Making Rural Roads Safer in Texas: New Data Tools & Approaches to Driver Training

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Texas A&M Transportation Institute

Presentation Outline

1. Overview of recent project focused on large trucks and rural roadway safety in Texas.
2. Rural roadway safety project outreach and education materials for Texas.
3. Introduction to a new project focused on training drivers to improve work zone safety.

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Improving CMV Safety on Rural Roads in Texas: From Data to Information for Law Enforcement and Large Truck Drivers

PI: Eva Shipp, PhD

Srinivas Geedipally, PhD, PE,
Robert Wunderlich, PE, Lingtao Wu, PhD, PE,
Marcie Perez, Dennis Perkinson, PhD,
Ashesh Pant, Michael Martin

10/19 to 9/22 (COVID delay)

Background & Rationale

Goal

Prevent crashes / reduce their severity for events involving large trucks on rural roadways in Texas by:

- Improving law enforcement effectiveness
- Increasing fleet operator/driver knowledge of hazardous rural roadways and driving behaviors

Key Activities

Crash Profiles

ID Factors
(All truck crashes & severe crashes)

Outreach / Education Materials

(Iterative process based on stakeholder feedback: LEOs, fleet operators / drivers)

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Classifying Crashes

2014 – 2018, TxDOT reportable crashes

- **121,186 truck tractor**
- **44,158 heavy truck/pick-up 10,000+ lbs***
- **2,252,889 passenger**

Fields:

TRUCKS: truck tractor, truck, other, unknown

PASSENGER: 2, 4-door passenger, van, SUV, light pick-up trucks, other, unknown

- **CRIS vehicle body style**
- **CRIS vehicle body style and VIN weight**
- **VIN body class**
- **VIN body class and VIN weight**
- **CRIS vehicle body style and VIN body class**
- **VIN vehicle model**
- **VIN make**
- **VIN model**
- **VIN model and VIN weight (10,000+ lbs.)**
- **VIN weight (10,000+ lbs.)**

***Excludes personal use vehicles**

NHTSA VIN Decoder API

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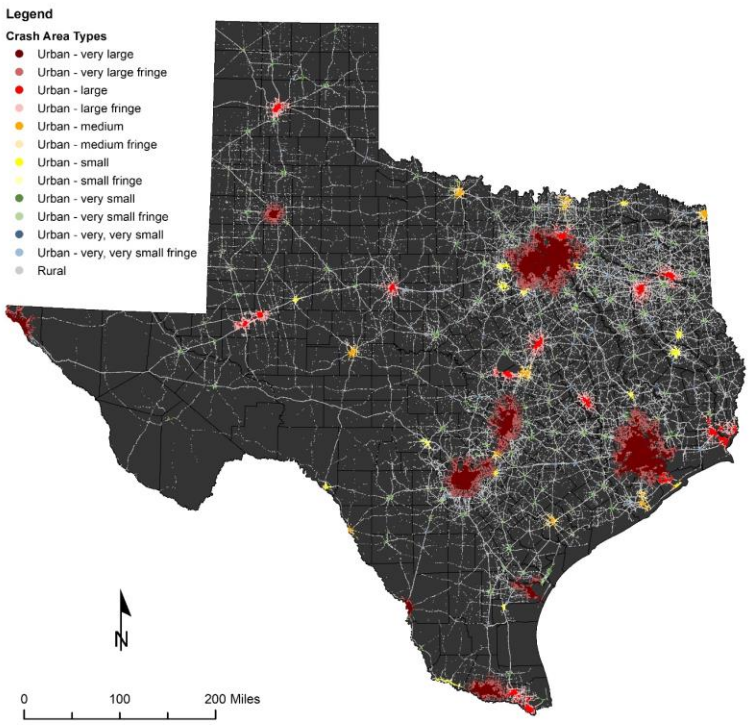
Defining Area Type: Rural, Fringe & Urban



Use US Census to define urban area geography (ACS 5-yr estimates)

ID buffers based on extraterritorial jurisdictions (ETJ) distances per TX local government code.

Plot crashes

Rural = all that is NOT urban or fringe

Label	Population Category	Fringe Buffer
Urban - Very large	> 250K population	5 miles
Urban - Large	100K-250K	5 miles
Urban - Medium	50K-100K	3.5 miles
Urban - Small	25K-50K	2 miles
Urban - Very Small	5K-25K	1 mile
Urban - Very, Very Small	<5K	0.5 mile
Rural	everywhere else	n/a

