



TMDL Project Updates: Hurricane Creek and Biloxi Creek

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How did we get here?

- TMDLs are required to be developed by Section 303(d) of the federal Clean Water Act for all waters identified on the Section 303(d) list of impaired waters.



Why a Total Maximum Daily Load (TMDL)?

- A surface water body is considered impaired if it does not meet applicable water quality standards for one or more of its designated uses.



What is a TMDL?

- A TMDL determines the maximum amount of a specific pollutant that a water body can receive and still maintain its designated use.

Indicator bacteria used for assessment:

- Fresh waterbodies: ***E. coli***
- Tidal waterbodies: **Enterococcus**



Photo credit: Sophia Staska



TMDL Allocations

$$\text{TMDL} = \text{WLA}_{(\text{WWTF})} + \text{WLA}_{(\text{PSW})} + \text{LA} + \text{FG} + \text{MOS}$$

- **WLA_(WWTF)** – wasteload allocation for all Wastewater Treatment Facility (WWTF) discharges
- **WLA_(PSW)** – wasteload allocation for all types of permitted stormwater discharges (PSW)
- **LA** – load allocation
- **FG** – future growth
- **MOS** – margin of safety

TMDLs are expressed as a daily pollutant load.



TCEQ's Addendum Process

An addendum can only be added to the original TMDL if these two conditions are met:

1. The candidate AU must have the **same impairment type** as the **original TMDL** (i.e. bacteria, dissolved oxygen, etc.).
2. The candidate AU must already be located within the **TMDL watershed boundary**.



TCEQ's Addendum Process

Addendum projects have expedited timelines:

- They are completed in **1 – 2 years** rather than **4 – 6 years** when developing a new TMDL.
- This shortened timeline is because addendum AUs are not being developed from scratch unlike an original TMDL which expedites the process.

Informal review and approval process by TCEQ and EPA:

- Instead of going through the Agenda process in front of the TCEQ Commissioners, the addendum is submitted through a routine quarterly update to Texas' Water Quality Management Plan (WQMP).
- After EPA approves the **quarterly WQMP update** then the addendum is officially a part of the TMDL.



Previously completed TMDLs in Tributaries of the Neches River Below Lake Palestine

TCEQ adopted **Four** TMDLs for *Indicator Bacteria in Tributaries of the Neches River below Lake Palestine* on **October 5, 2022**.

- EPA approved the TMDLs on **June 7, 2023**.
- I-Plan was approved on **August 16, 2023**.

Waterbodies included:

- **Jack Creek** (0604C_01)
- **Cedar Creek** (0604A_02)
- **Hurricane Creek** (0604B_01)
- **Biloxi Creek** (0604M_03)

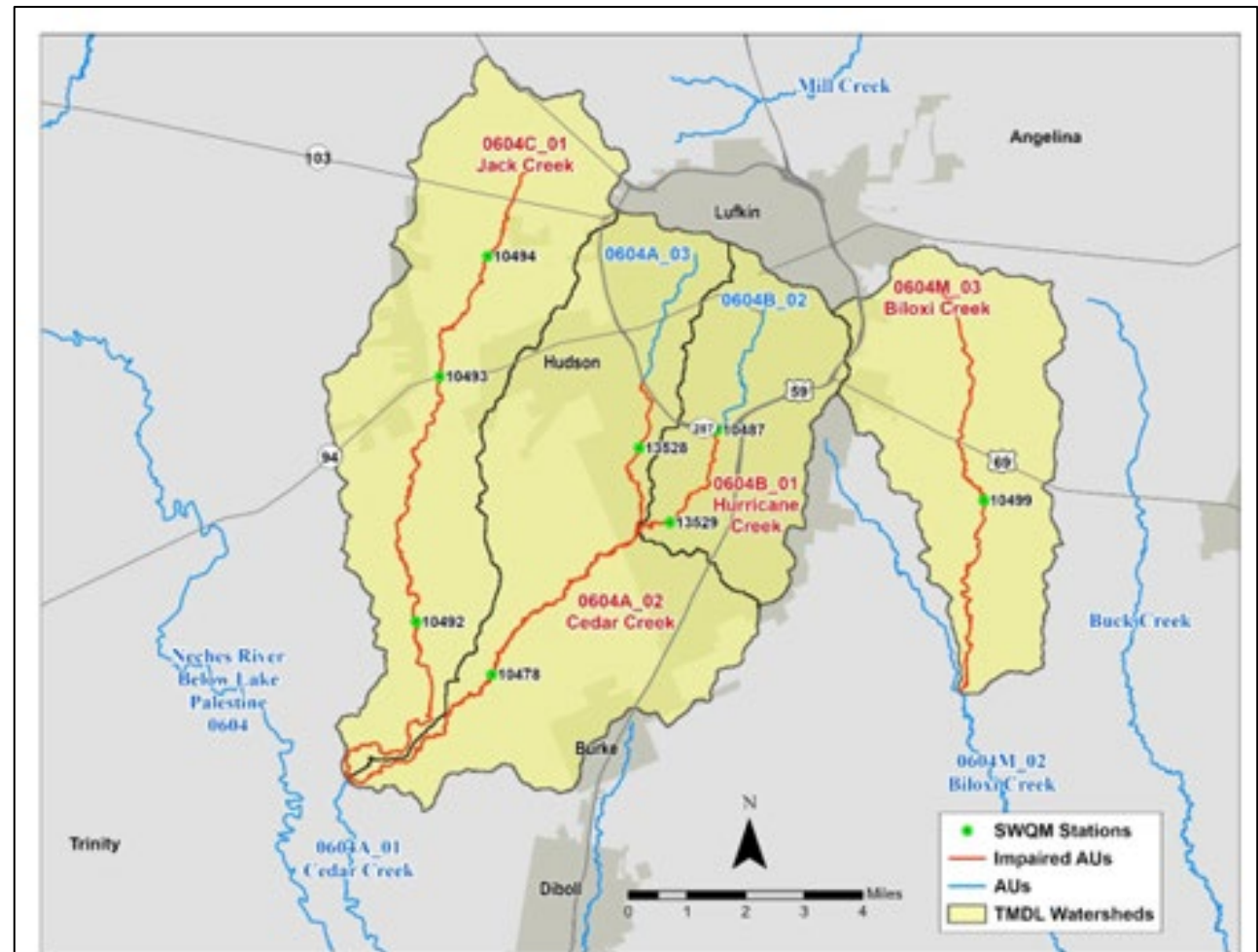


Figure 1. Map of the TMDL watersheds

Addendum One to Four TMDLs for Bacteria in Tributaries of the Neches River below Lake Palestine

- An addendum to the original TMDL was submitted to EPA through the **January 2024** WQMP update.
- That addendum added **one additional TMDL** for indicator bacteria for **one AU** in **Cedar Creek** (AU 0604A_03).
- Both the addendum and original TMDLs were developed in coordination with the Texas Water Resources Institute (TWRI).

