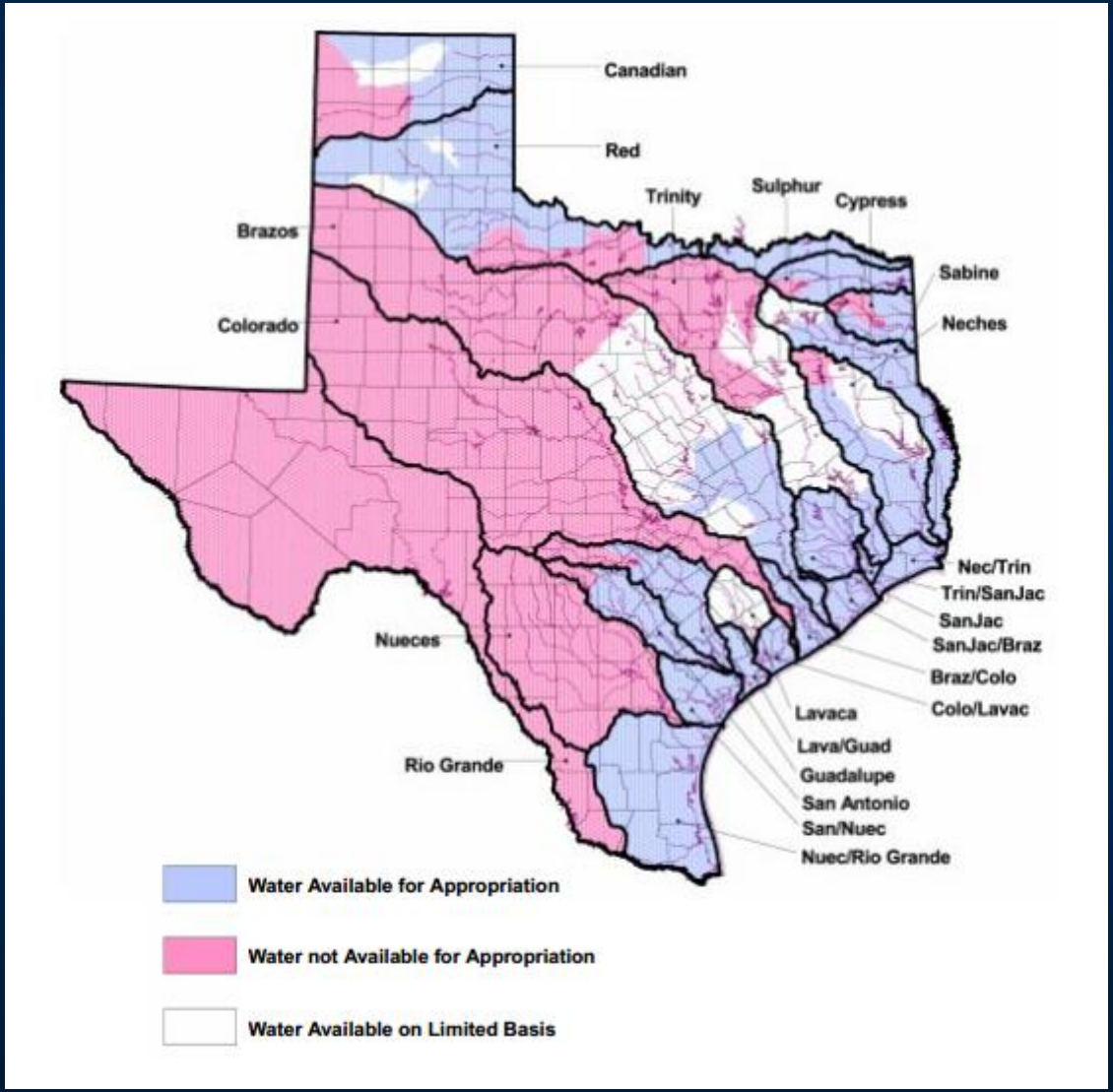
Surface Water Rights Primer

- Permitting regulated by TCEQ
- Surface water rights issued in perpetuity
- Prior appropriation and riparian doctrine
- Since 1985, special conditions added for environmental flow protection
- No new permits can be granted for environmental flows; only amendments
- Several basins fully or over-appropriated

Appropriated Surface Water Volumes

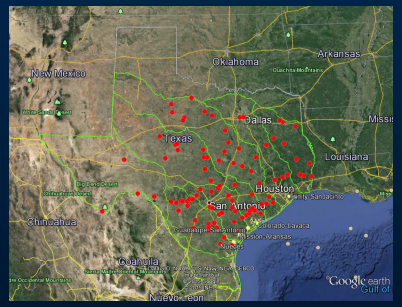


Water Availability (2000)



Senate Bill 3
Voluntary Strategies

- Senate Bill 3 (SB 3) environmental flows process: 80th Texas Legislature in 2007 established environmental flows standards.
- SB 3 also calls for voluntary strategies to meet environmental flow standards, especially in fully appropriated basins: “a variety of market approaches, both public and private, for filling the gap must be explored and pursued.”



TX E-flow Standards Adopted

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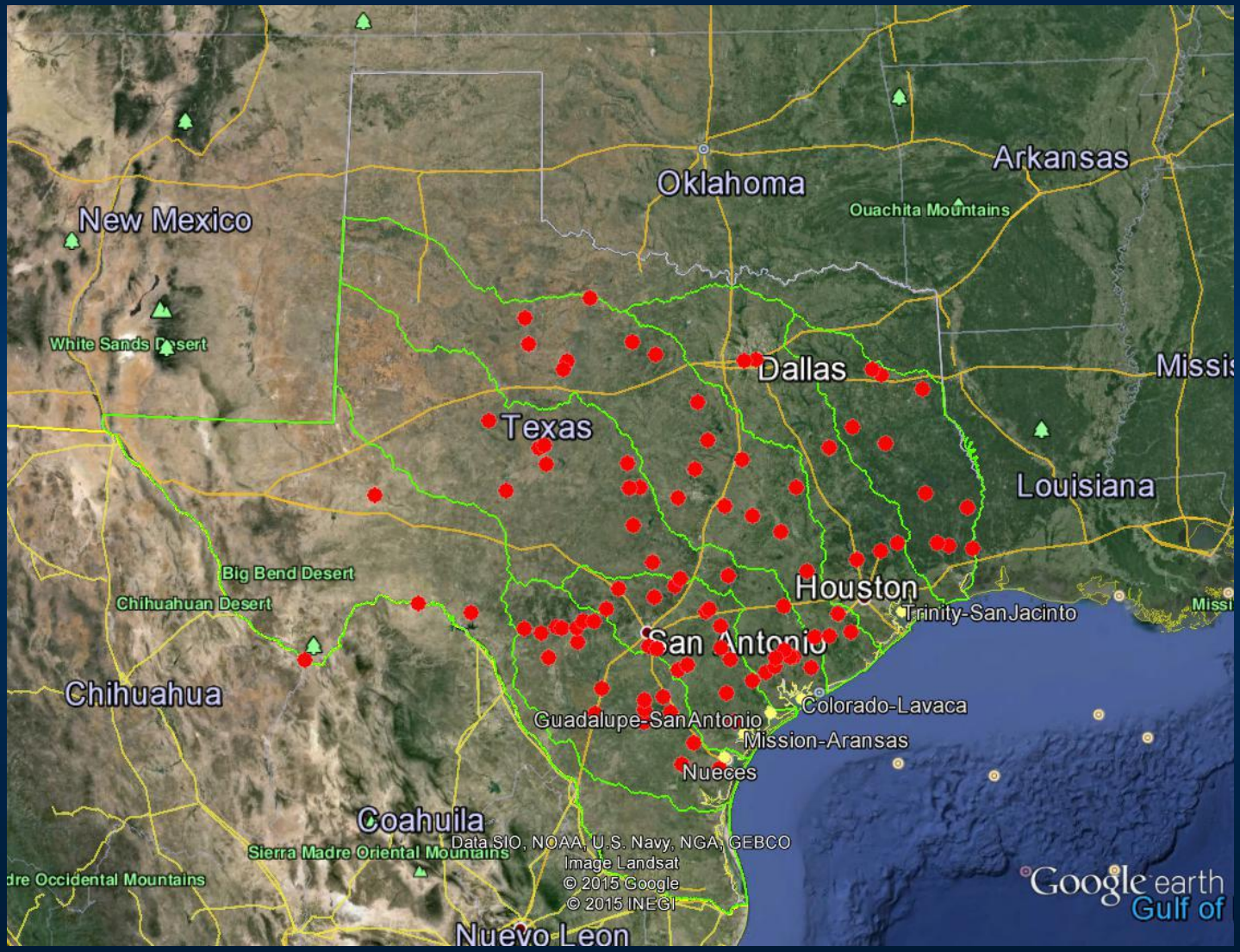
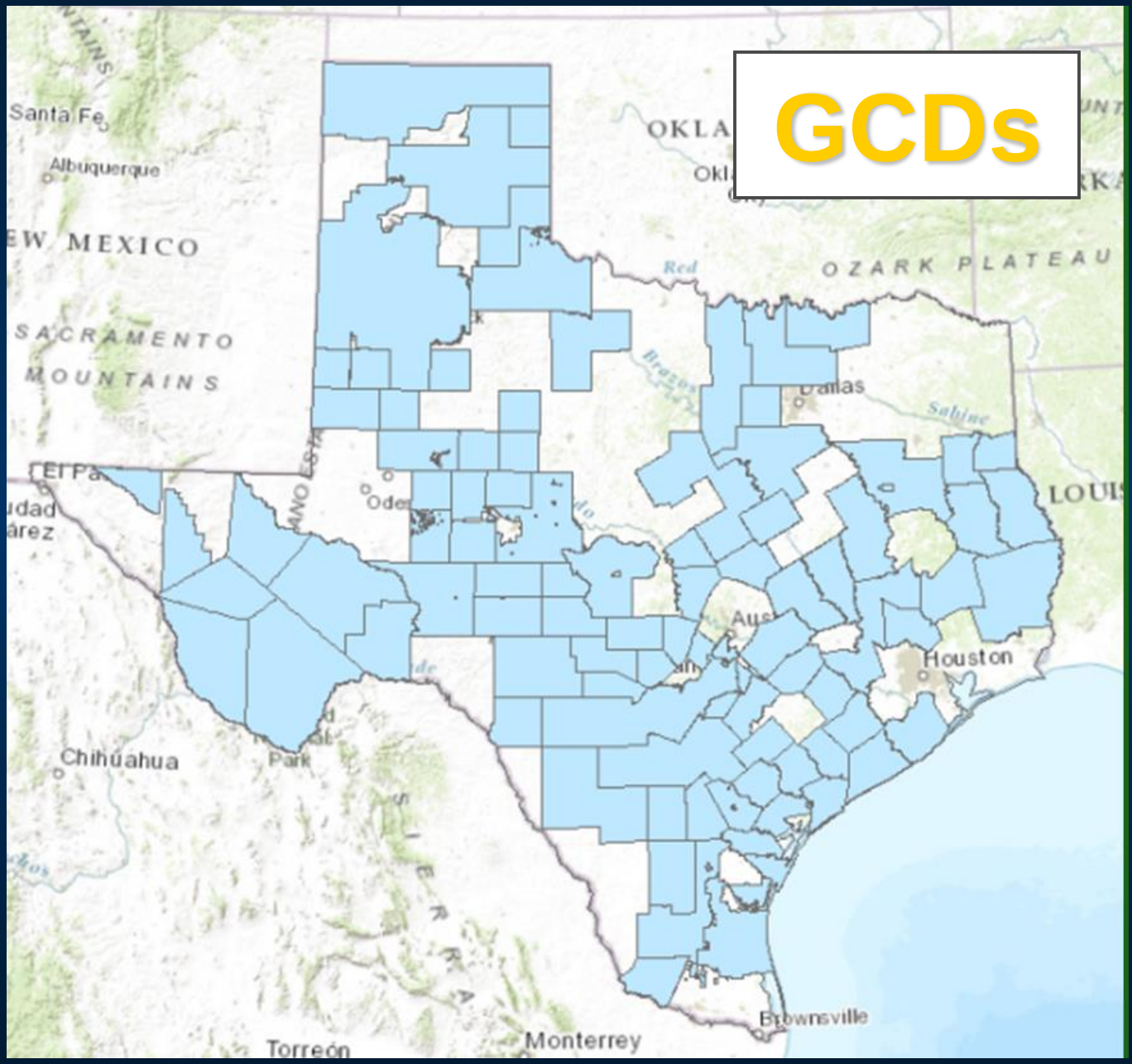
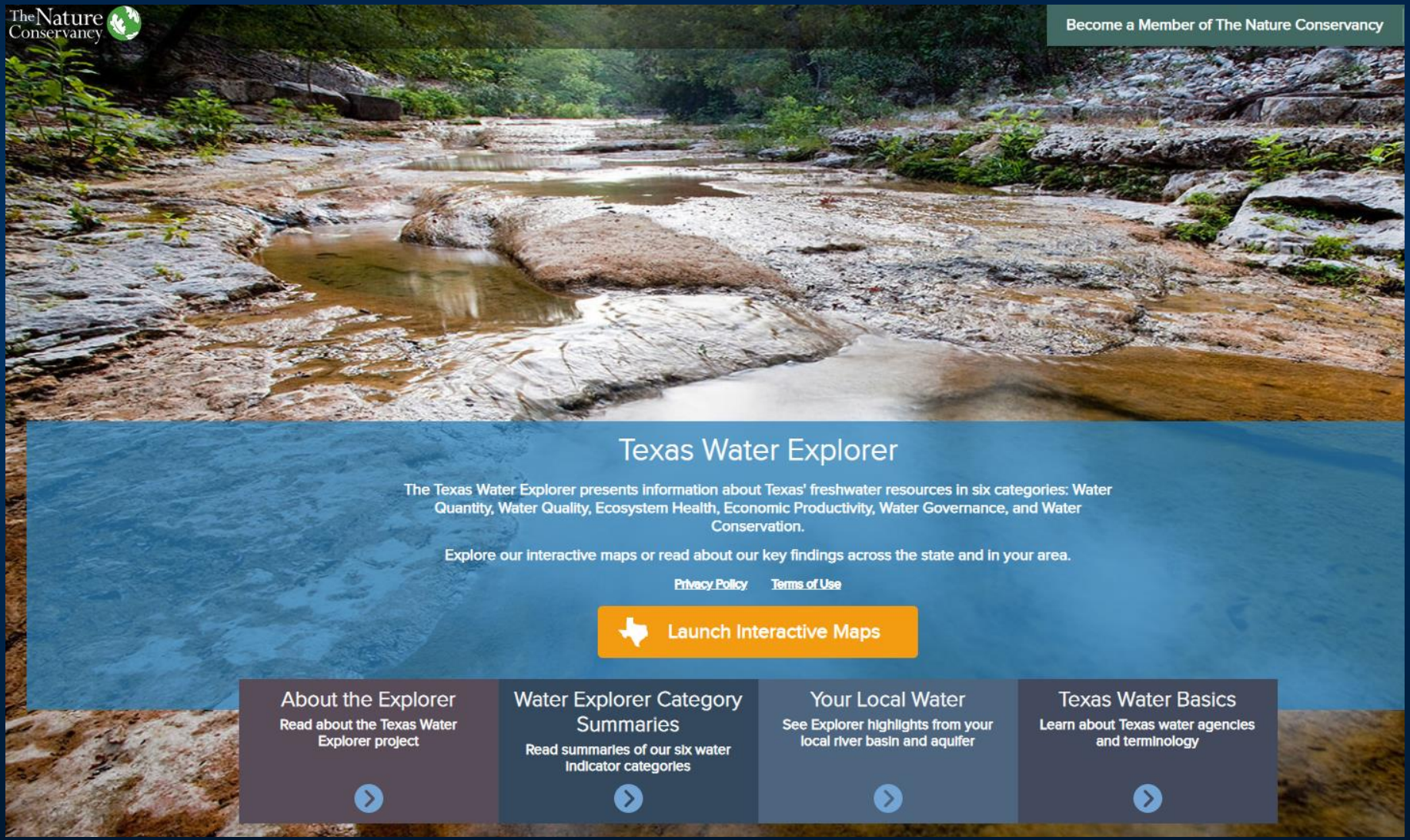