NEW TTI STANDARD

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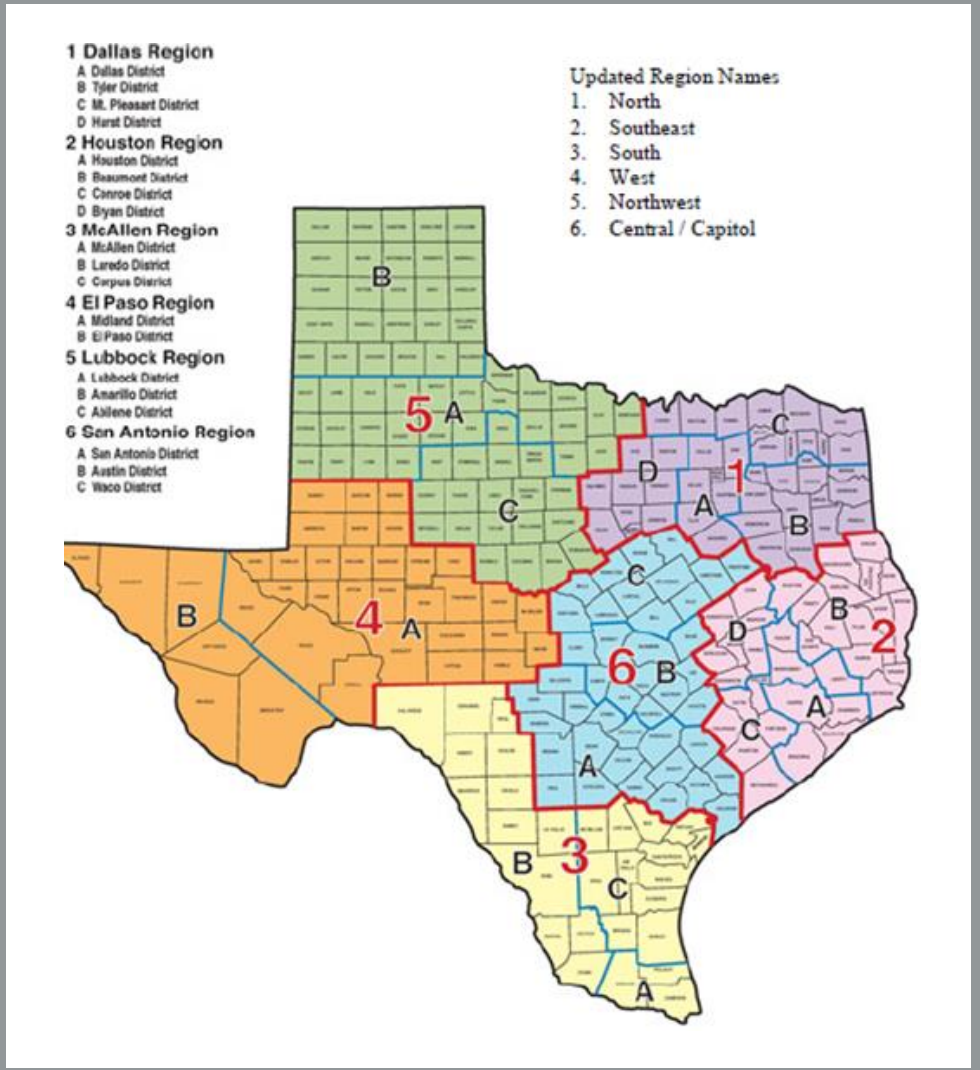
6 DPS Regions



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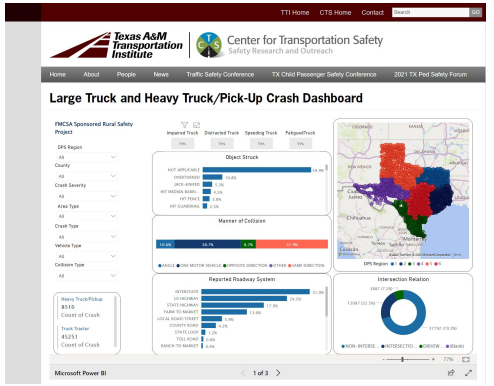
Outreach / Education Materials