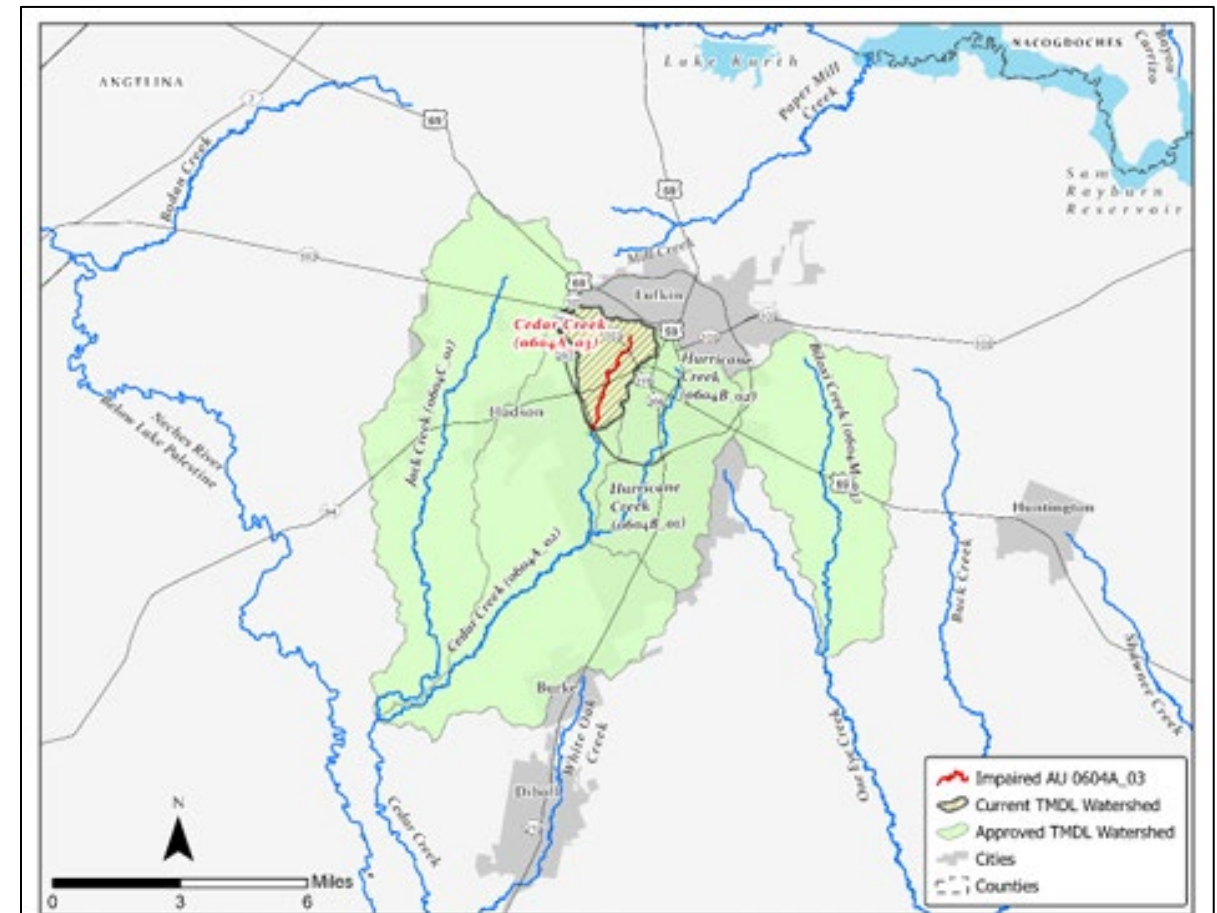


Figure III-1. Map showing the previously approved TMDL watersheds and the Cedar Creek 0604A_03 watershed added by this addendum

Project Background: Addendum Two (Hurricane Creek) and One TMDL for Bacteria in Biloxi Creek