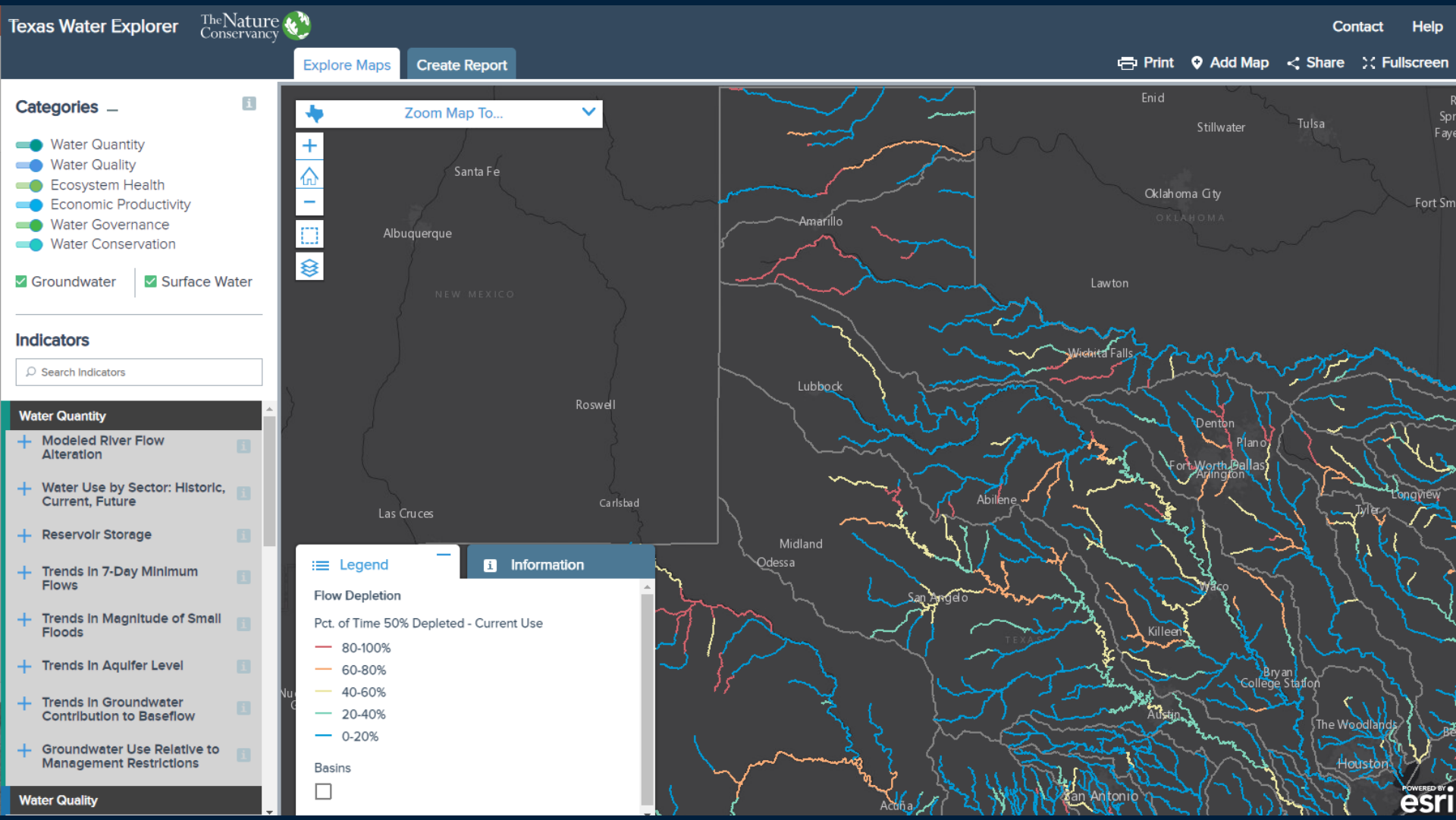
Groundwater 101

- Groundwater pumped under “rule of capture” – no connection to surface water rights permitting
- Groundwater Conservation Districts (GCDs) set up by legislature in some areas of the state – not all parts of all aquifers
- Some aquifers over-drafted severely (e.g., Ogalalla)


GCDs
Santa Fe
Albuquerque
EW MEXICO
SACRAMENTO
MOUNTAINS
OKLA
OZARK PLATEAU
Red
Dallas
Sabine
Houston
Chihuahua
Monterrey
Torreón
Brownsville

TNC's Texas Water Explorer




Texas Water Explorer
The Nature Conservancy
Contact
Help
Explore Maps
Create Report
Print
Add Map
Share
Fullscreen
Categories
Water Quantity
Water Quality
Ecosystem Health
Economic Productivity
Water Governance
Water Conservation
Groundwater
Surface Water
Indicators
Search Indicators
Water Quantity
Modeled River Flow Alteration
Water Use by Sector: Historic, Current, Future
Reservoir Storage
Trends in 7-Day Minimum Flows
Trends in Magnitude of Small Floods
Trends in Aquifer Level
Trends in Groundwater Contribution to Baseflow
Groundwater Use Relative to Management Restrictions
Water Quality
Zoom Map To...
Legend
Information
Flow Depletion
Pct. of Time 50% Depleted - Current Use
80-100%
60-80%
40-60%
20-40%
0-20%
Basins
Santa Fe
Albuquerque
NEW MEXICO
Las Cruces
Roswell
Carlsbad
Amarillo
Lubbock
Midland
Odessa
Abilene
San Angelo
Enid
Stillwater
Tulsa
Oklahoma City
OKLAHOMA
Lawton
Wichita Falls
Denton
Plano
Fort Worth
Dallas
Arlington
Longview
Tyler
Waco
Killeen
Bryan
College Station
Austin
The Woodlands
Houston
San Antonio
Acuña
TEXAS
POWERED BY esri

Texas Water Explorer Indicators

Water Quantity

- Flow depletion
- Water use by sector
- Reservoir storage
- Trends in 7-day minimum flows
- Trends in magnitude of small floods
- Trends in aquifer level
- Trends in springflow or river baseflow
- Groundwater use/Management restrictions

Water Quality

- Water quality violations
- Vulnerability to ecol. impacts from land uses
- Gw: Trends in water quality parameters
- Gw: Exceedence of drinking water standards

Economic Productivity

- Value of Water in the Economy

Ecosystem Health

- Native biological communities
- Invasive species
- Priority conservation areas
- River fragmentation
- Paddling trails

Governance

- Environmental flow protection
- Endangered species
- Watershed management (for water quality)
- Groundwater Management (GCDs)

Water Conservation

- Urban water use efficiency
- Water efficiency in electricity generation
- Irrigation demand

TPWDs Environmental Flow Information Toolkit (EFIT)

1. **Decision Support Tool (DST)**

   Enables a user to identify areas to align with flow management strategies for the restoration and protection of environmental flows

2. **EFIT Strategies**

   Identify and implement voluntary strategies to secure water for the environment, suitable for Texas policy and public dialogue

GP EFIT Hydrology Dashboard

GP EFIT: The Great Plains Environmental Flow Information Toolkit

Selection Index

Step 1: Review the percent change in pre and post attainment frequency by selecting a flow metric and mapping USGS gages by hydrologic alteration

Step 2: Choose the river basin and USGS gage station location of interest

Step 3: Use the water rights criteria selection to help identify potential voluntary strategies

Select Flow Regime Component

Avg Summer Base Flows

Select River Basin

None

Select USGS Gage

None

Select Water Right Use Type(s)