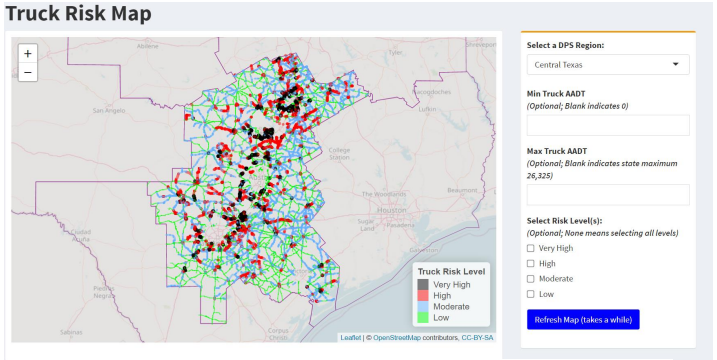
Crash Profiles

- Diagrams
- Data Dashboard



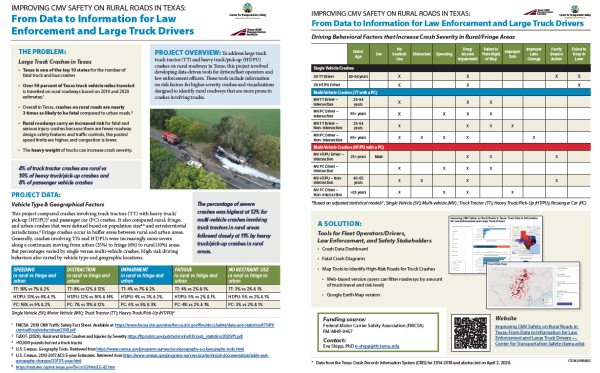
Roadway Maps

- Static
- Interactive

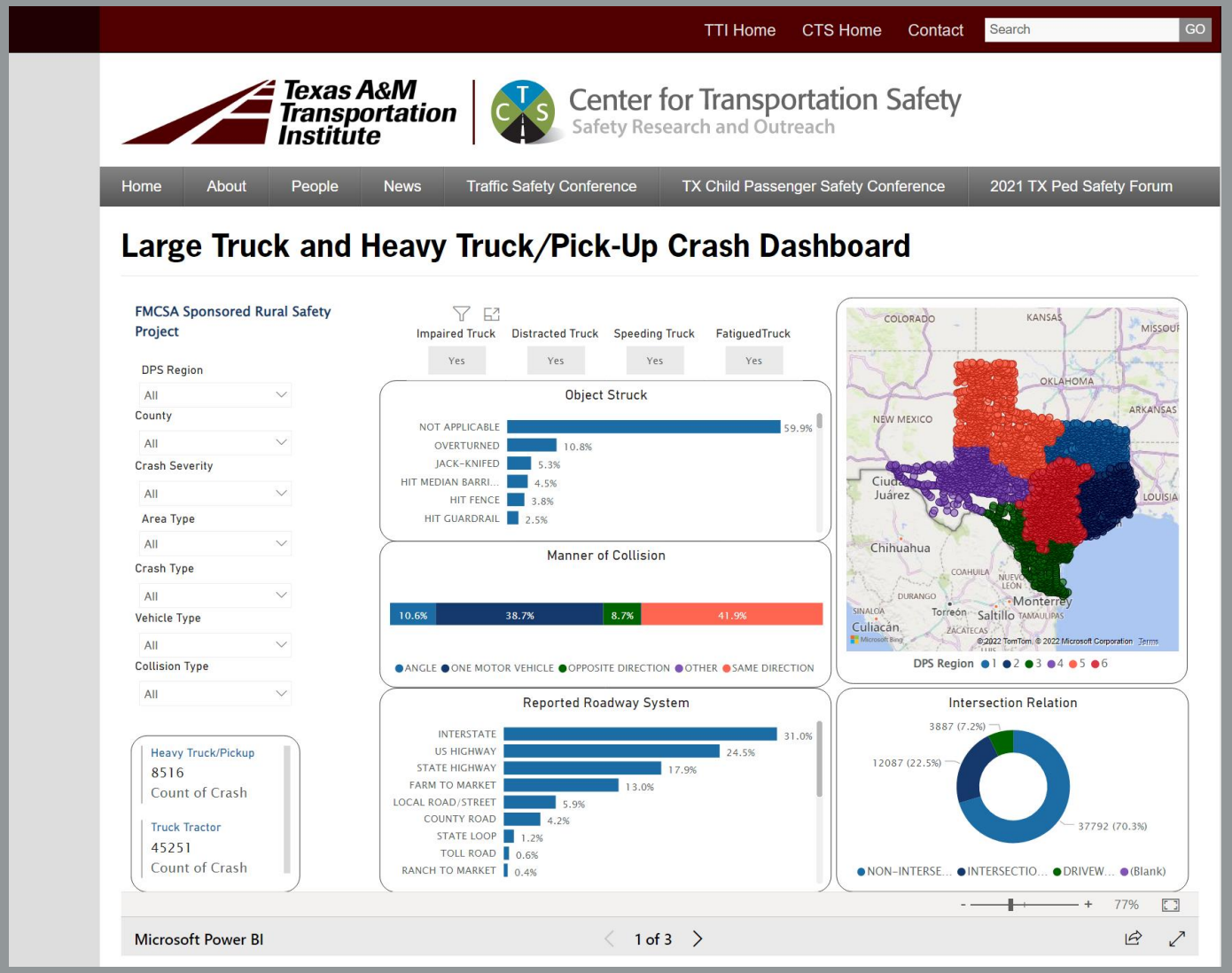


Factsheet

- Overview
- Website links



Data Dashboard



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Roadway Maps: Overview

1. Based on predictive NOT reactive methods
   - Systemic approach IDs high crash potential segments.
   - Not a simple hotspot map.
   - Factors: AADT, area type, posted speed limit, truck percentage, number of lanes, lane width.
   - Comparison of crash proportion to VMT to identify overrepresentation is key
   - Apply weighting scheme.
   - Categorize roadway segments (very high, high, medium, low), plot , & color roadway segments.
2. Two versions: Static & interactive
3. Freely downloadable with user guides