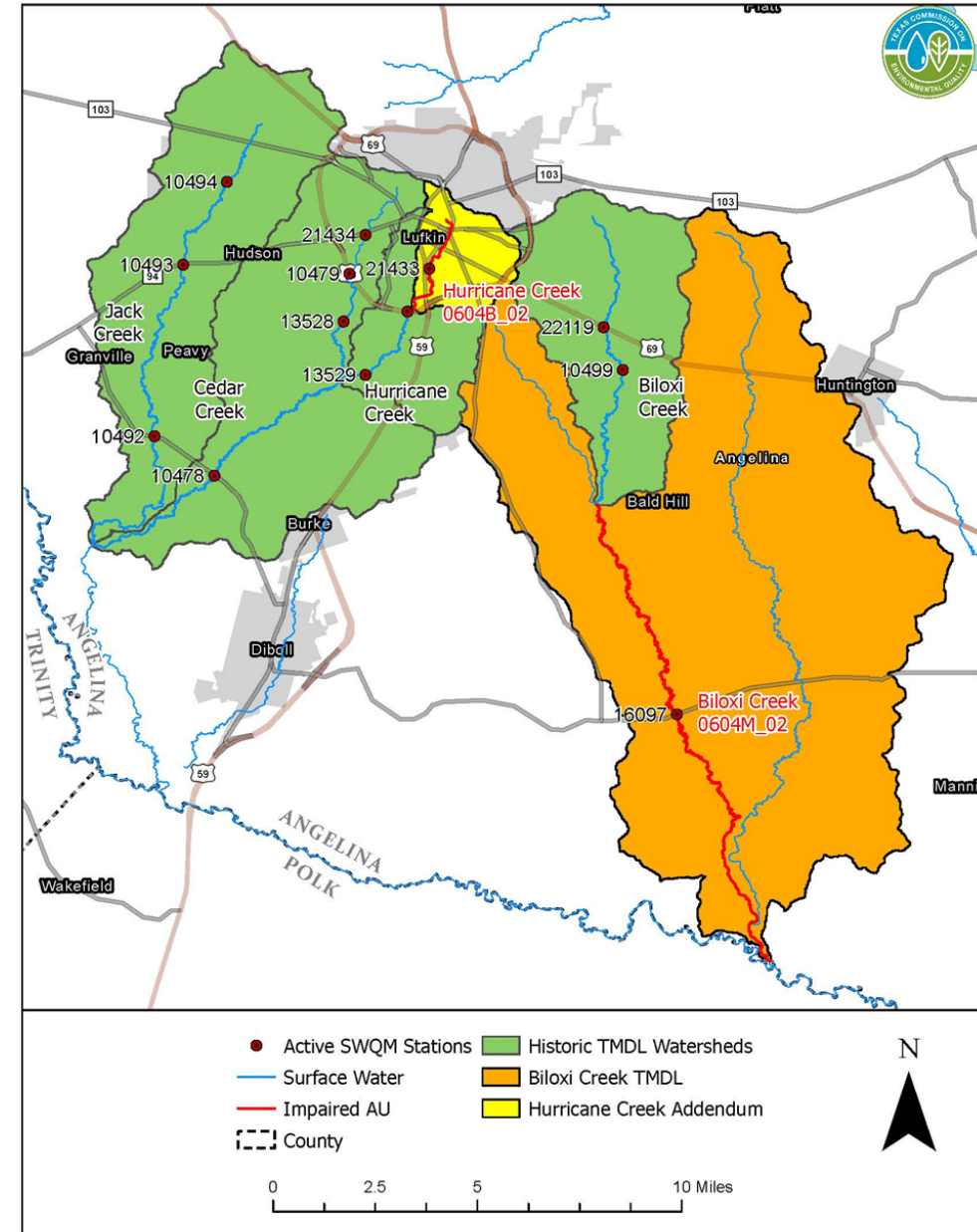
- Additional bacteria impairments on **Hurricane Creek** (AU 0604B_02) and **Biloxi Creek** (AU 0604M_02) were identified in the **2024 IR**

Table 1. 2024 Texas Integrated Report summary for Hurricane Creek

AU	Parameter	SWQM Station	No. of Samples	Data Date Range	<i>E. coli</i> Geometric Mean (cfu/100 mL)
0604B_02	<i>E. coli</i>	21433	21	12/1/15 – 11/30/22	692.72

Table 2. 2024 Texas Integrated Report summary for Biloxi Creek

AU	Parameter	SWQM Station	No. of Samples	Data Date Range	<i>E. coli</i> Geometric Mean (cfu/100 mL)
0604M_02	<i>E. coli</i>	16097	27	12/1/15 – 11/30/22	185.49

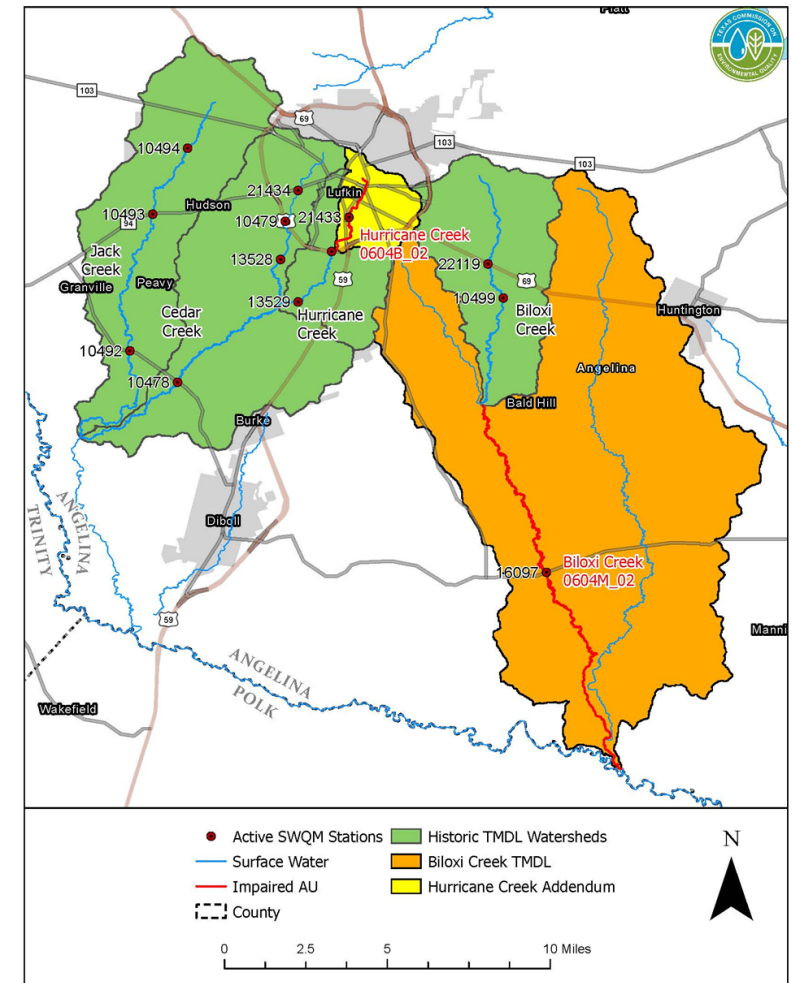


Project Background: *Addendum Two to Four TMDLs for Bacteria in Tributaries of the Neches River below Lake Palestine and One TMDL for Bacteria in Biloxi Creek*

Initiated our first “in-house” TMDL project to develop bacteria TMDLs for **Hurricane Creek** (0604B_02) and **Biloxi Creek** (0604M_02).

- Hurricane Creek meets the conditions to be an addendum and will be included in the WQMP update process.
- Biloxi Creek does not meet the conditions to be an addendum and will be a **separate TMDL project**.

The remainder of this presentation will focus on Hurricane Creek, as Biloxi Creek will be presented at a later date.