None

Filter Water Right by Date

Set Priority Date Range

12/30/1900

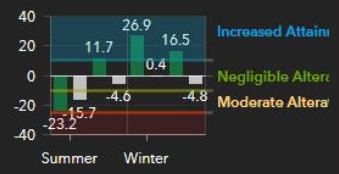
8/6/2018

Hydrology-Based Target Flows: Avg. Summer Base Flows

Canadian Rv nr Amarillo, TX

Flow Recommendations | Gage List

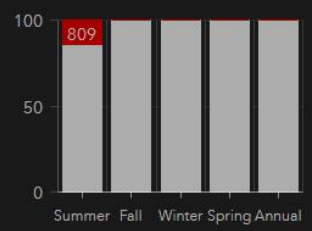
Percent Change In Attainment Frequency



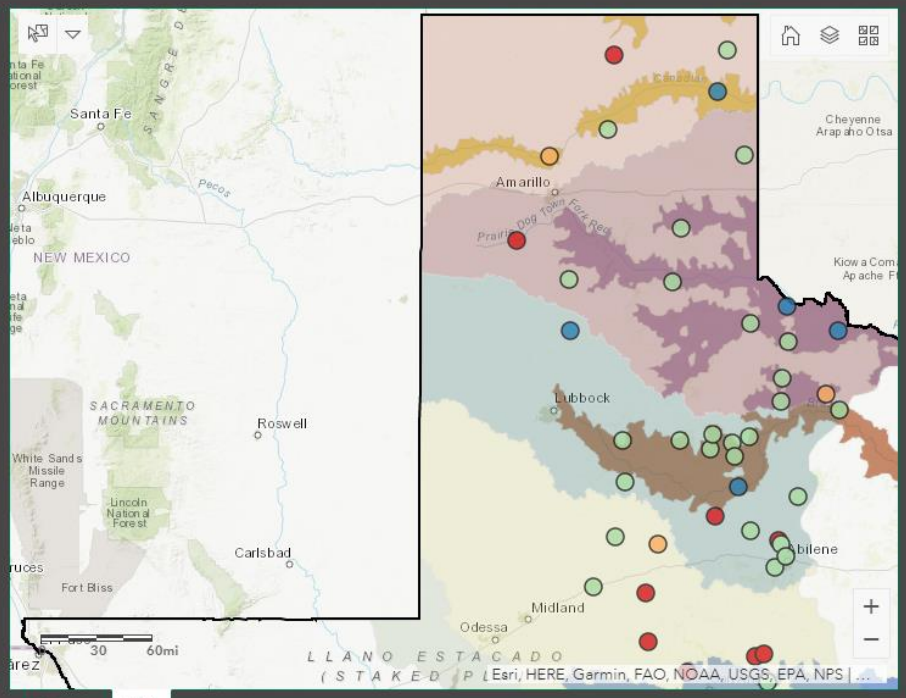
Base Flow Alteration

Subsistence Flow Alteration

Base Flow Deficits (acre-ft)



Subsistence Flow | Base Flow



Tutorial | Map

Legend

USGS Discharge Locations:

Degree_of Hydrologic Alteration

- > 10% = Increased Attainment
- > -10 - 10% = Negligible Alteration
- > -25 - -10% = Moderate Alteration
- < -25% = High Alteration

Texas Border

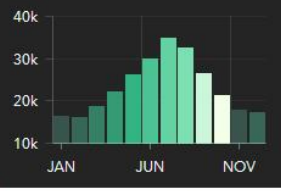
Click on the icon to add layers to the map. Use the scrollbar on the right-hand side to see all data layers selected within the extent.

TEXAS PARKS & WILDLIFE

Priority Date	3/9/1975
HUC08 Name	Running Water Draw
Total Permitted	1,248 ac-ft
Storage Amount	4,427 ac-ft
Period Reliability Range	8 - 8%
Use Type	Irrigation

Diversion Type	Diversion Point
GNIS Name	Catfish Draw
HUC08 Name	Running Water Draw
HUC10 Name	Running Water Draw
HUC12 Name	Mustang Draw

Monthly Pattern of Use (acre-ft)



Monthly Pattern of Surface W...

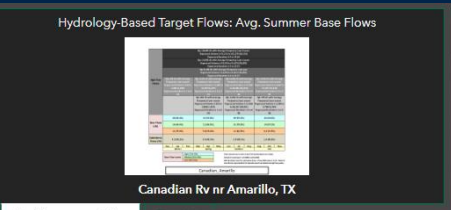
Total Number of Water Rights

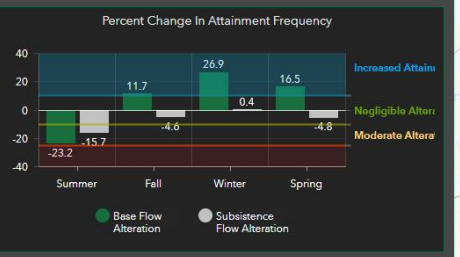
599

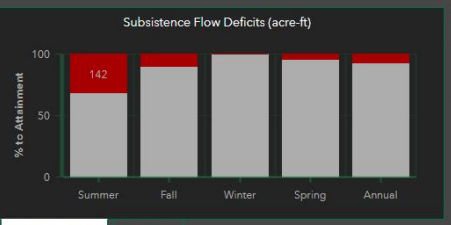
Total Amount Permitted (acre-

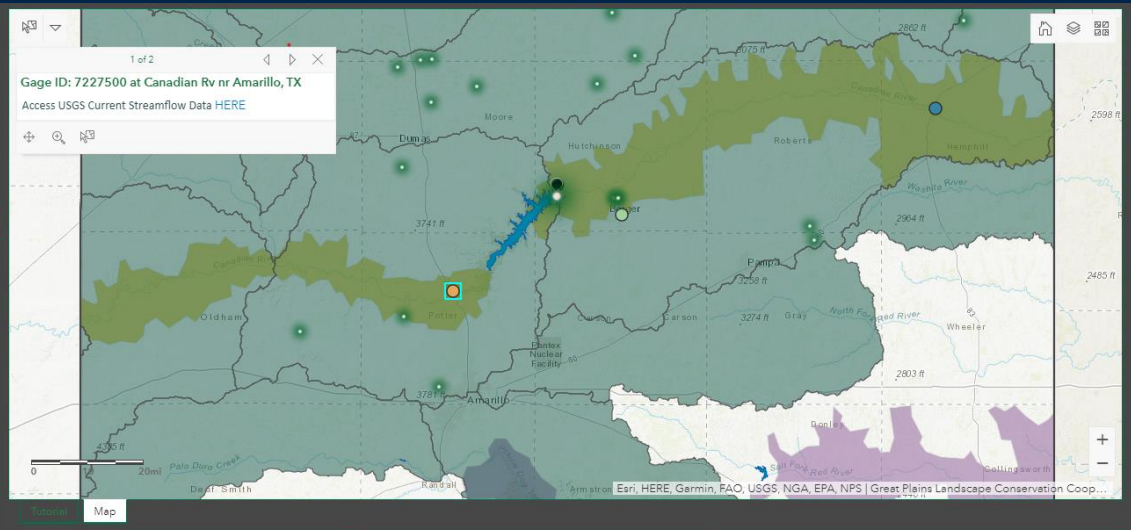
737,908.2

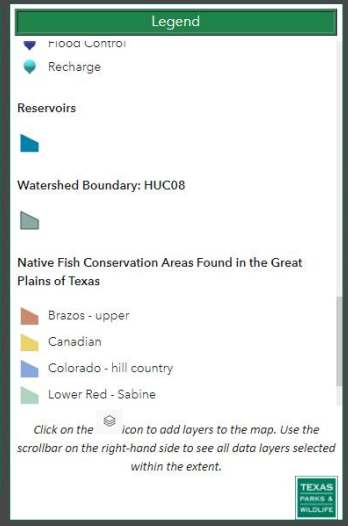
Select USGS gage











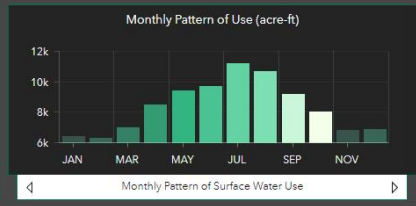
Period Reliability Range	2 - 8%
Use Type	Mining

Water Right No. 3780

Priority Date	5/19/1968
HUC08 Name	Lake Meredith
Total Permitted	10 ac-ft
Storage Amount	59.6 ac-ft
Period Reliability Range	13 - 14%

Diversion Location
Water Right No. 3782

Diversion Type	Diversion Point
GNIS Name	Canadian River
HUC08 Name	Lake Meredith
HUC10 Name	Lake Meredith
HUC12 Name	Lower Lake Meredith-Canadian River



Total Number of Water Rights

1

Total Amount Permitted (acre-ft)

151,200

Hydrology-Based Target Flows: Avg. Summer Base Flows

High Flow Pulses	Qp: 18,600 cfs with Average Frequency 1 per 5 years Regressed Volume is 51,123 to 132,276 (82,233) Regressed Duration is 5 to 15 (8)											
	Qp: 13,000 cfs with Average Frequency 1 per 2 years Regressed Volume is 35,243 to 91,076 (56,655) Regressed Duration is 4 to 13 (7)											
	Qp: 9,100 cfs with Average Frequency 1 per year Regressed Volume is 24,333 to 62,814 (39,096) Regressed Duration is 4 to 12 (7)											
	Qp: 205 cfs with Average Frequency 1 per season Regressed Volume is 499 to 2,006 (1,000) Regressed Duration is 1 to 6 (3)			Qp: 1,620 cfs with Average Frequency 1 per season Regressed Volume is 3,906 to 10,575 (6,427) Regressed Duration is 2 to 7 (4)			Qp: 6,390 cfs with Average Frequency 1 per season Regressed Volume is 17,930 to 40,088 (26,810) Regressed Duration is 3 to 9 (6)			Qp: 2,440 cfs with Average Frequency 1 per season Regressed Volume is 6,367 to 17,376 (10,518) Regressed Duration is 3 to 9 (5)		
				Qp: 390 cfs with Average Frequency 2 per season Regressed Volume is 926 to 2,508 (1,524) Regressed Duration is 1 to 5 (3)			Qp: 4,620 cfs with Average Frequency 2 per season Regressed Volume is 12,668 to 28,292 (18,931) Regressed Duration is 3 to 8 (5)			Qp: 578 cfs with Average Frequency 2 per season Regressed Volume is 1,360 to 3,708 (2,245) Regressed Duration is 2 to 5 (3)		
Base Flows (cfs)	40 (33.4%)			24 (37.8%)			69 (59.2%)			34 (39.0%)		
	16 (56.9%)			12 (56.5%)			31 (70.3%)			14 (57.2%)		
	11 (75.9%)			7.8 (73.0%)			11 (82.5%)			9.2 (72.5%)		
Subsistence Flows (cfs)	5.2 (95.2%)			2.4 (95.2%)			2.5 (95.1%)			1.6 (95.3%)		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
	Winter			Spring			Summer			Fall		

Base Flow Levels	
	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)

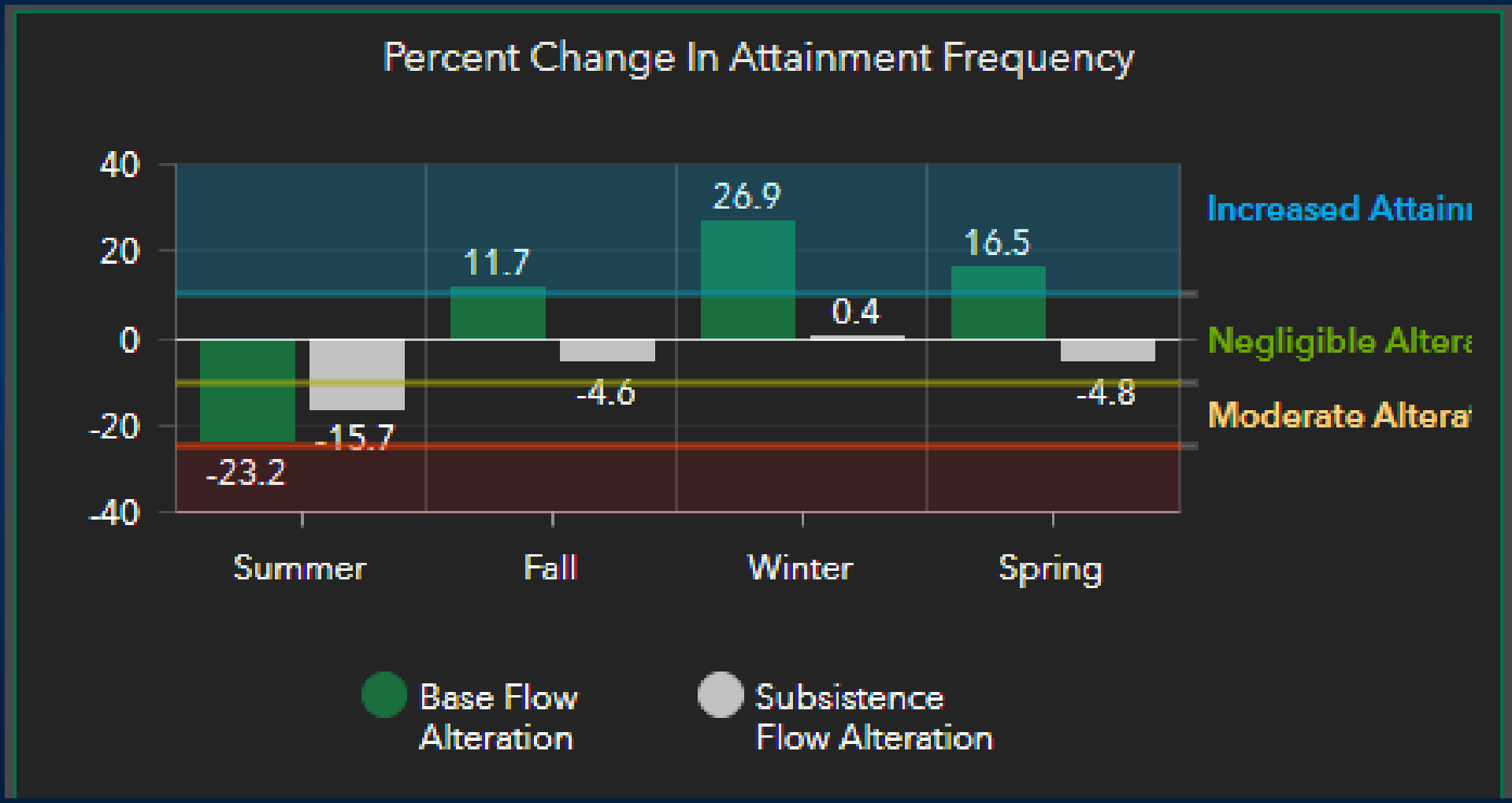
Pulse volumes are in units of acre-feet and durations are in days.