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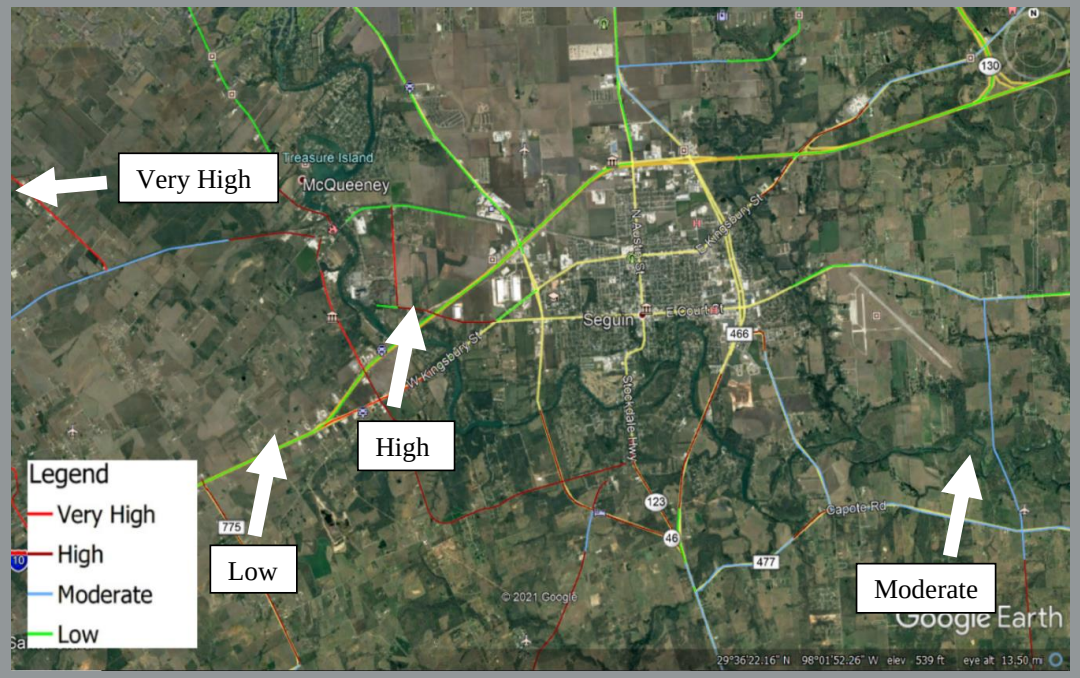
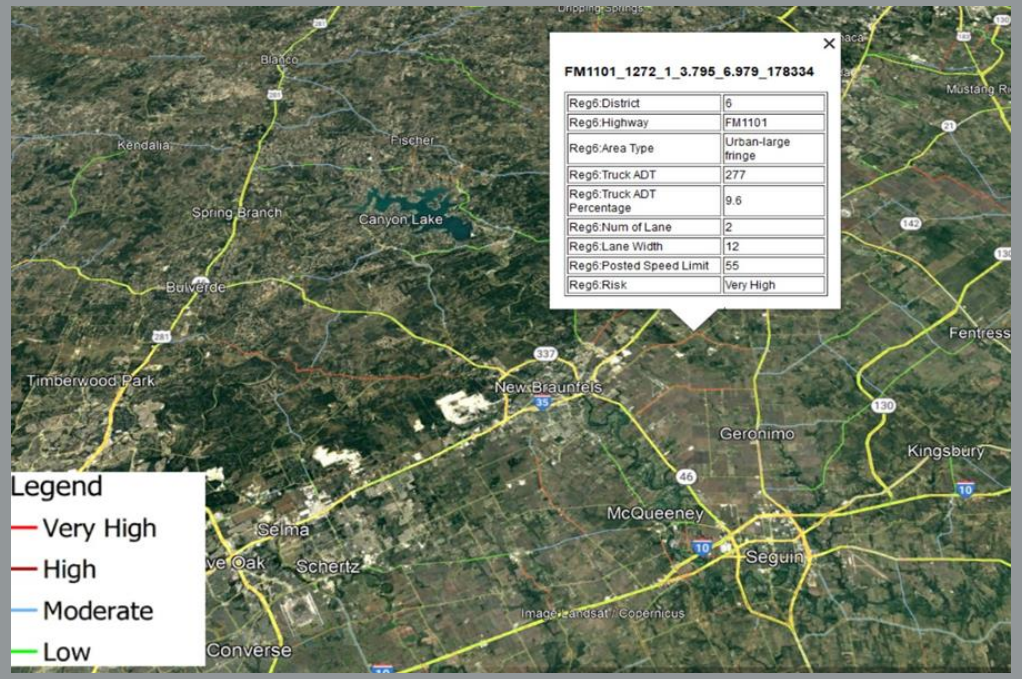
Roadway Maps: Google Earth (Static)





