Tri-colored bat potential roosting sites: A GIS analysis of Tarrant County culverts

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Introduction

- White-nose syndrome (WNS), a disease caused by the fungal pathogen *Pseudogymnoascus destructans*, is severely affecting hibernating bat populations across North America (Cryan et al., 2013).
- The tri-colored bat (*Perimyotis subflavus*) has experienced significant declines in the northeastern part of its range due to WNS, prompting its proposed listing as an endangered species (Perea et al., 2022; USFWS).
- Proactive conservation efforts are critical to prevent further decline of the species.
- Texas, which includes part of the tri-colored bat's overwintering range, has emerged as one of the species' remaining strongholds (Newman et al., 2021). However, limited research exists on the species' distribution and roosting behavior within the state.
- Culverts may serve as important winter roosts for for tri-colored bats (Meierhofer et al., 2019). This has significant implications for the Texas Department of Transportation (TxDOT), the agency responsible for managing these structures.
- To aid TxDOT, this project aims to identify culverts in Tarrant County that may serve as critical overwintering habitat for this species.

Figure 1: Side view of a tri-colored bat

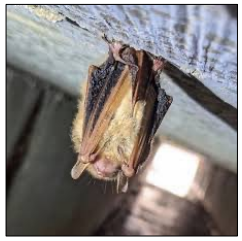


Figure 2: Image of a tri-colored bat perched in a culvert

Methods

- To determine how many **potential roost sites are available**, we collected bridge/culvert data from TxDOT on the following characteristics:
  - **Average Daily Traffic (ADT)**
  - **Structure Span Type**
  - **Structure Length**
  - **Structure Material Type**
- **2,773 structures** were identified in Tarrant County
- Using Tarrant County Culverts as a layer, we used ArcGIS Pro to query for potential survey sites

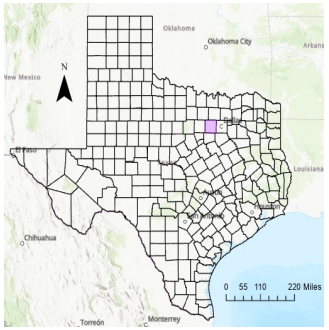


Figure 3: Map highlighting Tarrant County in purple

1) Queried for **culvert structures only**

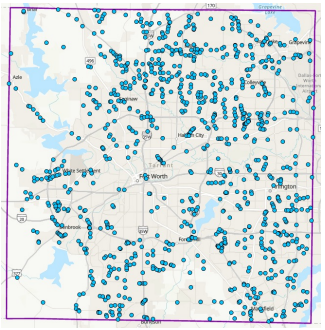


Figure 4: Map of culverts identified in Tarrant County

2) Queried for **structure length > 8 m**

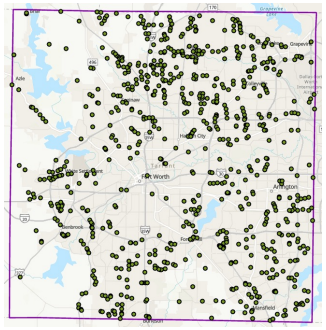


Figure 5: Map of culverts with a structure length > 8 m

3)
a) Used **Summary Statistics Tool** to calculate **mean ADT**
b) Queried for culverts with an **ADT ≤ the mean**
c) Queried for **multiple box or multiple pipe** span type
d) Yielded a map of culverts to serve as **potential roost sites**

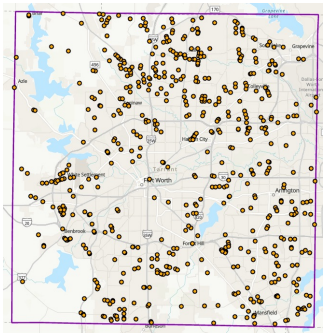
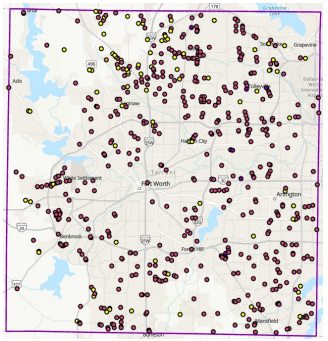


Figure 6: Map of potential winter roost sites



4) Classified potential roost sites by **material type**

Figure 7: Map of potential roost sites by material type

Results

- Out of the 1,107 culverts in Tarrant County, we identified **601** as **potential roost sites**

Figure 9: Image of a galvanized corrugated metal (CGM) culvert

Figure 8: Image of a steel culvert

Selected Culverts by Material Type:

Material Type	# of Culverts Selected	Recommended # for Surveys
Steel	2	2
CGM	8	8
Concrete	502	15
Aluminum, Wrought Iron, or Cast Iron	1	1
Precast/ Prestressed	88	15
Total	**601**	**41**

Figure 10: Image of a concrete culvert

Figure 11: Image of an aluminum culvert

Figure 12: Image of a precast culvert

Conclusions and Next Steps

- Our study determined that 22% of transportation infrastructure in Tarrant County are potentially suitable wintering roosts for the tri-colored bat.
- With this information, TxDOT can undertake maintenance activities at structures during months when this species is not likely to be using them.
- This data also has created an opportunity to do further research into the identification of more specific characteristics that constitute suitable roosting sites.
- In the fall of 2025, the Bat Lab plans to collaborate with TxDOT to conduct environmental DNA (eDNA) sampling and acoustic monitoring to establish use by tri-colored bats. These efforts will help refine conservation strategies for this species moving forward.

References

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