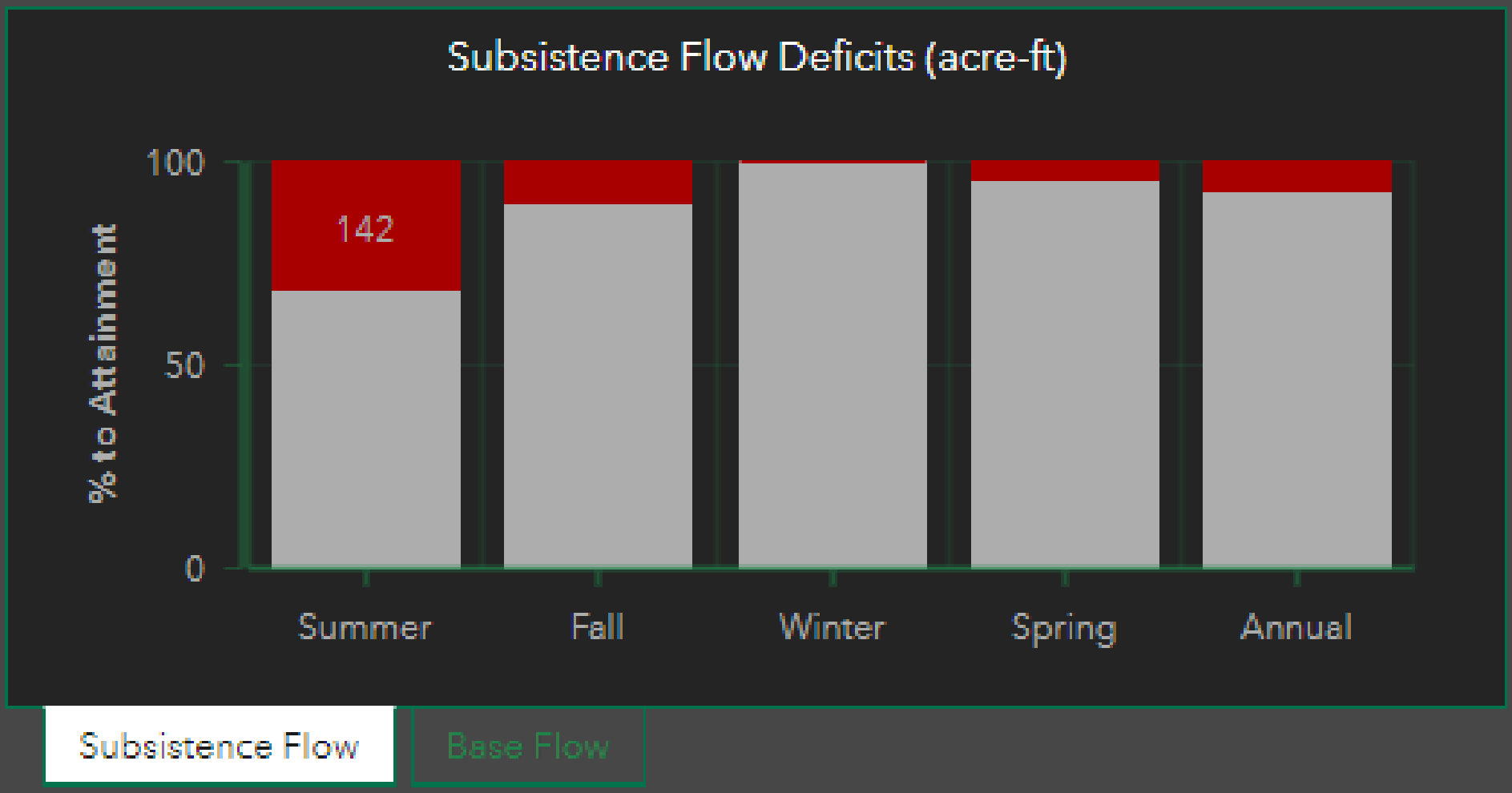
Period of record used : 1/1/1939 to 12/31/1962.

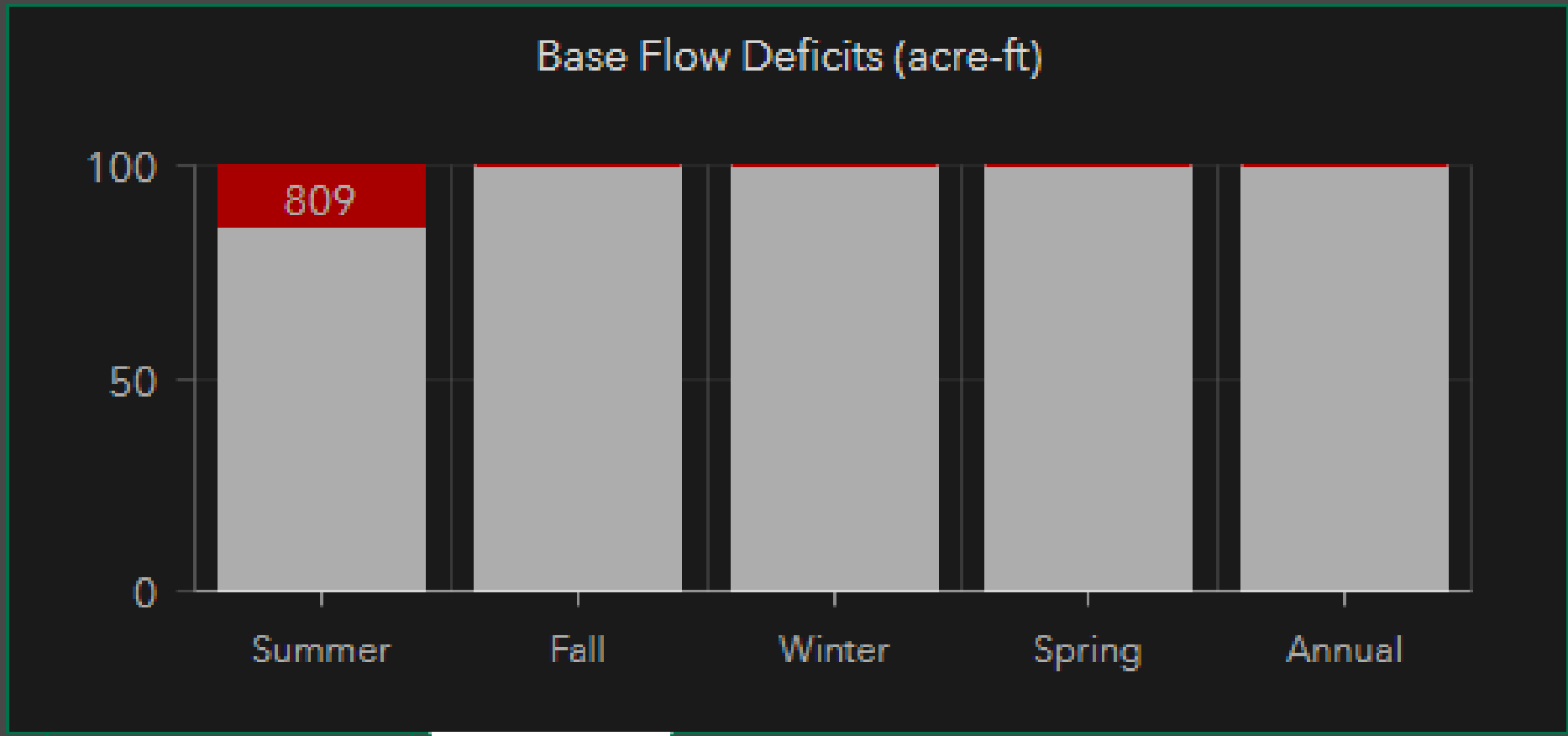
Q95 calculation used for subsistence flows. Annual Q95 value is 2.4 cfs. Water Q User did not input bankfull; all episodic events are labeled as high flow pulses.

Canadian_Amarillo

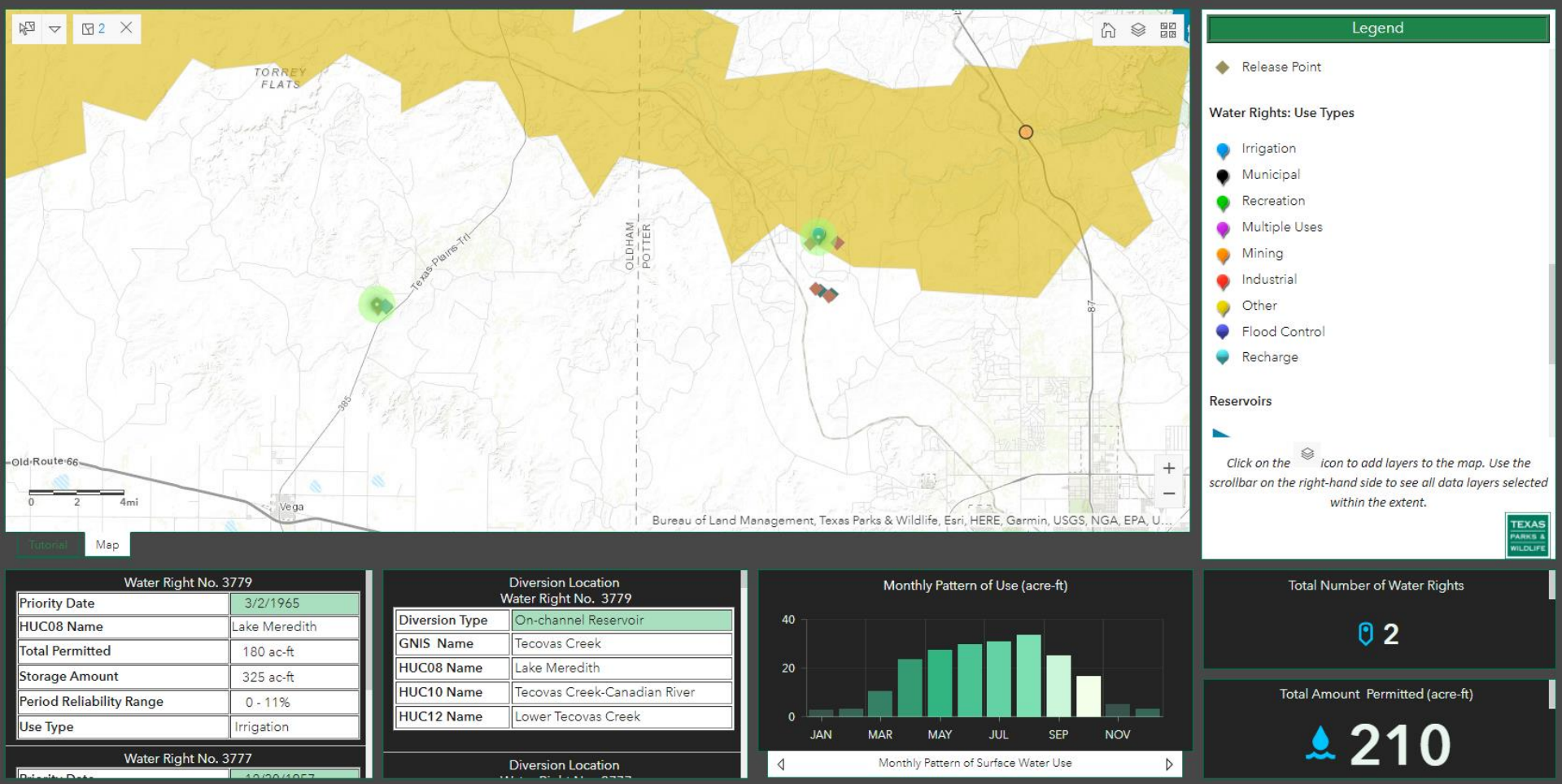
Canadian Rv nr Amarillo, TX


Percent Change In Attainment Frequency
40
20
0
-20
-40
26.9
16.5
11.7
0.4
-4.6
-4.8
-15.7
-23.2
Summer
Fall
Winter
Spring
Increased Attaini
Negligible Altera
Moderate Altera
Base Flow Alteration
Subsistence Flow Alteration