***Statewide & by DPS (Texas Department of Public Safety) Region**

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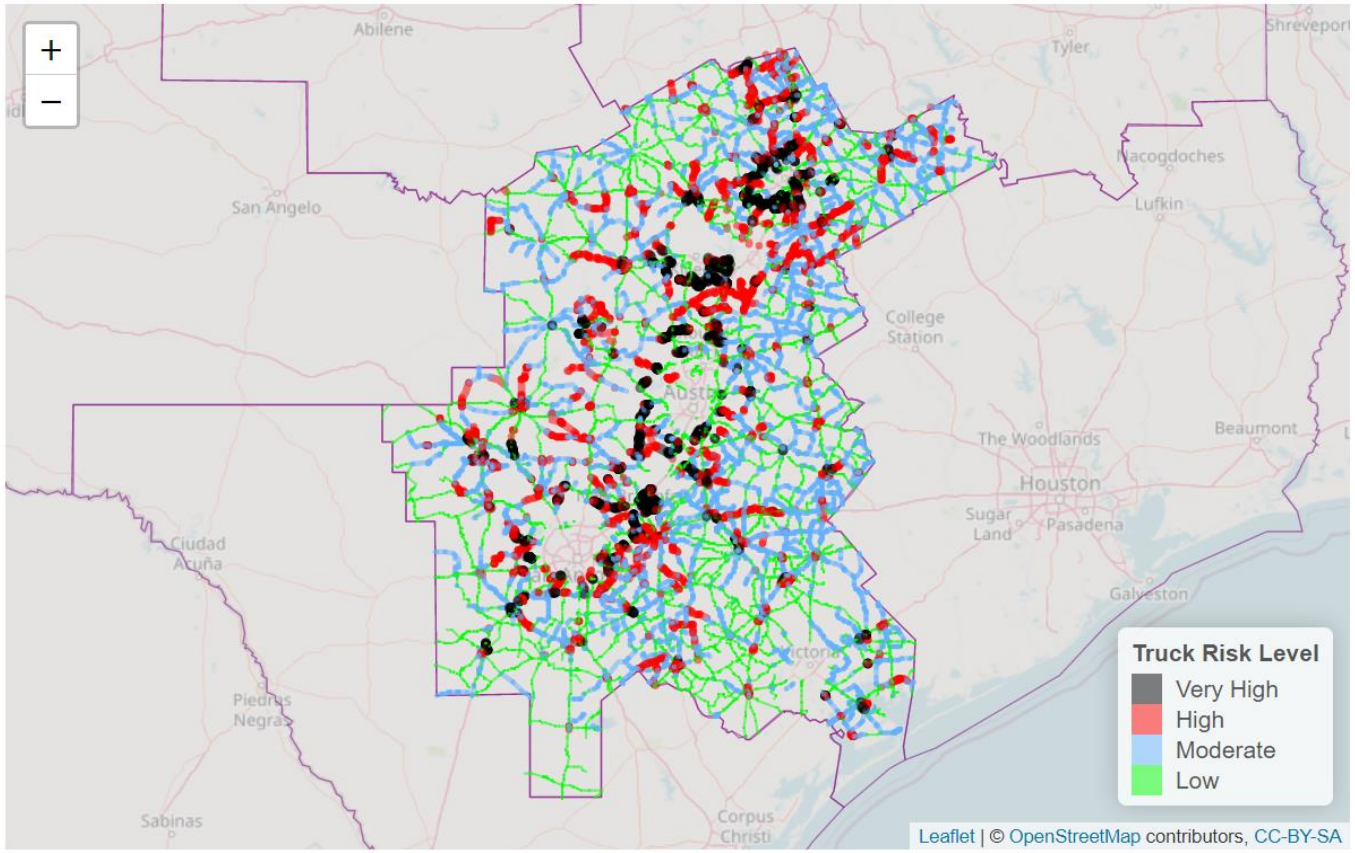
Roadway Maps: Interactive

Truck Risk Map



Select a DPS Region:

Central Texas

Min Truck AADT

(Optional; Blank indicates 0)