Project Timeline

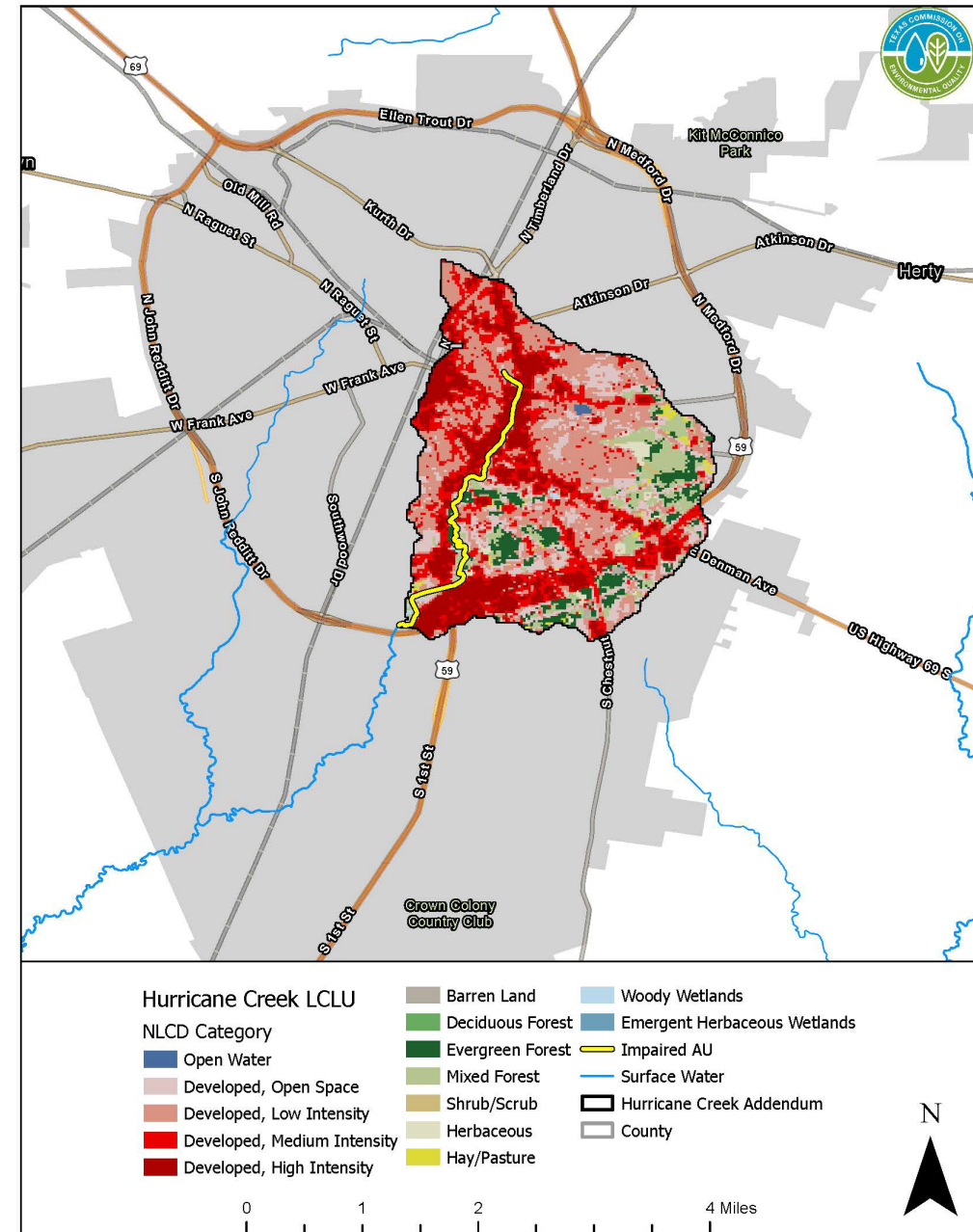


**Key features within the watershed as they
pertain to bacteria TMDL development**

Land Cover

The Hurricane Creek watershed's predominant land covers are **Developed** (82.92%), **Mixed Forest** (7.28%), and **Evergreen Forest** (6.59%).

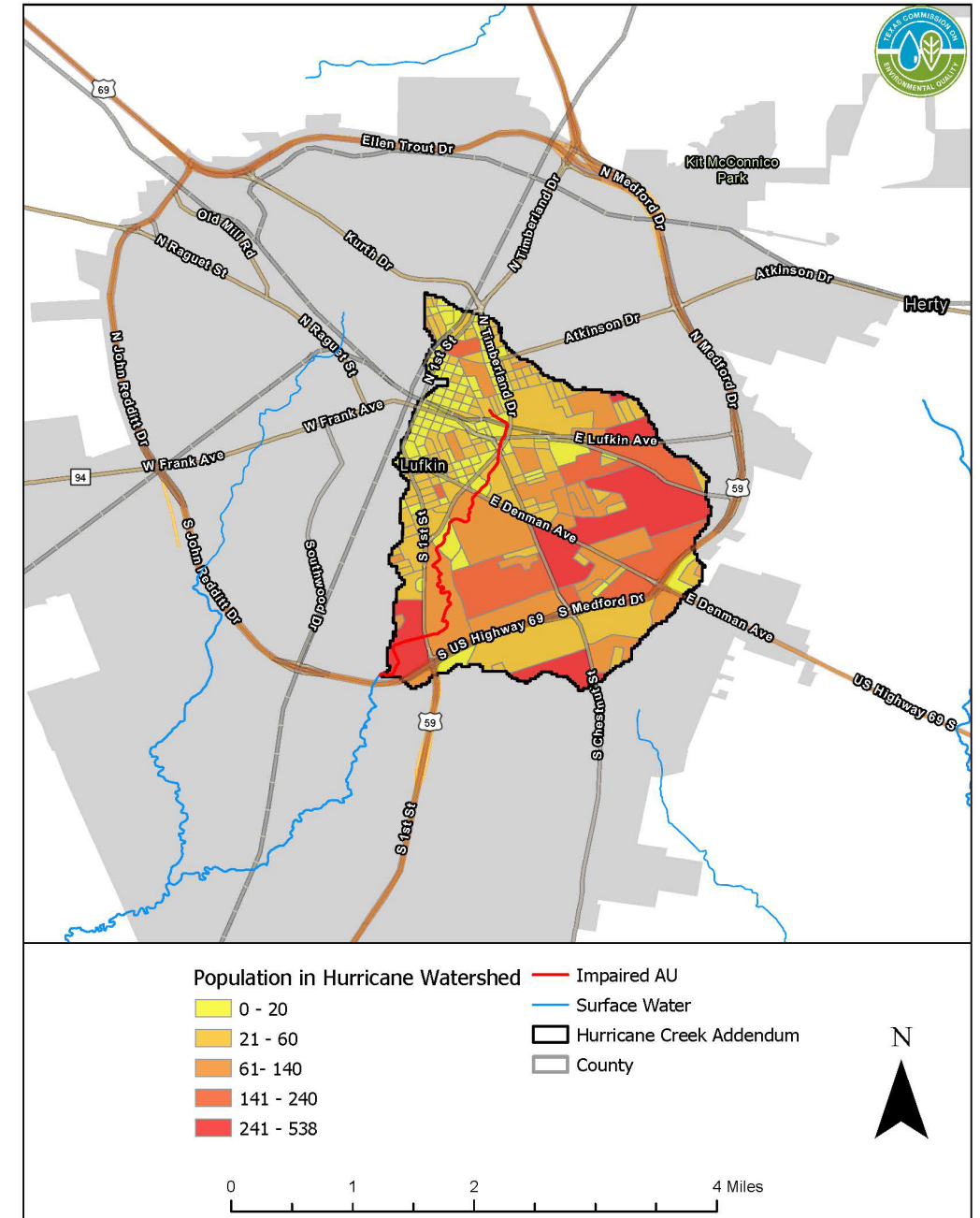
Land Cover Category	Area (acres)	% of Total Land Cover
Open Water	6.00	0.19%
Developed, Open Space	388.00	12.18%
Developed, Low Intensity	1,037.00	32.56%
Developed, Medium Intensity	639.00	20.06%
Developed, High Intensity	577.00	18.12%
Barren Land	11.00	0.35%
Deciduous Forest	1.00	0.03%
Evergreen Forest	210.00	6.59%
Mixed Forest	232.00	7.28%
Shrub/Scrub	9.00	0.28%
Grassland/Herbaceous	34.00	1.07%
Pasture/Hay	26.00	0.82%
Woody Wetlands	14.00	0.44%
Emergent Herbaceous Wetlands	1.00	0.03%
Total	3,185.00	100%