Subsistence Flow Deficits (acre-ft)
% to Attainment
100
50
0
142
Summer
Fall
Winter
Spring
Annual
Subsistence Flow
Base Flow


Base Flow Deficits (acre-ft)
100
50
0
809
Summer
Fall
Winter
Spring
Annual
Subsistence Flow
Base Flow

Assessing Water Rights



Water Right No. 3779

Priority Date	3/2/1965
HUC08 Name	Lake Meredith
Total Permitted	180 ac-ft
Storage Amount	325 ac-ft
Period Reliability Range	0 - 11%
Use Type	Irrigation

Water Right No. 3777

Diversion Location
Water Right No. 3779

Diversion Type	On-channel Reservoir
GNIS Name	Tecovas Creek
HUC08 Name	Lake Meredith
HUC10 Name	Tecovas Creek-Canadian River
HUC12 Name	Lower Tecovas Creek

Diversion Location

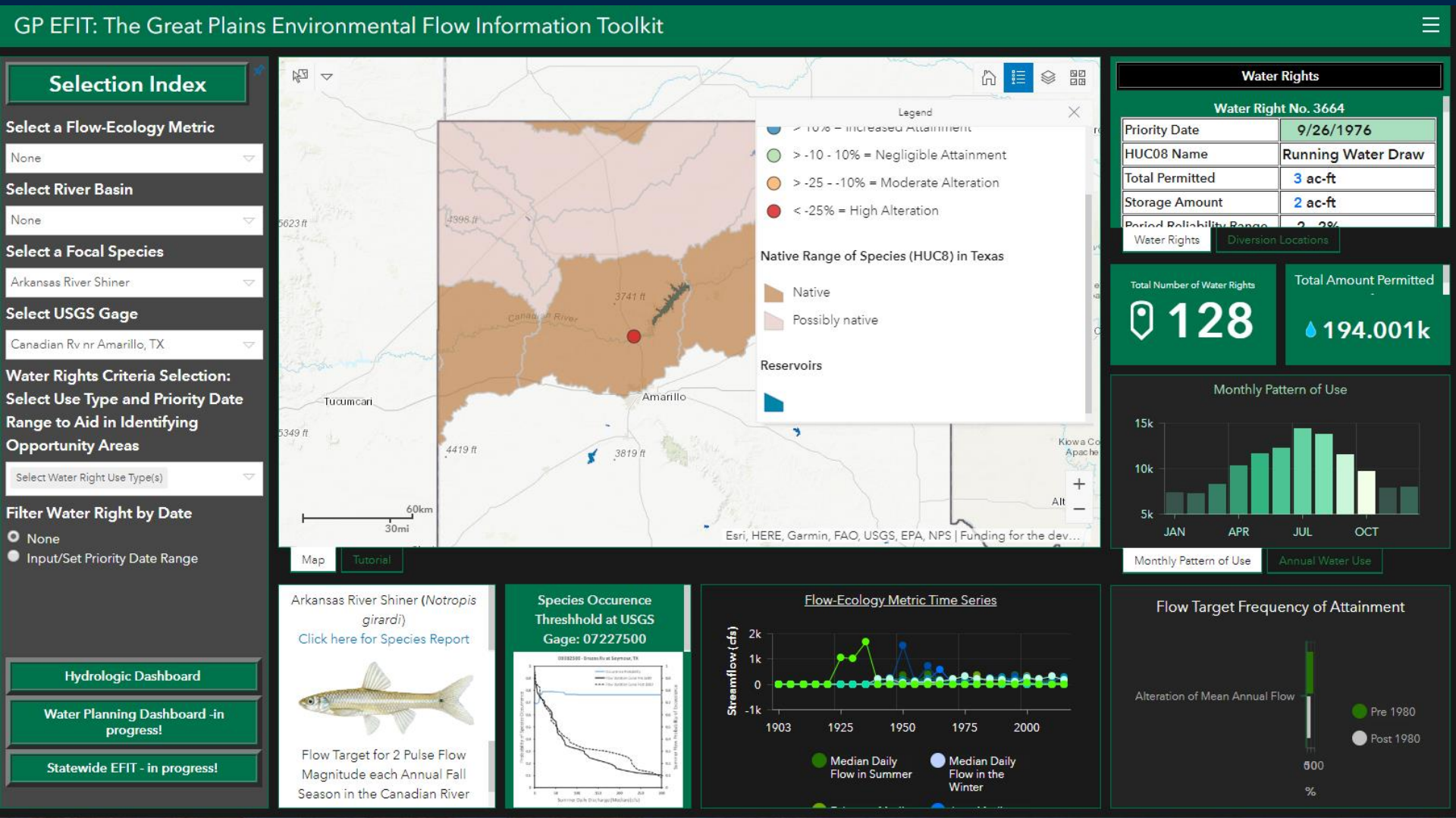
Total Number of Water Rights

2

Total Amount Permitted (acre-ft)

210

GP Flow-Ecology Dashboard



Plains Minnow *Hybognathus placitus* (Image © Joseph R. Tomelleri)

Status: SGCN (proposed)
Threats in Upper Brazos River, Upper Red River, and Upper Canadian Native Fish Conservation Areas: loss of natural flow regime; reduced stream flow; habitat fragmentation; habitat loss
Description: Mid-dorsal stripe broad and solid; first obvious dorsal fin ray a thin splint, closely attached to the following well developed but unbranched ray; distance from origin of anal fin to end of caudal peduncle contained two and one-half or fewer times in distance from tip of snout to origin of anal fin (Hubbs et al. 2008).
Range: Central Texas from the Colorado and Brazos basins to the Red River and northward to North Dakota and Montana (Hubbs et al 2008).
Habitat: Commonly in turbid rivers having exposed, shallow, sand-filled channels (Cross et al. 1985) where sediments accumulate in shallow backwaters, gentle eddies, and along the deeper edges of sand "waves" that are formed on shifting substrate by actions of the current (Cross and Collins 1995).
Biology: Herbivore, primarily feeding on algae and other organic bottom material (Pflieger 1997; Goldstein and Simon 1999). Flood-pulse, broadcast spawner (Miller and Robison 2004; Lehtinen and Leyzer 1988; Cross and Collins 1995).

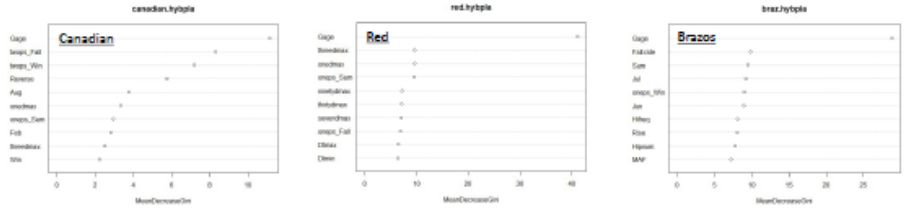
Flow-Ecology Relationships and Flow Targets

Literature Review

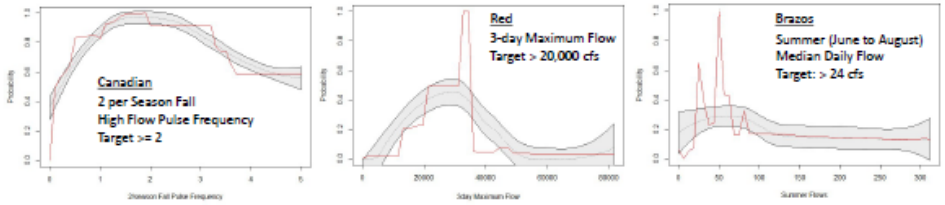
1. Summer Zero Flows Days = 0 (Perkin et al. 2014, 2015, Worthington et al. 2016)

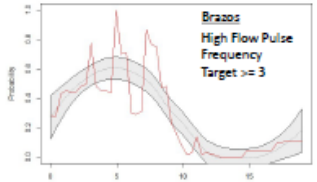
Flow-Ecology Modeling

Influence Plots From Random Forest Models:



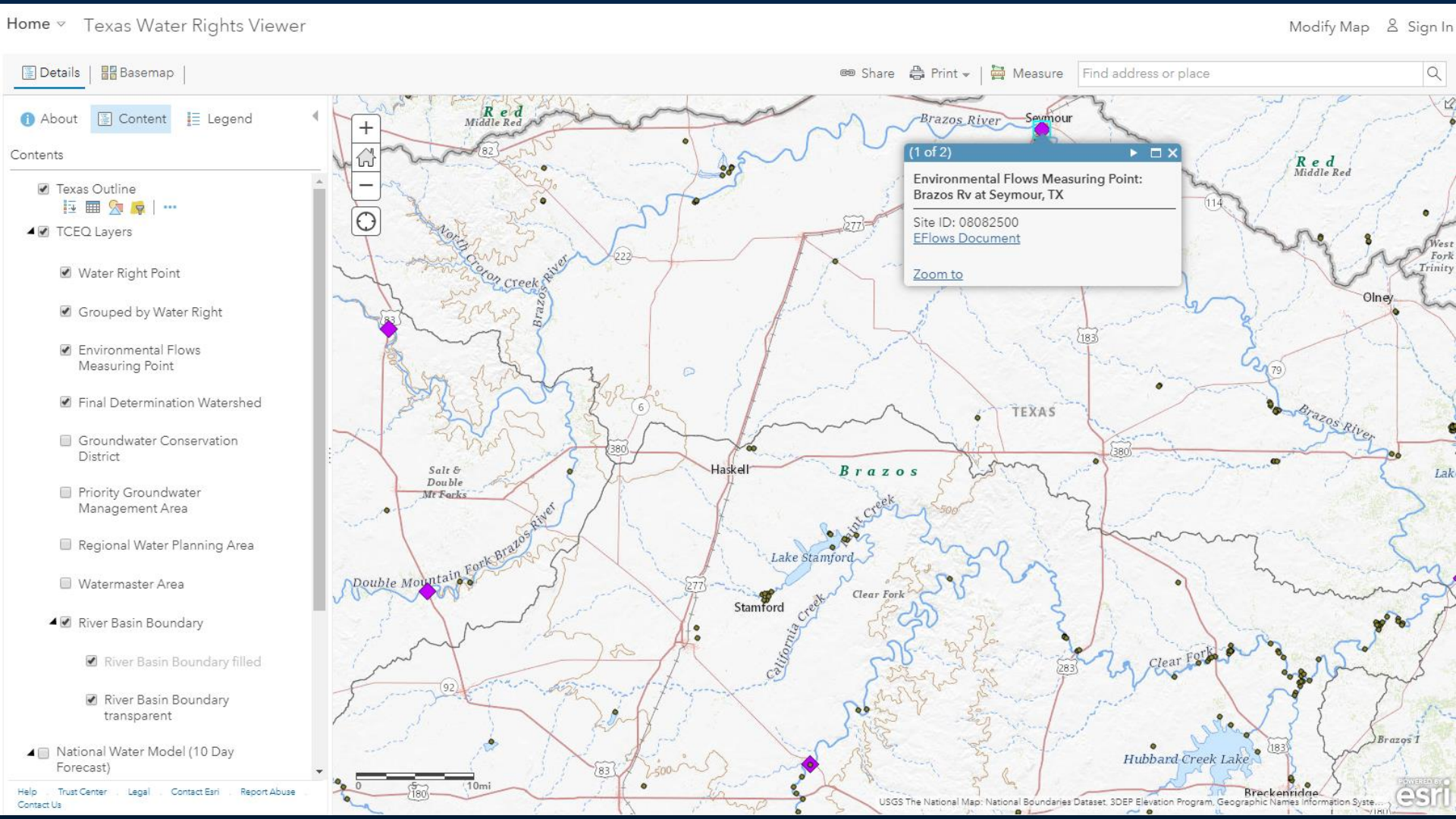
Partial Dependence Plots:

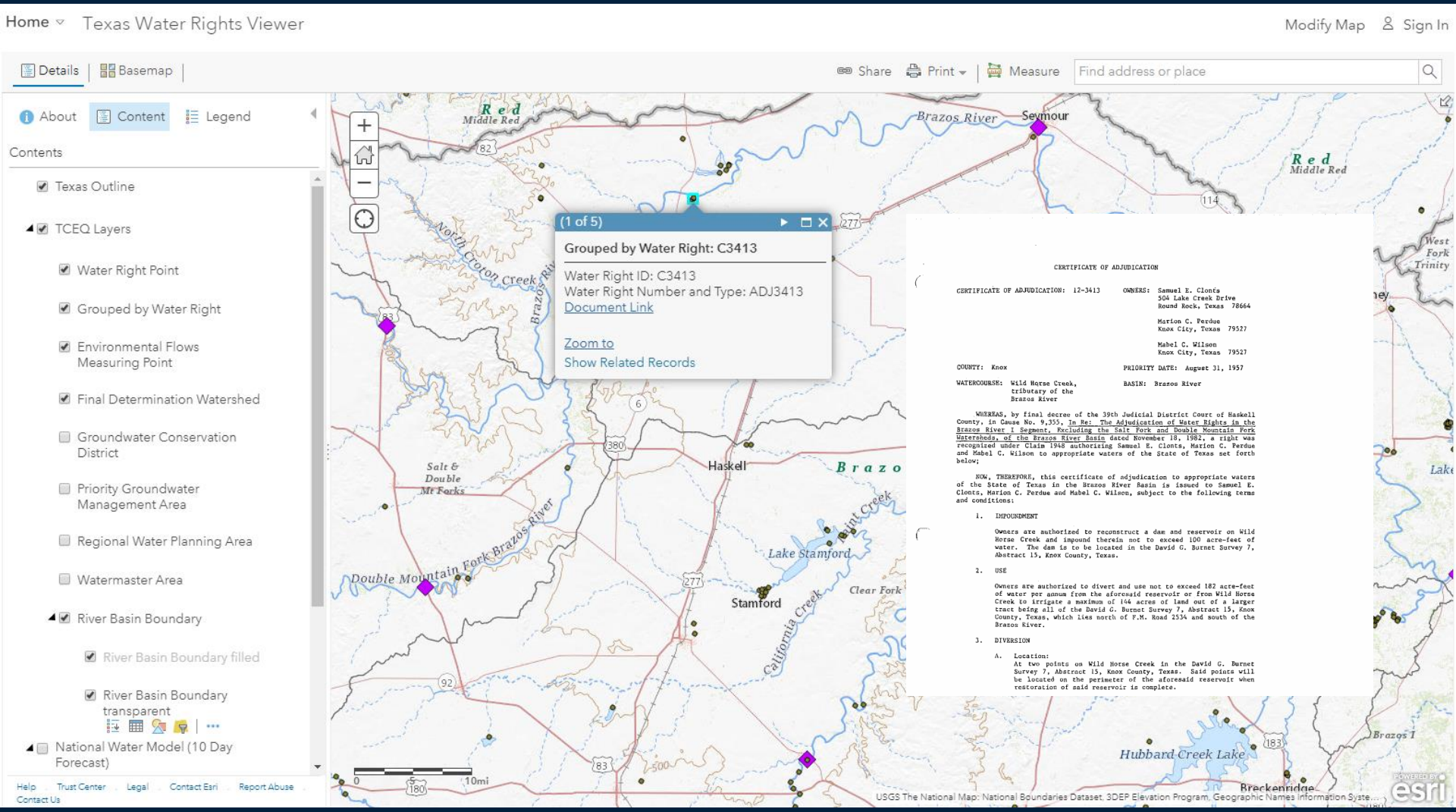




Draft

TCEQs Water Rights Viewer




Home
Texas Water Rights Viewer
Modify Map
Sign In
Details
Basemap
Share
Print
Measure
Find address or place
About
Content
Legend
Contents
Texas Outline
TCEQ Layers
Water Right Point
Grouped by Water Right
Environmental Flows Measuring Point
Final Determination Watershed
Groundwater Conservation District
Priority Groundwater Management Area
Regional Water Planning Area
Watermaster Area
River Basin Boundary
River Basin Boundary filled
River Basin Boundary transparent
National Water Model (10 Day Forecast)
Help
Trust Center
Legal
Contact Esri
Report Abuse
Contact Us
(1 of 5)
Grouped by Water Right: C3413
Water Right ID: C3413
Water Right Number and Type: ADJ3413
Document Link
Zoom to
Show Related Records
CERTIFICATE OF ADJUDICATION
CERTIFICATE OF ADJUDICATION: 12-3413
OWNERS: Samuel E. Clonts
504 Lake Creek Drive
Round Rock, Texas 78664
Marion C. Perdue
Knox City, Texas 79527
Mabel C. Wilson
Knox City, Texas 79527
COUNTY: Knox
PRIORITY DATE: August 31, 1957
WATERCOURSE: Wild Horse Creek, tributary of the Brazos River
BASIN: Brazos River
WHEREAS, by final decree of the 39th Judicial District Court of Haskell County, in Cause No. 9,355, In Re: The Adjudication of Water Rights in the Brazos River I Segment, Excluding the Salt Fork and Double Mountain Fork Watersheds, of the Brazos River Basin dated November 18, 1982, a right was recognized under Claim 1948 authorizing Samuel E. Clonts, Marion C. Perdue and Mabel C. Wilson to appropriate waters of the State of Texas set forth below;
NOW, THEREFORE, this certificate of adjudication to appropriate waters of the State of Texas in the Brazos River Basin is issued to Samuel E. Clonts, Marion C. Perdue and Mabel C. Wilson, subject to the following terms and conditions:
1. IMPOUNDMENT
Owners are authorized to reconstruct a dam and reservoir on Wild Horse Creek and impound therein not to exceed 100 acre-feet of water. The dam is to be located in the David G. Burnet Survey 7, Abstract 15, Knox County, Texas.
2. USE
Owners are authorized to divert and use not to exceed 182 acre-feet of water per annum from the aforesaid reservoir or from Wild Horse Creek to irrigate a maximum of 164 acres of land out of a larger tract being all of the David G. Burnet Survey 7, Abstract 15, Knox County, Texas, which lies north of F.M. Road 2534 and south of the Brazos River.
3. DIVERSION
A. Location:
At two points on Wild Horse Creek in the David G. Burnet Survey 7, Abstract 15, Knox County, Texas. Said points will be located on the perimeter of the aforesaid reservoir when restoration of said reservoir is complete.
Seymour
Brazos River
Red
Middle Red
North Croton Creek
Haskell
Salt & Double Mt Forks
Double Mountain Fork Brazos River
Lake Stamford
Stamford
Paint Creek
Clear Fork
California Creek
Hubbard Creek Lake
Breckenridge
West Fork Trinity
Brazos I
0
5
10mi
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information Syste...
esri

Poll #3

Kevin’s favorite fish?

A. Bluefin Tuna

B. Bigmouth Buffalo

C. Blue Sucker

D. Flathead Catfish aka Yellow Cat

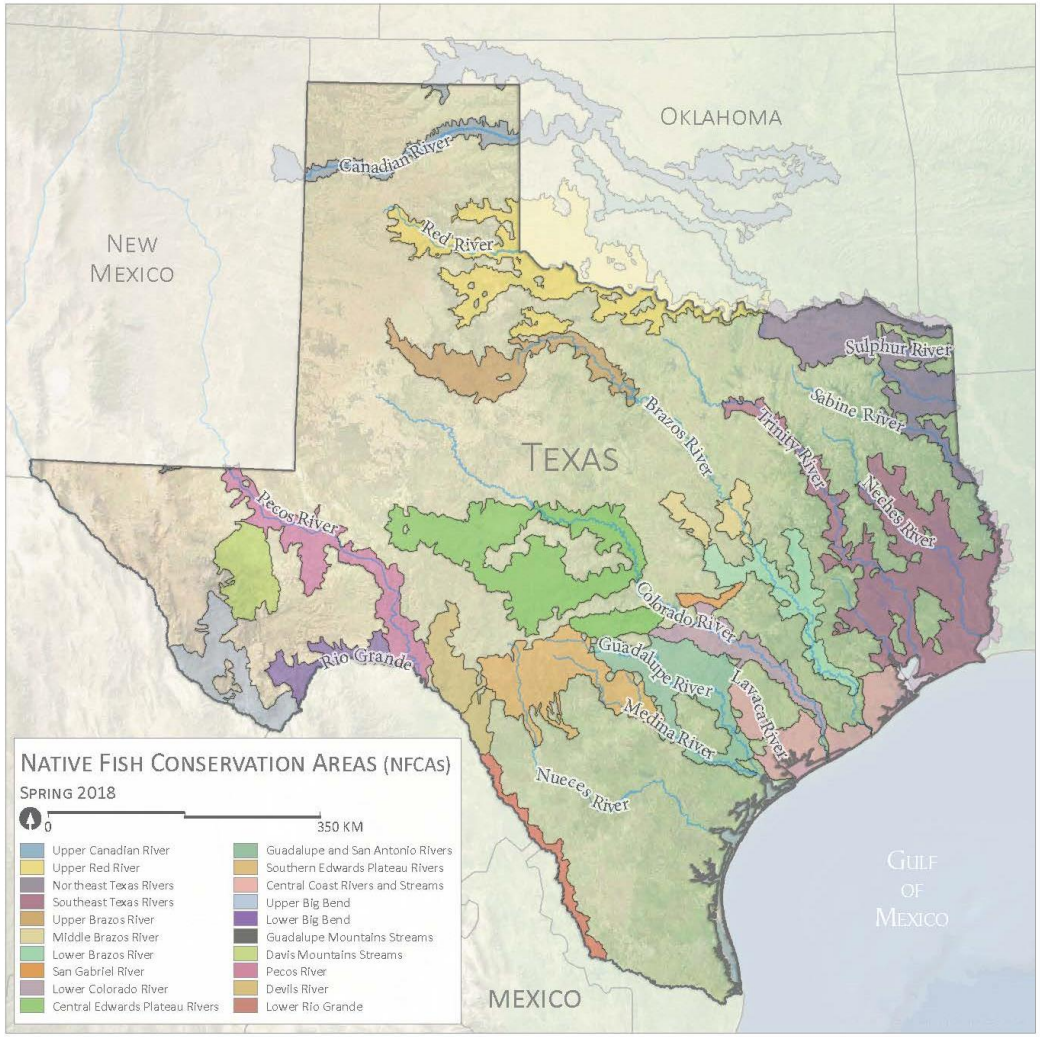
Fishes

Blue Sucker *Cycleptus elongatus*

Native Fish Conservation Areas

Conservation Goals

1) Facilitate conservation partnership networks
2) Protect and maintain intact habitats
3) Restore altered habitats
4) Restore instream and floodplain connectivity
5) Mitigate effects of invasive species
6) Establish conservation demonstration areas
7) Conduct research to fill critical science needs
8) Monitor conservation outcomes and perform adaptive management