Max Truck AADT

(Optional; Blank indicates state maximum 26,325)

Select Risk Level(s):

(Optional; None means selecting all levels)

- [ ] Very High
- [ ] High
- [ ] Moderate
- [ ] Low

Refresh Map (takes a while)

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Fact Sheet

IMPROVING CMV SAFETY ON RURAL ROADS IN TEXAS:

From Data to Information for Law Enforcement and Large Truck Drivers

THE PROBLEM:

Large Truck Crashes in Texas

- **Texas is one of the top 10 states** for the number of fatal truck and bus crashes
- **Over 50 percent of Texas truck vehicle miles traveled** is travelled on rural roadways based on 2019 and 2020 estimates.[1]
- Overall in Texas, **crashes on rural roads are nearly 3 times as likely to be fatal** compared to urban roads.[2]
- **Rural roadways carry an increased risk** for fatal and serious injury crashes because there are fewer roadway design safety features and traffic controls, the posted speed limits are higher, and congestion is lower.
- The **heavy weight** of trucks can increase crash severity.

4% of truck tractor crashes are rural vs 10% of heavy truck/pick-up crashes and 8% of passenger vehicle crashes

PROJECT OVERVIEW: To address large truck truck tractor (TT) and heavy truck/pick-up (HT/PU) crashes on rural roadways in Texas, this project involved developing data-driven tools for drivers/fleet operators and law enforcement officers. These tools include information on risk factors for higher severity crashes and visualizations designed to identify rural roadways that are more prone to crashes involving trucks.

PROJECT DATA:

Vehicle Type & Geographical Factors

This project compared crashes involving truck tractors (TT) with heavy truck/pick-up (HT/PU)[3] and passenger car (PC) crashes. It also compared rural, fringe, and urban crashes that were defined based on population size[4,5] and extraterritorial jurisdictions.[6] Fringe crashes occur in buffer areas between rural and urban areas. Generally, crashes involving TTs and HT/PUs were increasingly more severe along a continuum moving from urban (25%) to fringe (6%) to rural (10%) areas. But percentages varied by single versus multi-vehicle crashes. High risk driving behaviors also varied by vehicle type and geographic locations.

The percentage of severe crashes was highest at 13% for multi-vehicle crashes involving truck tractors in rural areas followed closely at 11% by heavy truck/pick-up crashes in rural areas.

SPEEDING in rural vs fringe and urban	*DISTRACTION in rural vs fringe and urban*	*IMPAIRMENT in rural vs fringe and urban*	*FATIGUE in rural vs fringe and urban*	*NO RESTRAINT USE in rural vs fringe vs urban*
TT: 16% vs 7% & 2%	TT: 9% vs 12% & 12%	TT: 4% vs 7% & 2%	TT: 4% vs 2% & 1%	TT: 3% vs 2% & 1%
HT/PU: 13% vs 6% & 1%	HT/PU: 12% vs 16% & 14%	HT/PU: 4% vs 3% & 2%	HT/PU: 5% vs 2% & 1%	HT/PU: 5% vs 2% & 1%
PC: 16% vs 9% & 2%	PC: 7% vs 11% & 12%	PC: 6% vs 5% & 3%	PC: 4% vs 2% & 1%	PC: 3% vs 2% & 1%

Single Vehicle (SV); Motor Vehicle (MV); Truck Tractor (TT); Heavy Truck/Pick-Up (HT/PU)[3]

[1] FMCSA. 2019 CMV Traffic Safety Fact Sheet. Available at: https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/safety/data-and-statistics/473411/cmvtrafficsafetyfactsheet2018.pdf

[2] TxDOT. (2020). Rural and Urban Crashes and Injuries by Severity https://ftp.txdot.gov/pub/txdot-info/trf/crash_statistics/2020/11.pdf

[3] >10,000 pounds but not a truck tractor

[4] U.S. Census. Geography Tools. Retrieved from https://www.census.gov/programs-surveys/acs/geography-acs/geography-tools.html

[5] U.S. Census. 2013-2017 ACS 5-year Estimates. Retrieved from https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2017/5-year.html

[6] https://statutes.capitol.texas.gov/Docs/LG/htm/LG.42.htm

IMPROVING CMV SAFETY ON RURAL ROADS IN TEXAS:

From Data to Information for Law Enforcement and Large Truck Drivers

Driving Behavioral Factors that Increase Crash Severity in Rural/Fringe Areas

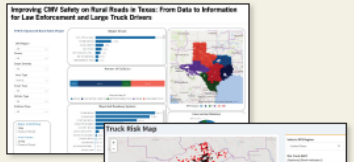
	Driver Age	Sex	No Seatbelt Use	Distracted	Speeding	Drug/ Alcohol Impairment	Failed to Yield Right of Way	Improper Turn	Improper Lane Change	Faulty Evasive Action	Failed to Keep in Lane
Single Vehicle Crashes											
SV TT Driver	40-64 years		X			X				X	X
SV HT/PU Driver			X			X					X
Multi-Vehicle Crashes (TT with a PC)											
MV TT Driver – Intersection	25-64 years		X			X	X				
MV PC Driver – Intersection	65+ years		X		X	X	X				
MV TT Driver – Non- Intersection	25-64 years		X			X	X	X			
MV PC Driver – Non- Intersection	65+ years		X	X	X	X			X		
Multi-Vehicle Crashes (HT/PU with a PC)											
MV HT/PU Driver – Intersection	25+ years	Male				X	X			X	
MV PC Driver – Intersection			X		X	X	X				
MV HT/PU – Non-Intersection	40-65 years		X	X		X				X	
MV PC Driver – Non- Intersection	>65 years		X		X	X		X			

Based on adjusted statistical models[7]; Single Vehicle (SV); Multi-vehicle (MV); Truck Tractor (TT); Heavy Truck/Pick-Up (HT/PU); Passenger Car (PC)

A SOLUTION:

Tools for Fleet Operators/Drivers, Law Enforcement, and Safety Stakeholders

- Crash Data Dashboard
- Fatal Crash Diagrams
- Map Tools to Identify High-Risk Roads for Truck Crashes
  - Web-based version (users can filter roadways by amount of truck travel and risk level)
  - Google Earth Map version



Funding source:
Federal Motor Carrier Safety Association (FMCSA)
FM-MHP-0457

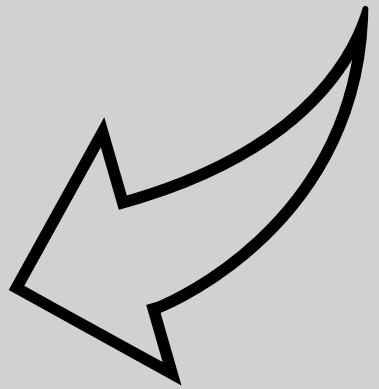
Contact:
Eva Shipp, PhD e-shipp@tti.tamu.edu

Website
Improving CMV Safety on Rural Roads in Texas: From Data to Information for Law Enforcement and Large Truck Drivers — Center for Transportation Safety (tamu.edu)

[7] Data from the Texas Crash Records Information System (CRIS) for 2014-2018 and abstracted on April 2, 2020.

CTS2242.01901.0822

https://cts.tti.tamu.edu/improving-cmv-safety-on-rural-roads-in-Texas/



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Developing Experiential and Evidence-Based Training on Work Zone Safety in Texas

PIs: Eva Shipp & Emily Martin

Started 10/22

Collaboration with TTI Workzone Safety Group, TAMU RELLIS Academic Alliance, & Western Dairy Transport

WESTERN DAIRY TRANSPORT

RELLIS
THE TEXAS A&M UNIVERSITY SYSTEM

Background & Rationale

Goal:

Improve CMV safety in work zones located on rural, urban, and fringe (e.g., region bordering rural and urbanized areas) roadways.

- Reduce number of crashes overall
- Reduce crash rate / VMT

Key Objective:

- Develop & evaluate an evidence-based training module for truck tractor drivers.

Background: Work Zones

1. Work Zones

- "*...where roadwork takes place and may involve lane closures, detours and moving construction equipment.*" [ADTSEA/AAMVA, n.d]
- Temporary & unexpected changes that require slowing down
- Often lack shoulders
- Workers present

2. Texas

- In 2021, 3,400 active work zones & 2,795 crashes involving truck tractor (25% ↑ over 2020).
- Every year since 2017, > 2,500 work zone crashes involving truck tractor.
- Rural roadway crashes: 2x likely to be fatal or suspected serious injury events.

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Background: Training Needs

- Consensus that evidence- / theory-based approaches improve the impact of programs targeting driving behaviors & skills. [Foss, 2007]
- Limited theory-based research for employer provided traffic safety programs.
  - Contribution of driving simulators to improving truck driver safety outcomes not well known, specifically for work zones.
  - Recent BTSCRP project:

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Guidance for Employer-Based Behavioral Traffic Safety Program for Drivers in the Workplace

WHAT ARE YOU TRYING TO LEARN?

What are other people doing and what is available?

A collection of business practices of driver safety programs currently in use.

VIEW CASE STUDIES

How do we change behavior?

Effective behavioral change and underlying theories are described.

VIEW THEORIES

How do I know if my program is working?

Information describing common training evaluation sources and designs.

VIEW MEASURES

What can help me plan my safety program?

Visualize the interactions of resources and outcomes in an interactive logic model.