Population and Population Projections

Watershed population estimates were developed using the U.S. Census Bureau **2020 census blocks data** (USCB, 2020).

- 2020 population: **8,132**
- 2070 projected population: **10,350**
- Projected population increase (2020 – 2070): **27.3%**



Potential Nonpoint Sources of Bacteria

Domestic Animal Waste

- Pets
- Livestock

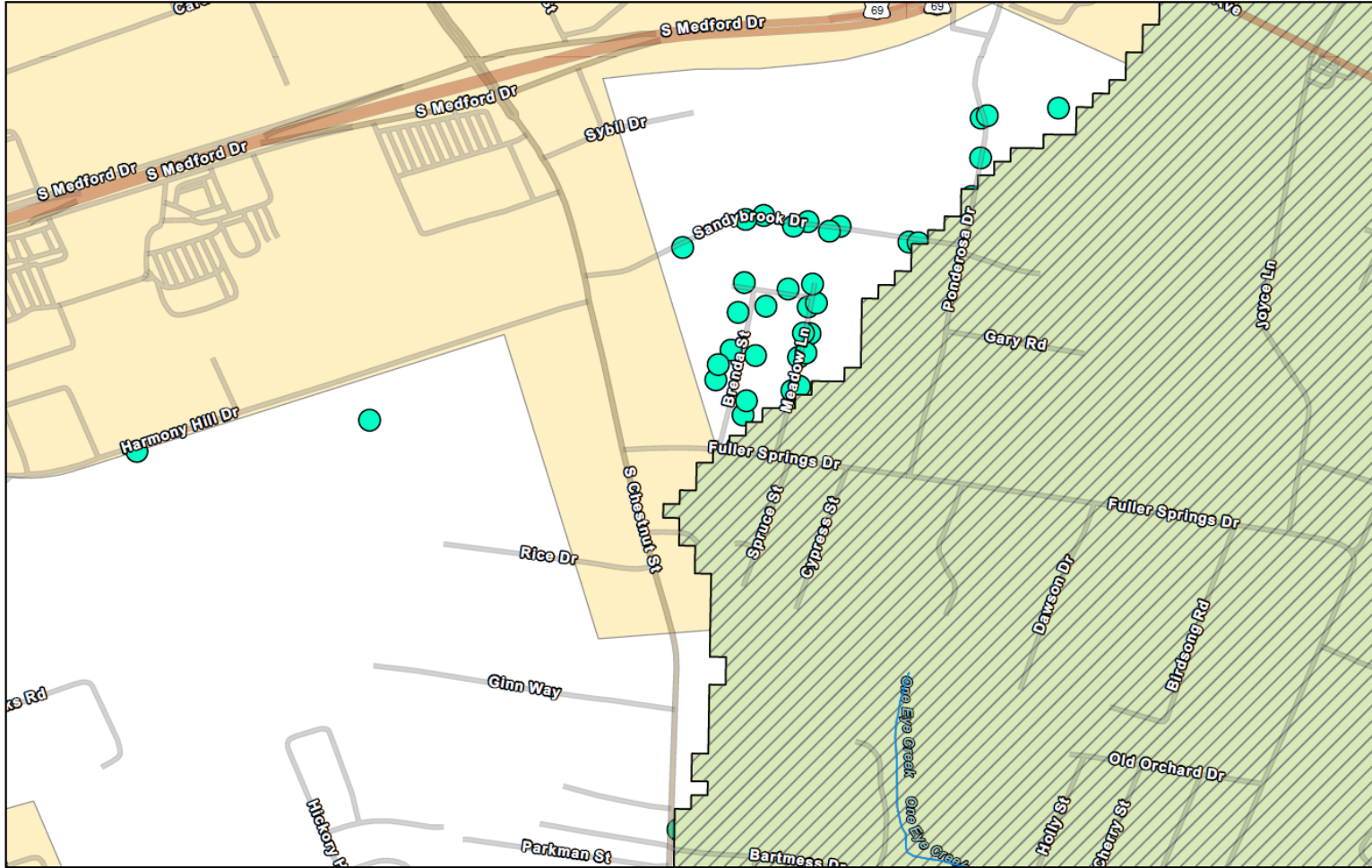
Wildlife/Feral Hog Waste

- Deer and Other Wildlife
- Feral Hogs

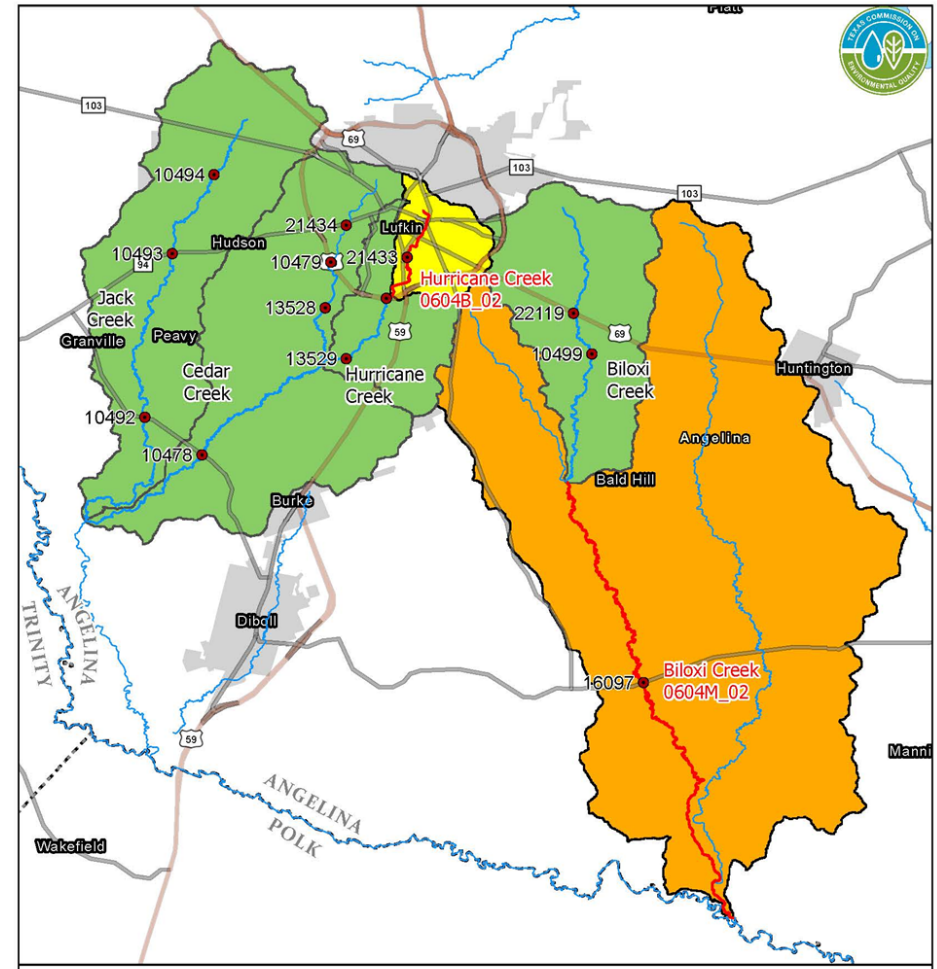
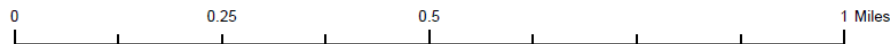
E. coli contributions from the mentioned sources could not be determined based on existing information.

- However, due to the urbanized nature of the watershed, it is assumed that the contribution from wildlife and feral hogs is minimal.