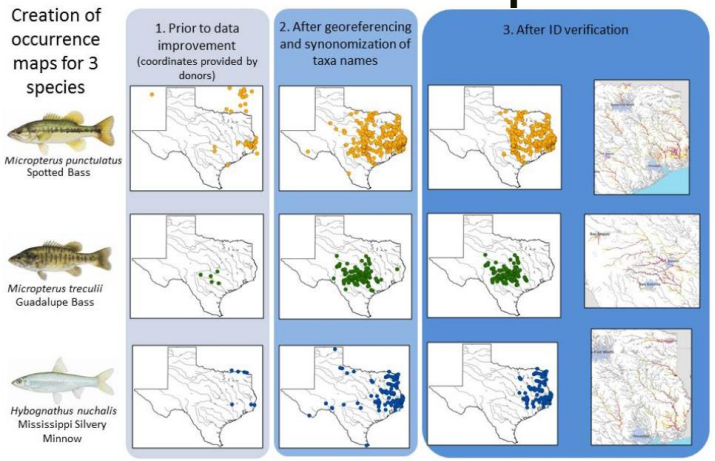


Native Fish Conservation Areas

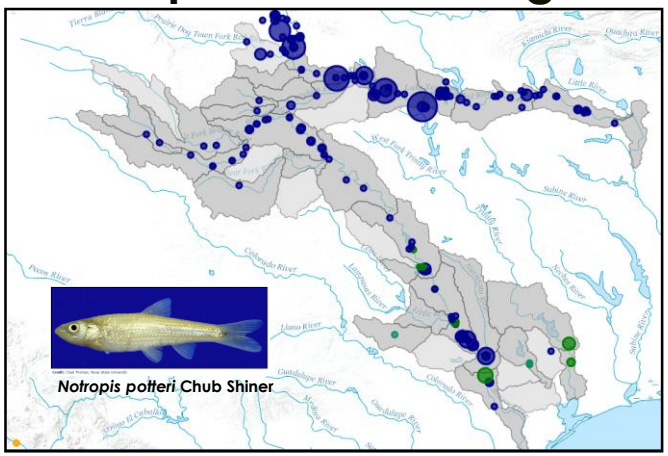
Desired Outcomes

- Wild, naturally-produced, self-sustaining populations
- Functional watersheds
  - ✓Natural land cover
  - ✓Intact riparian buffers
  - ✓Natural river flow patterns
  - ✓Instream connectivity
- Local stewardship
- Sustained conservation investments

Occurrence Maps

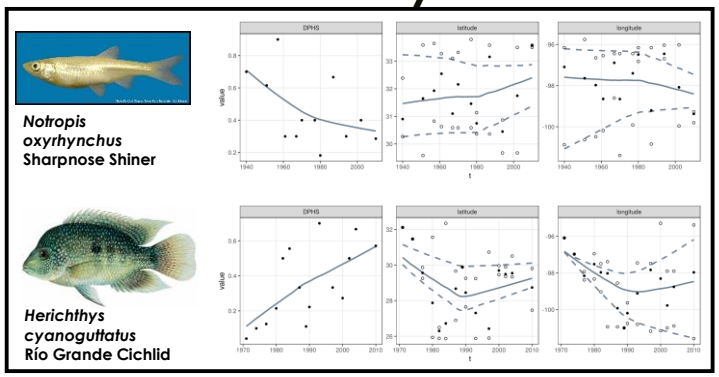


Maps of Native Ranges

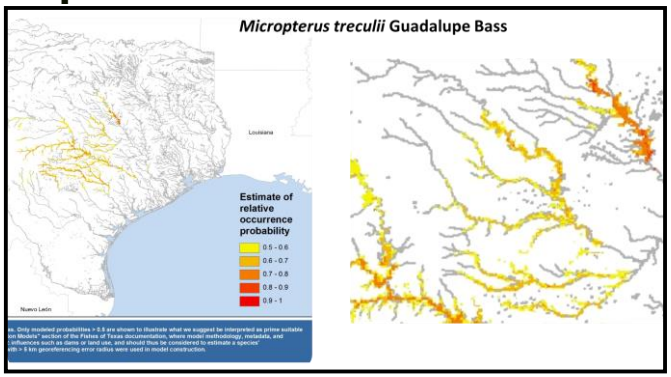


FISHES OF Texas

Trend Analyses

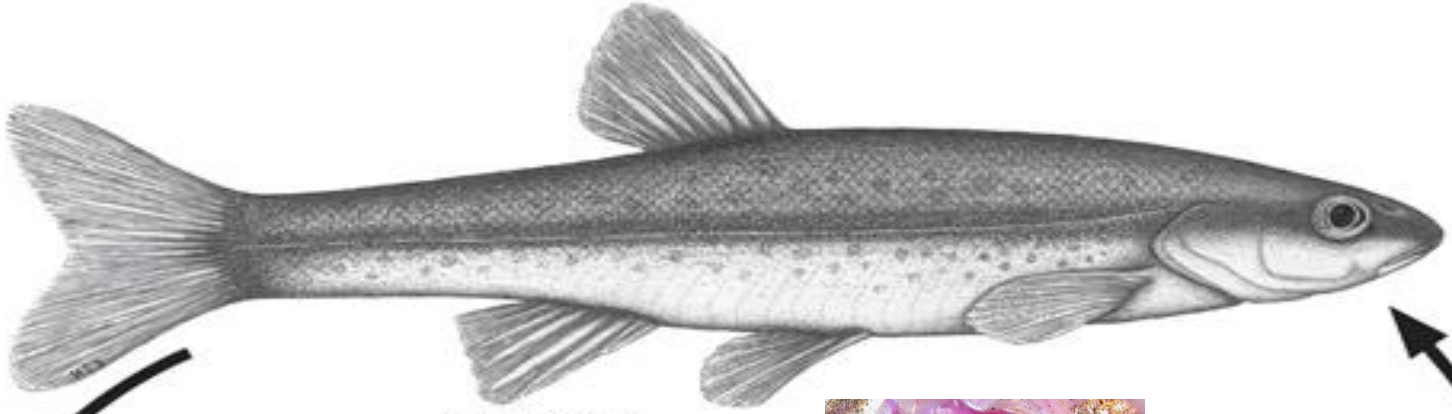


Species Distribution Models



Freshwater Mussels

Texas Fatmucket *Lampsilis bracteata*

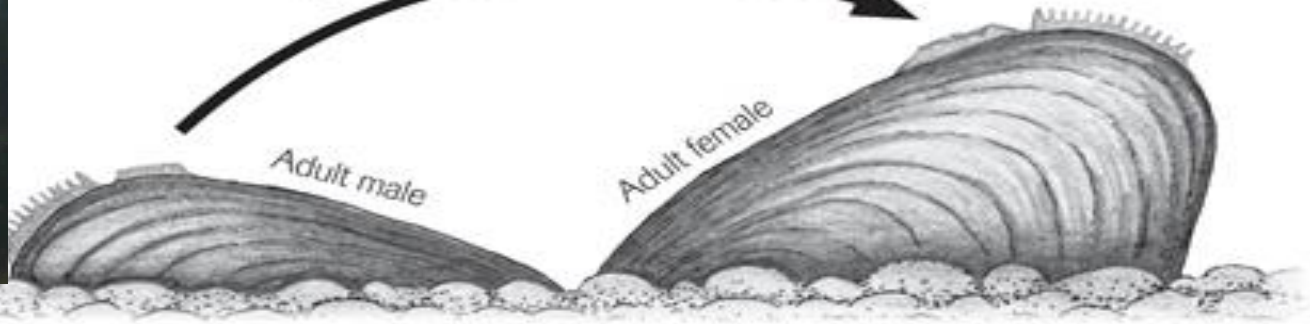


3. Transport
Glochidia lucky enough to find a suitable host will form a cyst and remain on a host for several weeks.

2. Spawning
Embryos develop into larvae called glochidia, which are released into the water and must encounter and attach to a host fish.

4. Settlement
Juvenile mussels release from the host fish and sink to the bottom. They burrow in the sediment and remain buried until they mature.

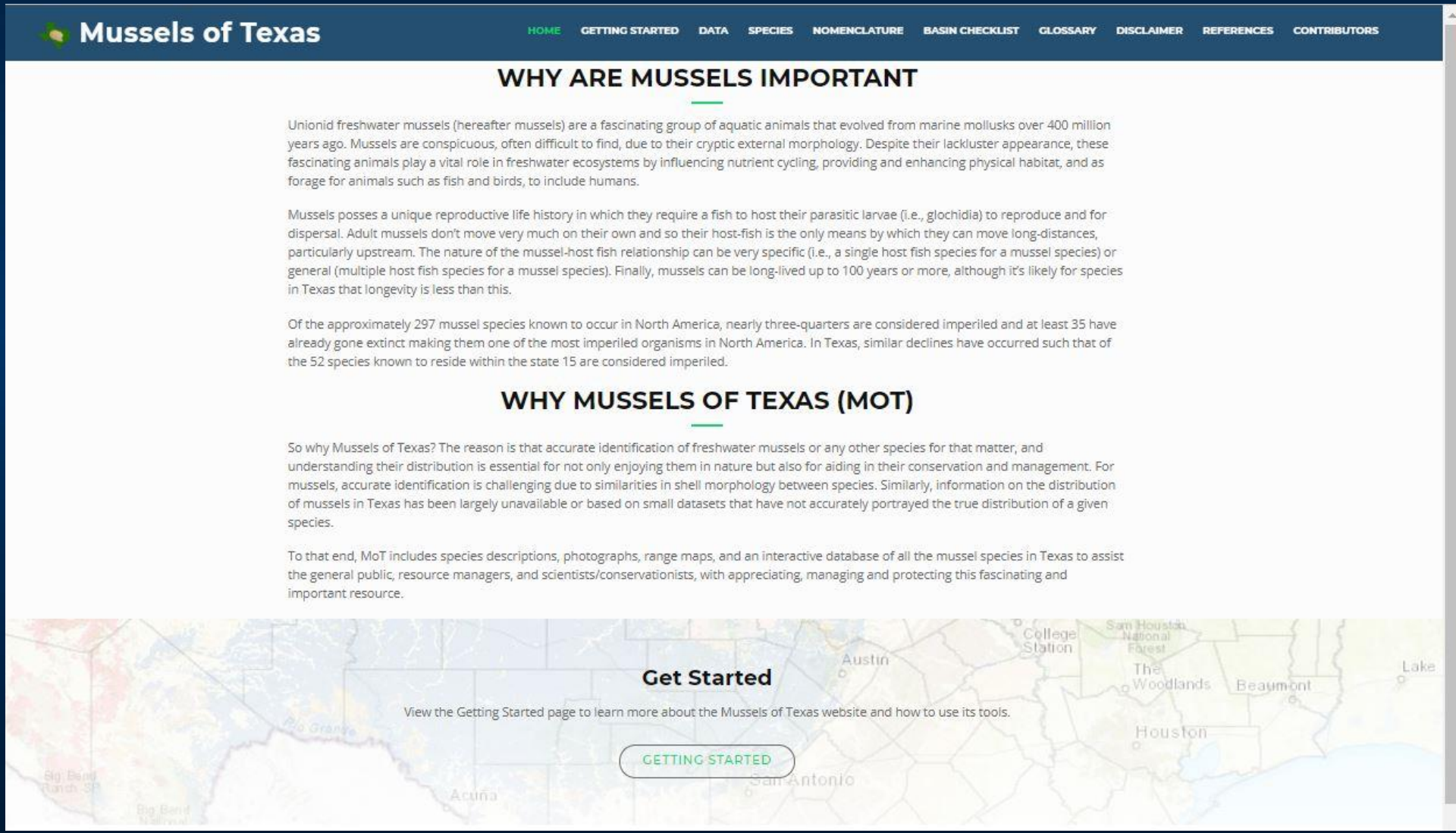
1. Breeding
Males release sperm into the water. After being inhaled by females, sperm fertilizes eggs



ILLUSTRATIONS: ETHAN NEDEAU/HTTP://WWW.BIODRAWVERSITY.COM

Life cycle of a typical freshwater mussel.

