

## Introduction

- Timberlake Biological Field Station (TBFS) is located on the banks of a segment of the Colorado River designated as ecologically significant<sup>1</sup> by the state (Figure 1).
  - This segment serves both biological function and has high aquatic life/aesthetic value.
- Elevated levels of nutrients such as nitrogen and phosphorous have been detected at monitoring stations upstream of TBFS; excess nutrients can be damaging to the water quality and aquatic health.
  - Potential upstream sources include point and non-point sources such as Concentrated Animal Feed Operations (CAFOs), farming<sup>2</sup> and municipal outfalls (Figure 2).

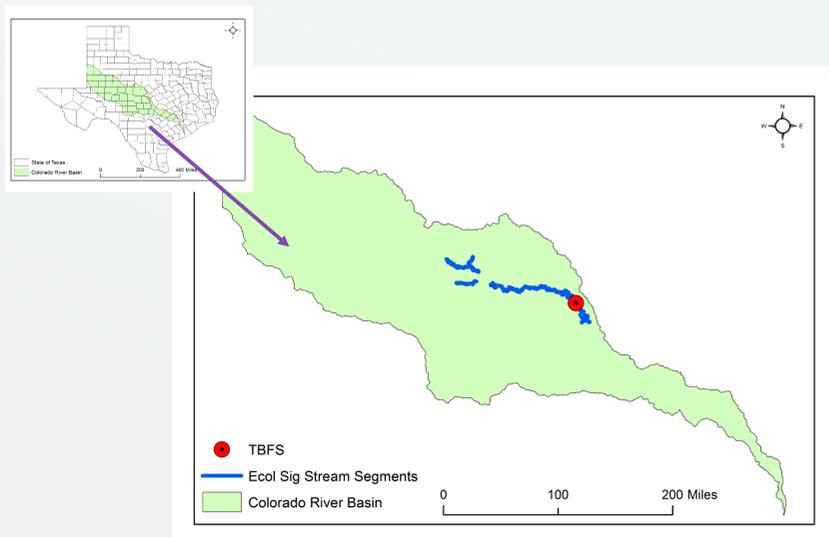


Figure 1. TBFS location along the Colorado River

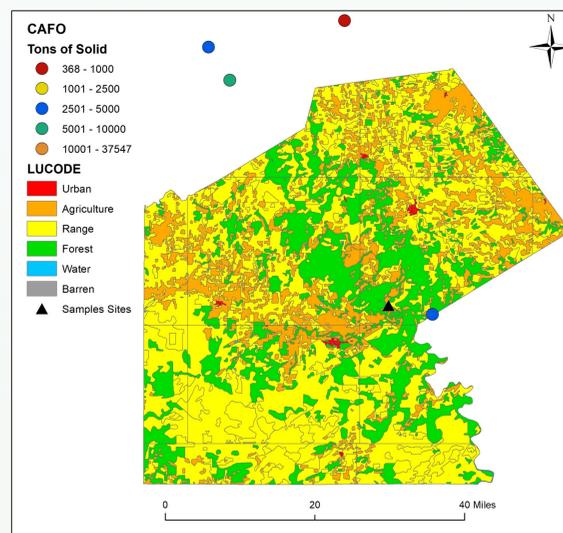


Figure 2. Land use around TBFS & location of sampling sites

## Methodology

- Stream samples (grab) were collected ~ bi-weekly at various points along the Colorado within the TBFS for TN/TP analyses.
- Field parameters (pH, Dissolved Oxygen [DO], temp., conductivity, etc.) were recorded during sampling using a YSI 556 multiparameter probe.
- Spectrophotometer model DR6000 was used to determine TN (method 350 low range) and TP (method 536) using Hach TNT plus reagents.
- Historic TN data at nearby monitoring stations were compiled from TCEQ surface water quality database<sup>3</sup>.