- Approximately **34 On-site Sewer Facilities (OSSFs)** are located along the southeast watershed boundary
 - The TMDL watershed is located within a region where the estimated failure rate is about **19%**.





- Sewer CCN Service Areas
- Biloxi Watershed
- Surface Water
- Estimated OSSF Location



- Active SWQM Stations
- Surface Water
- Impaired AU
- County
- Historic TMDL Watersheds
- Biloxi Creek TMDL
- Hurricane Creek Addendum



Regulated/Point Sources



- As of April 2025, there were **no WWTFs** with a Texas Pollutant Discharge Elimination System (TPDES) permit discharging in the TMDL addendum watershed.



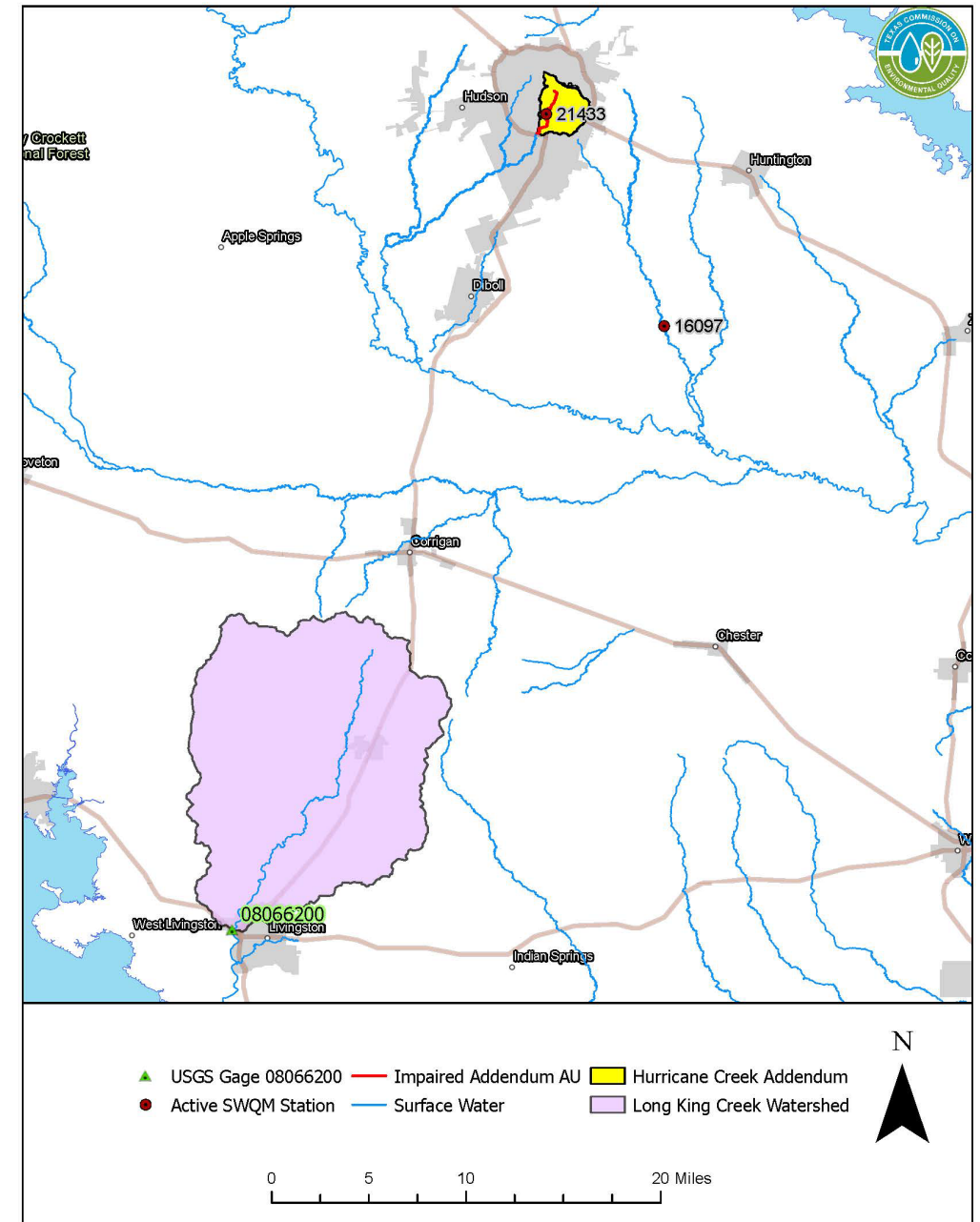
- There were also **no active general permits** with **no active wastewater general permit authorizations**.
- The estimated total area of regulated stormwater is about **37.61 acres**, which is **1.18%** of the watershed.