Mussels of Texas

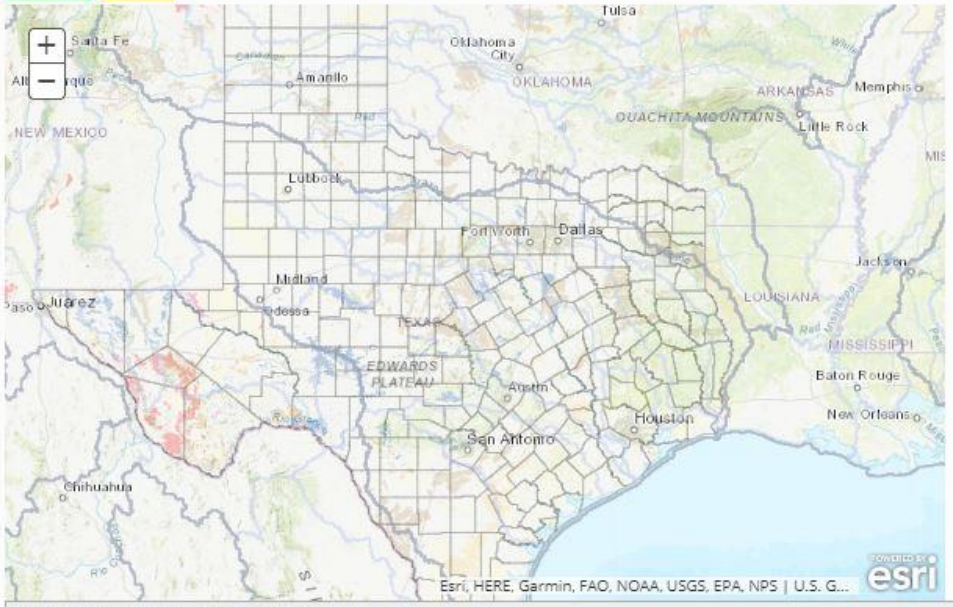


Data

-Select Species- -Select County- -Select Drainage- -Select Waterbody-

Search Clear

Data Download Data Upload



Legend

4-digit HU (Subregion)

2-digit HU (Region)

SGMC_Geology_1m

Igneous and Metamorphic, undifferentiated

Igneous and Sedimentary, undifferentiated

Igneous, intrusive

Igneous,

Layers

Draw

Print

Occurrences (Features: 20272, Selected: 0)

CollectedOn	Species Name	Drainage Name	Counties	Waterbody Name
	Utterbackia imbecillis	Neches	Nacogdoches	Poe Lake
	Villosa lienosa	Neches	Nacogdoches	Bayou La Nana
	Villosa lienosa	Neches	Nacogdoches	Bayou La Nana
	Villosa lienosa	Neches	Nacogdoches	Bayou La Nana
	Villosa lienosa	Neches	Nacogdoches	Bayou La Nana
	Villosa lienosa	Neches	Nacogdoches	Bayou La Nana

Open Advanced Map Viewer

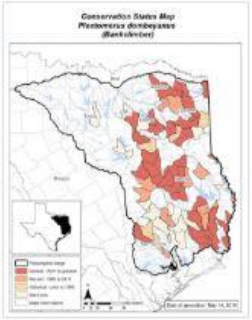
Plectomerus dombeyanus

Type locality

Peru, type specimen missing and reported type locality is erroneous. Syntype from Lake St. Joseph, Mississippi and lectotype from Lake Charles, Louisiana.

Identification

[Follows Vidrine 1993; Parmalee and Bogan 1998; Williams et al. 2008; Williams et al. 2014]



Shell structure: thick, moderately inflated, smaller individuals can be compressed; outline rectangular to rhomboidal; posterior ridge high, sharp, and ends at the base of the shell in a point; posterior slope steep, flat to slightly concave and often sculptured with plications or corrugations, which may be obscure or absent in some individuals.

Shell color: greenish-brown, brown, or black; dull but may be shiny in smaller individuals.

Shell texture: plications and corrugations on posterior 75% of shell, umbo region may show corrugations oblique to mid-disk sculpturing, disk sculpturing may be less prominent on larger individuals.

Beaks: low, broad, even to elevated slightly above the hinge line; umbo cavity wide, shallow.

Beak sculpture: irregular, double-looped or nodulous ridges.

Teeth: pseudocardinal teeth thick, erect, triangular, 2 divergent teeth in left valve, may separate dorsally, 1 tooth in the right valve, usually with a thin anterior denticle and occasionally with a posterior denticle. Lateral teeth long, thin, straight to slightly curved, 2 in left valve, 1 in right valve.

Interdentum: short to moderately long and narrow.

Nacre: usually purple or pink, can be white in small individuals, occasionally with brassy blotches or highlights, iridescent posteriorly.

Other: not sexually dimorphic; soft tissues creamy-white to tan.

General range: East Texas to western Alabama and north to southeastern Missouri and southwestern Kentucky (Vidrine 1993; Parmalee and Bogan 1998; Williams et al. 2008).

Range in Texas: San Jacinto River drainage to the Sabine River and north to the Red River drainage.

Habitat: Reported from medium to large rivers, oxbows, lakes and reservoirs. In riverine habitat it can occur in lentic habitats (e.g., along the shore or in backwater pools or eddies) with still to moderate currents in mud or sand or among cobble and boulders. In mainchannel habitats it can occur in moderate to swift currents in sand, gravel or cobble substrates. Most often occurs in stable habitats where environmental impacts are infrequent and potential for bed mobility is low (Parmalee and Bogan 1998; Williams et al. 2008; Williams et al. 2014; Haag and Cicerello 2016; Randklev et al. 2019).

Hosts: Unknown. However, Marshall (2014) identified encystment on wild-caught individuals of *Cyprinella lutrensis*, Red Shiner (Cyprinidae) and *Fundulus notatus*, Blackstripe Topminnow (Fundulidae) but transformation was not observed.

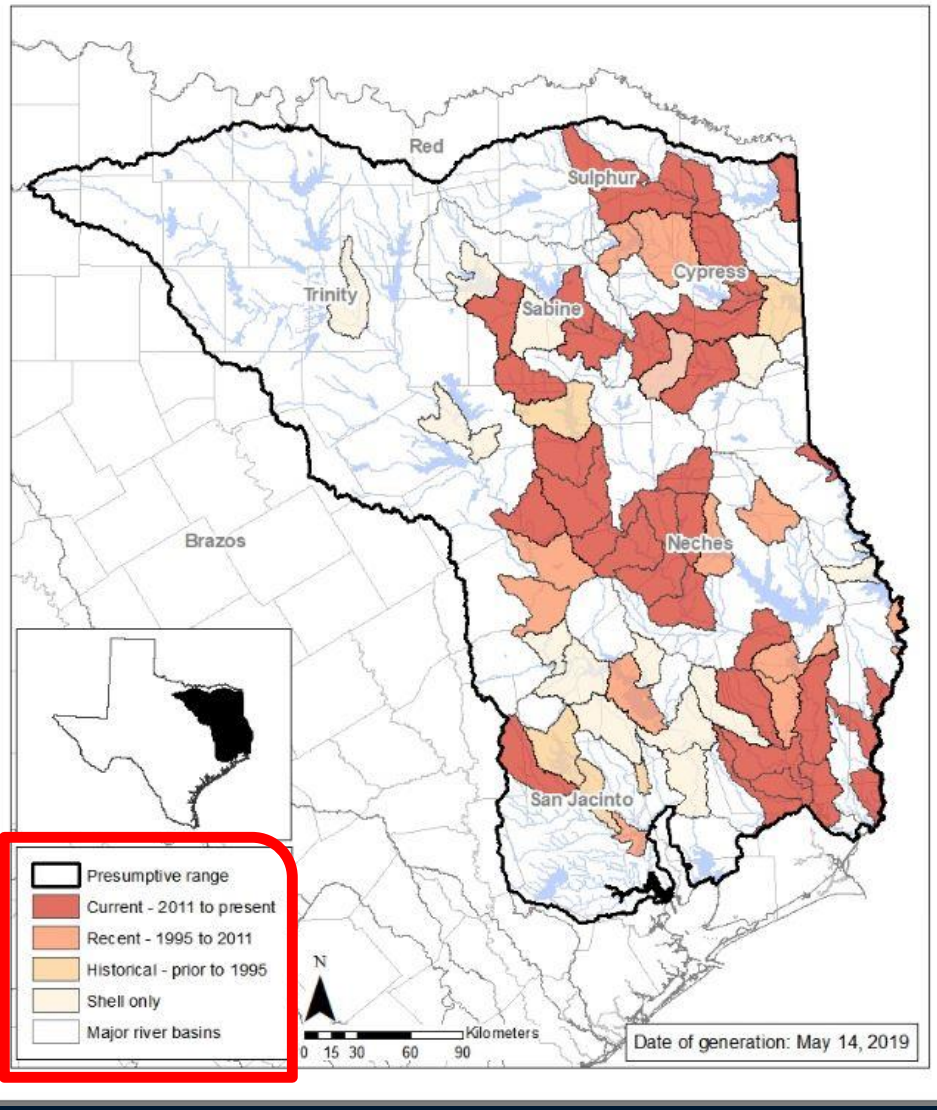
Reproduction: Short-term brooder; all 4 gills are marsupial, with glochidia held across the entire gill but there may be variability where glochidia are brooded; marsupium becomes padded when gravid (Williams et al. 2008); developing glochidia are brooded from May to September (Frierson 1904; Howells 2000). Outside of Texas, females have been reported gravid in July (Hoggarth 1988). In Texas, eggs were found in females from July through September, but mature glochidia were observed only in July (Howells 2000). Glochidia are subelliptical in shape, without styliform hooks, and 223-231 mm in length and 238-259 mm in height (Hoggarth 1999). Haag (2012) reported maximum life span of 33 years, maturity at year 5, and mean fecundity of 553,500. No efforts have been made to confirm longevity, age of maturity, or fecundity for Texas populations.

Remarks: None.

Similar species: *Plectomerus dombeyanus* may be confused with *M. nervosa* and *A. plicata* but is more rectangular to rhomboidal in shape and has a well-defined posterior ridge and purple nacre. *Megalonaias nervosa* is more ovate in shape, has a poorly developed posterior ridge and its nacre is white. *Amblema plicata* is sub-oval to quadrate, has a posterior ridge that is rounded and often obscure and its nacre is white to bluish white, occasionally with pink or purple tint.

Legal listing status: TPWD: None. USFWS: None.

Photo caption: *Plectomerus dombeyanus* - Sulphur River [Sulphur River drainage], length 86 mm.



Poll #4

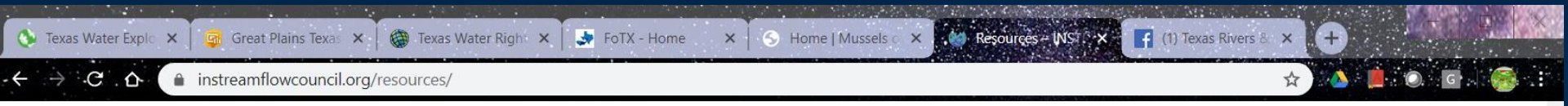
How many species of freshwater mussels are native to Texas, over or under 50?

A. Over 50 species

B. Under 50 species

* 15 mussels listed as state threatened; one listed as federally endangered

Environmental Flow Resources



Texas

Instream Flows in Texas (TPWD)

Texas Instream Flow Program
Includes links to following documents and final reports of basin-specific instream flow studies (Lower San Antonio River and Middle and Lower Brazos River)
- Texas Instream Flow Studies: Technical Overview
- The Science of Instream Flows: A Review of the Texas Instream Flow Program

Freshwater Inflows to Texas Bays and Estuaries (TPWD)

Environmental Flow Information Toolkit (TPWD)

Surface Water Rights and Availability (TCEQ)
- Environmental Flow Standards
- TCEQ Water Rights Viewer

Water Data for Texas (TWDB)

Groundwater Management in Texas (TWDB)

Water Resources Planning (TWDB)

Texas Water Explorer

Fishes of Texas

Mussels of Texas

What can you do?

- Get involved in water issues!
  - Conservation
  - Permitting
  - Water Planning
- Participate!
  - Locally, regionally, statewide, nationally, globally…

Contact Information

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TPWD, Inland Fisheries, River Studies
kevin.mayes@tpwd.texas.gov

Texas Rivers and Streams on Facebook
@texasriversandstreams on Instagram
#texasriveradventures
#texasriversandstreams

Acknowledgements

TEXAS PARKS & WILDLIFE

The Nature Conservancy

Texas Conservation Science TCS

Texas Department of Transportation

Texas A&M University 1876

Riverscape Ecology Lab
Texas A&M University

See you on the river…


TEXAS
PARKS &
WILDLIFE