VIEW LOGIC MODEL

Safety Insights

Short cuts undermine safety

VIEW SAFETY INSIGHTS

BTSCRP Web Resource 1: Employer-Based Driver Safety Programs:
https://crp.trb.org/btscrpwebresource1/

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Key Activity: Training/Intervention

1. Develop training module: Classroom materials & simulator drives
   - Crash data for Texas
   - LEO, driver/fleet operator, CMV instructor input
   - Theory-based approach (skill acquisition & risk perception)
2. Evaluate training module
3. Revise training module
4. Disseminate training module (including simulator drive specs)

Key Activity: Training/Intervention

L3Harris TranSim™

WESTERN DAIRY TRANSPORT

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Stay Tuned.

Coming Soon!

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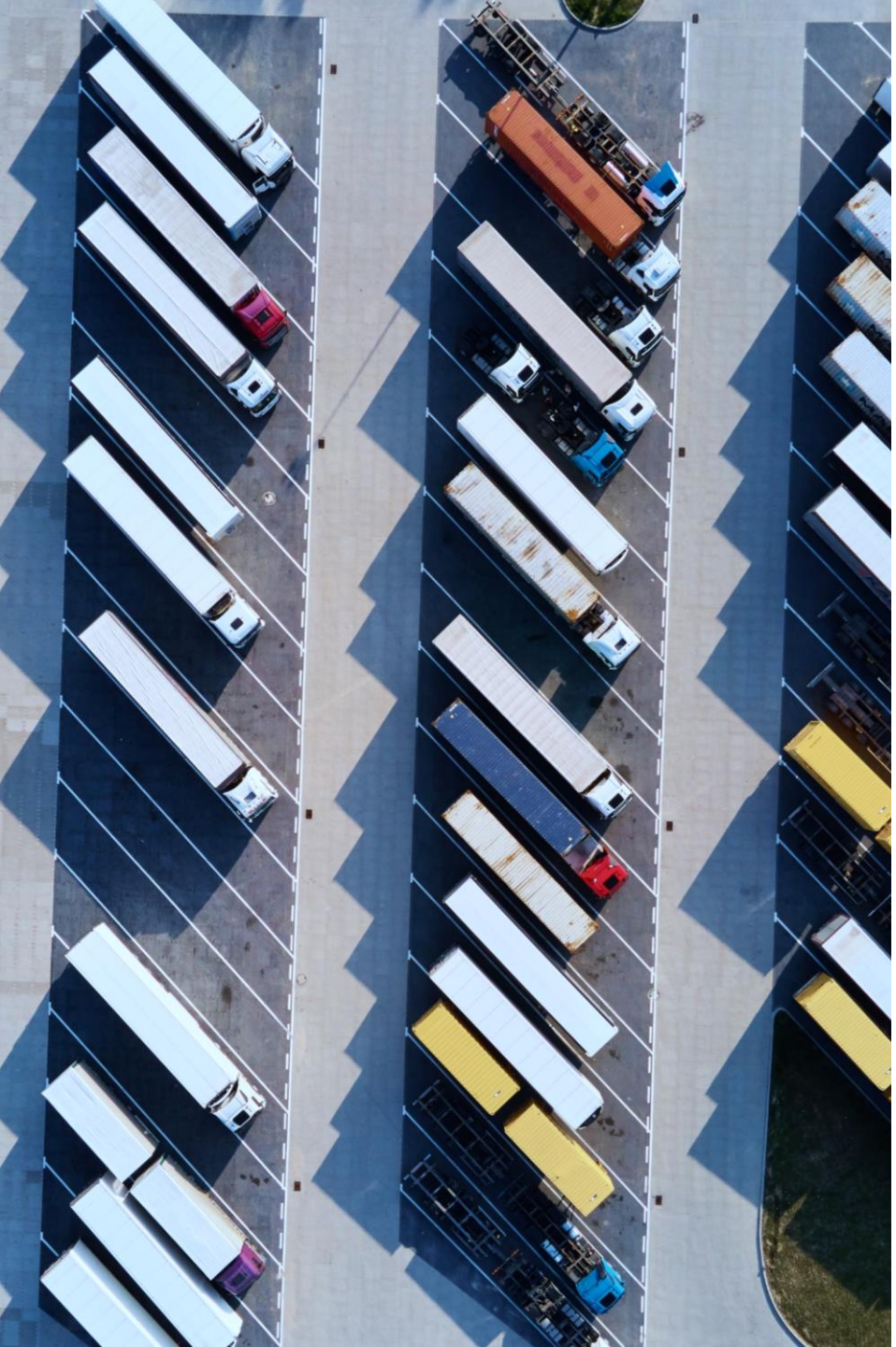

Thank you!

https://cts.tti.tamu.edu/improving-cmv-safety-on-rural-roads-in-Texas/

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