- No Sanitary Sewer Overflow (SSO) incidents were reported between 2005 to 2025.

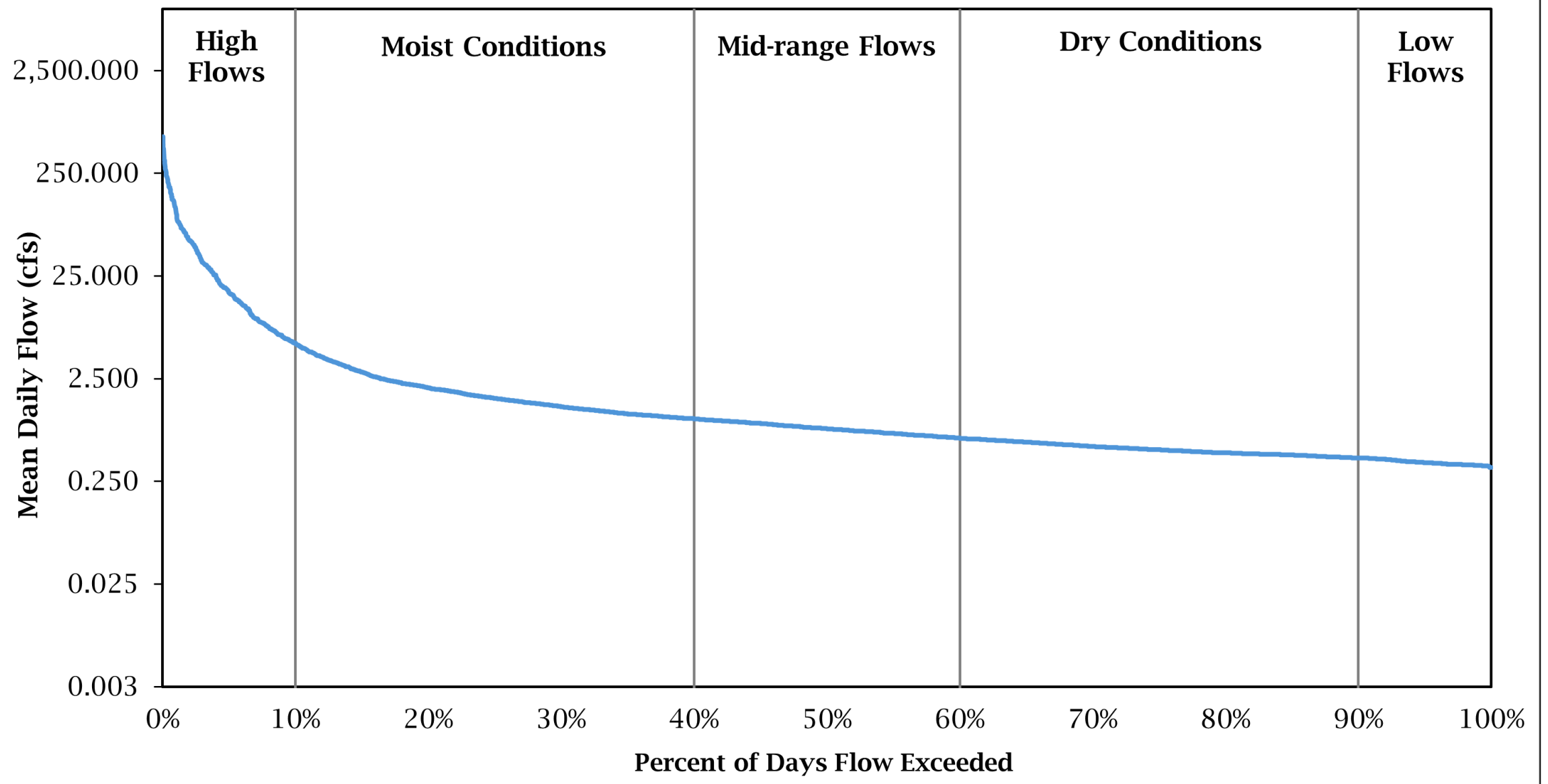
Develop Daily Streamflow Record

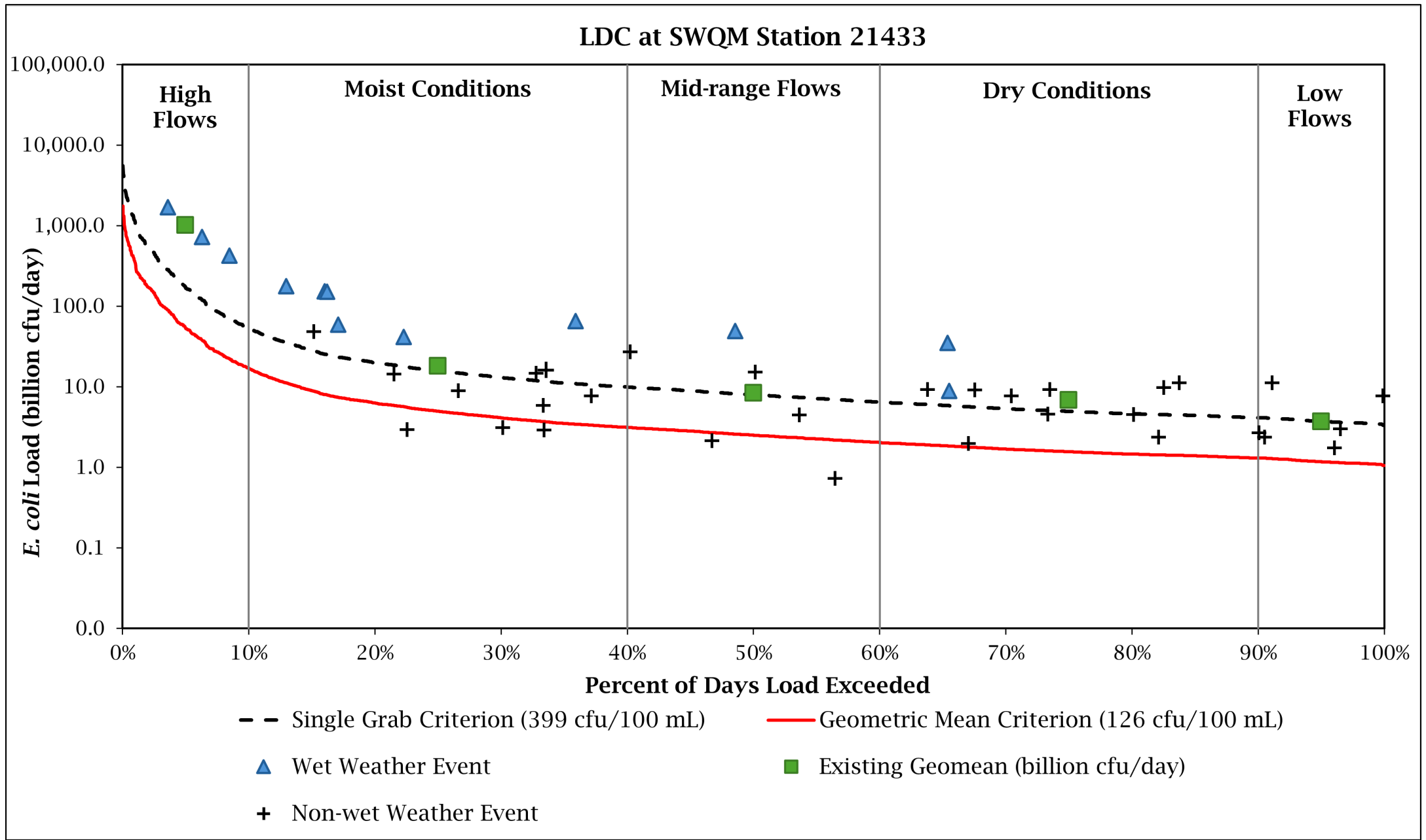
- The TMDL watershed does not have a USGS gage.
- Daily streamflow data were estimated at SWQM station 21433 by extrapolating streamflow records from USGS gage 08066200.
 - A drainage area ratio (DAR) was applied to account for the difference in watershed scale.





FDC at SWQM Station 21433





Allowable Load/TMDL

Water Body Name	AU	5% Exceedance Flow (cfs)	TMDL (Billion cfu/Day)
Hurricane Creek	0604B_02	17.144	52.851

- The allowable loading of *E. coli* that the impaired water body can receive daily was determined using the **median value** within the **highest flow regime** of the FDC (or 5% flow exceedance value) at the SWQM station.
- The “allowable load” displayed in the LDC at 5% exceedance is the TMDL.



TMDL Allocations

$$\text{TMDL} = \text{WLA}_{(\text{WWTF})} + \text{WLA}_{(\text{PSW})} + \text{LA} + \text{FG} + \text{MOS}$$

Table 1. TMDL allocation summary

AU	TMDL	MOS	WLA_{WWTF}	WLA_{SW}	LA	FG
0604B_02	52.851	2.643	0.000	0.580	48.570	1.058

*Load units are expressed as billion cfu/day *E. coli*

Table 2. Final TMDL allocation

AU	TMDL	MOS	$\text{WLA}_{\text{WWTF}}^{**}$	WLA_{SW}	LA
0604B_02	52.851	2.643	1.058	0.580	48.570

*Load units are expressed as billion cfu/day *E. coli*

