# Texas Instream Flow Recommendations/Standards:

# Trust or test?

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### Water quality

TCEQ Surface Water Quality Monitoring





Time

2020

2000

1980







Natural Flow Paradigm (NFP)

**Recommendations/Standards** 

- Seasonal & Yearly flow pulses

- Base flows

- Subsistence flows

### Is our approach trustworthy? Yes



# Do I trust our recommendations/standards? Not yet—need to be tested

Natural Flow Paradigm

A great start!

**Recommendations/Standards** 

- Seasonal & Yearly flow pulses

- Base flows

- Subsistence flows

My preference: Testing <sub>standards</sub> > Testing <sub>NFP</sub>

Each recommendation and standard = a prediction

#### Hydrologically stable rivers

#### Hydrologically variable rivers













Water temperature (°C)

Craig et al (2016)





#### Temperature-mediated feeding between spring-associated and riverine-associated congeners, with implications for community segregation

Cody A. Craig, Jeremy D. Maikoetter and Timothy H. Bonner Department of Biology/Aquatic Station, Texas State University, San Marcos, TX, USA





### San Antonio River: Pre 1800s



Craig and Bonner 2020

### San Antonio River: Currently



### San Antonio River: Currently





Upper Guadalupe River Spring-associated fishes during a supraseasonal drought



#### Edwards Aquifer HCP







#### **Summary Table**

#### Fountain Darter grades assigned per site of the San Marcos River in 2024 during a prolonged drought period.

Non-wadeable Sites						Wadeable Sites			
Spring Lake		Upper San Marcos River		Lower San Marcos River		Upper San Marcos River		Lower San Marcos River	
Apr-24	Oct-24	Apr-24	Oct-24	Apr-24	Oct-24	Apr-24	Oct-24	Apr-24	Oct-24
С	D	Α	В	Α	Α	Α	Α	Α	Α

#### Hydrologically stable rivers



San Marcos River flow triggers:

100 CFS (concerning)

50 CFS (minimum)

10 + years of biomonitoring:

100 CFS (less of a concern)

50 CFS (?)

30 CFS (?)

#### Hydrologically stable rivers

#### Hydrologically variable rivers





Complex questions require a lot of data!

USGS (long term data)

TCEQ (long term data)

Aquatic community abundances/CPUE: Missing

#### Hydrologically variable rivers



## Methods

- Monitored USGS Station (N = 18)
- Sampled following return to base flow conditions (+ 10 to 15 days) for four seasons



- Sampled riffles, runs, pools, and backwater
  - Shocked and seined
  - Identified and enumerated
  - Water quality, depth and velocity
  - Substrate
- Swiftwater specialist were taken for lab analysis
  - Dissections to determine gut fullness, gut contents, HSI, condition factor



#### • Sampled habitats (N = 362, 716 seine hauls)

- 130 riffles
- 153 runs

Results

- 56 backwaters
- 23 pools
- Fish: 59 species; *N* = 43,349



Total flow events captured = 258



### Lower Brazos River

Historical fluvial fish community









# Complex questions require more data (and patience!)

- Sources:
  - Habitat Conservation Plans (or something similar) and biomonitoring
  - Like with EAA, a community approach
    - "If we had known Species A would be listed by USFWS, we would have been collecting data over the last 20 years"
    - Include assessments to test flow recommendations/standards
      - Ex: Sample Spring/Fall + 1 (a flow tier)
  - Upper San Marcos River & Comal River biomonitoring
    - Recreation effects, chlorinated water spills, remove or rebuild low head dams, bridge construction, flood effects, drought effects, artificial night lights