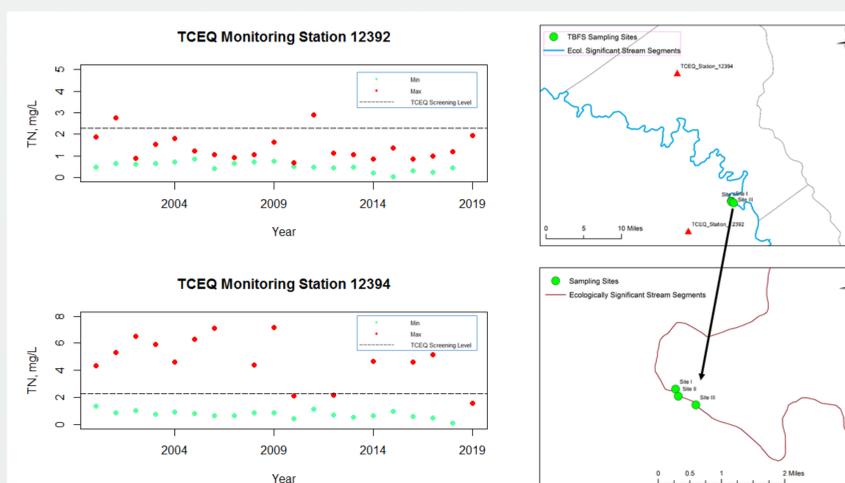


Figure 3. TN levels since 2000 at two TCEQ monitoring stations on segments contributing to the Colorado River

## Results

- The maximum TN and TP levels recorded at sampling sites within TBFS were well within TCEQ screening levels of 2.28 mg/L and 0.69 mg/L, respectively (Table 1).
- Dissolved oxygen and pH levels meet TCEQ criteria as well.
- TN in excess of the screening level has been routinely detected at TCEQ monitoring site 12394 near TBFS (Figure 3).
  - Winter wheat and pecans are the primary crops grown in the area draining to this site.

Table 1. Water quality indicators at sampling sites

Parameter	Units	TCEQ Criteria or Screening Level <sup>3</sup>	Statistic						Sample Size		
			Min			Max			Site I	Site II	Site III
DO	mg/L	> 3.0	7.23	6.63	7.22	8.57	8.24	8.83	4	2	4
pH	-	6.5-9.0	8.15	7.98	8.10	8.50	8.19	8.34	4	2	4
TN	mg/L	< 2.28	0.40	0.50	0.40	0.70	0.60	0.80	5	3	5
TP	mg/L	< 0.69	0.12	0.20	0.10	0.33	0.27	0.35	5	3	5

<sup>3</sup> Texas Commission on Environmental Quality. 2012. Guidance for Assessing and Reporting Surface Water Quality in Texas

## Conclusions

- Although TN levels in excess of state screening levels were detected upstream of TBFS as recently as 2018, monitoring over summer 2019 raised no alarms with regards to any measured parameter.
- Abnormally-high flows (> 10 to 100-times the median flows) at USGS gages<sup>4</sup> in the area throughout the spring/summer likely contributed to dilution of nutrients.
- High nitrogen levels in nearby stations show long-term monitoring of water quality is imperative considering the ecological significance of the segments.

## Objectives

- The overall objectives of this study are to monitor and investigate the long-term health of the Colorado River at TBFS by:
  - Sampling (at different times and locations) for direct measures of nutrient loads, including Total Nitrogen (TN) and Total Phosphorous (TP) & comparing with TCEQ freshwater stream screening levels.
  - Compiling and studying nutrient levels at adjacent/upstream TCEQ monitoring sites.

## References

1. Texas Parks and Wildlife Service. 2019. Significant stream segments for Region F. [https://tpwd.texas.gov/landwater/water/conservation/water\\_resources/water\\_quantity/signseg/regionf.html](https://tpwd.texas.gov/landwater/water/conservation/water_resources/water_quantity/signseg/regionf.html)
2. Web GIS. 2018. Mills and San Saba county land use. [http://www.webgis.com/terr\\_pages/lulcgeo\\_tx.html](http://www.webgis.com/terr_pages/lulcgeo_tx.html)
3. Texas Commission on Environmental Quality (TCEQ). 2019. Surface water quality web reporting tool. <https://www80.tceq.texas.gov/SwqmPublic/index.htm>
4. United States Geological Survey (USGS). 2019. Pecan Bayou near Mullin discharge data. [https://waterdata.usgs.gov/tx/nwis/uv/?site\\_no=08143600&agency\\_cd=USGS](https://waterdata.usgs.gov/tx/nwis/uv/?site_no=08143600&agency_cd=USGS)

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