** WLA_{WWTF} includes the FG component



Daily Load Reductions Needed to Meet *E. coli* Standard by Flow Category

Flow Regime	Simulated Flow (cfs)	Geomean Concentration (cfu/100 mL)	Existing Load (billion cfu/day)	Allowable Load (billion cfu/day)	Percent Reduction Required
High Flows	17.144	2,400	1,006.681	52.851	94.750%
Moist Conditions	1.610	457	18.004	4.964	72.428%
Mid-Range Flows	0.810	421	8.341	2.496	70.076%
Dry Conditions	0.508	546	6.785	1.566	76.920%
Low Flows	0.380	395	3.677	1.173	68.099%

Next Steps

- Submit the addendum to be included in **October 2026 WQMP update**.
 - The public comment notice will be emailed to stakeholders and posted on the TCEQ's [TMDL Program News webpage](#) and posted on the [WQMP Updates webpage](#).
- The AU in this addendum is within the area covered by the I-Plan developed by stakeholders for the original TMDL.
 - The I-Plan outlines an adaptive management approach in which measures are assessed annually by the stakeholders for efficiency and effectiveness.
 - Please refer to the original TMDL document for additional information regarding implementation and reasonable assurance.



Discussion and Questions

For more information, please contact:



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Visit our project website at:

<https://www.tceq.texas.gov/waterquality/tmdl/nav/118-lufkinwatersheds-bacteria>



Photo credit: ANRA