



## Reducing Rural Roadway Departures

### Every Day Counts Round 5

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### Today's Presenters



**Cate Satterfield**  
Roadway Safety Engineer,  
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Crete, IL



**Dick Albin**  
Road Safety Engineer  
FHWA, Resource Center  
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Technical Service Team  
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Traffic Engineer  
Franklin County, OH



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Traffic Engineering &  
Operations Manager,  
Thurston County, WA

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## What is “Every Day Counts”(EDC)?

State-based model to identify and rapidly deploy proven but underutilized innovations to:

- ✓ shorten the project delivery process
- ✓ enhance roadway safety
- ✓ reduce congestion
- ✓ improve environmental sustainability

- EDC Rounds: two year cycles
- Initiating 5<sup>th</sup> Round (2019-2020) - 10 innovations
- To date: 4 Rounds, over 40 innovations

For more information: <https://www.fhwa.dot.gov/innovation/>

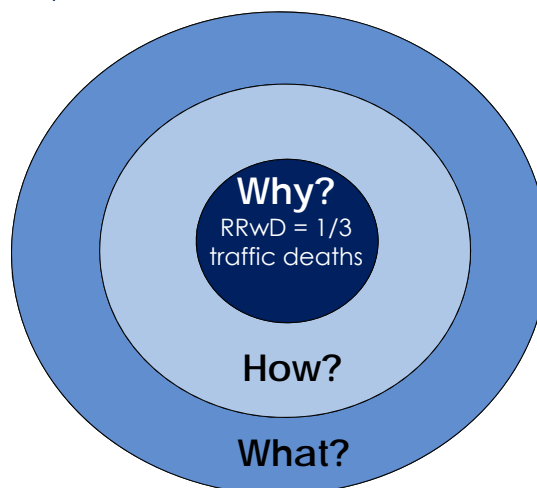
FAST Act, Sec.1444



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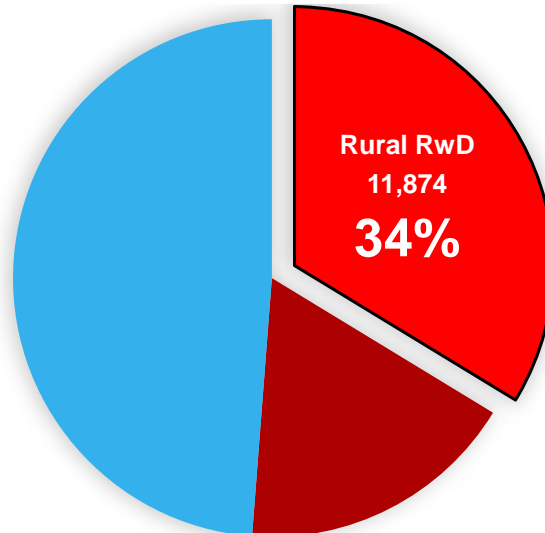
### The Mission

Reduce the potential for serious injury and fatal roadway departure crashes on **all public rural roads** by increasing the systemic deployment of proven countermeasures.



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## The Rural RwD Component of Fatalities

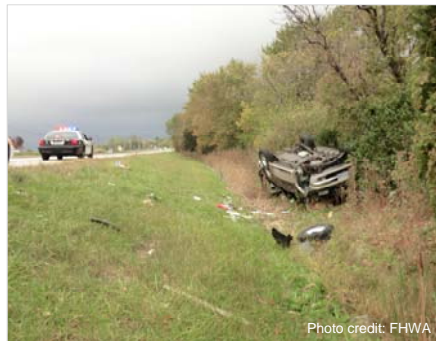


Source: NHTSA FARS (2014 – 2016 Annual Average)

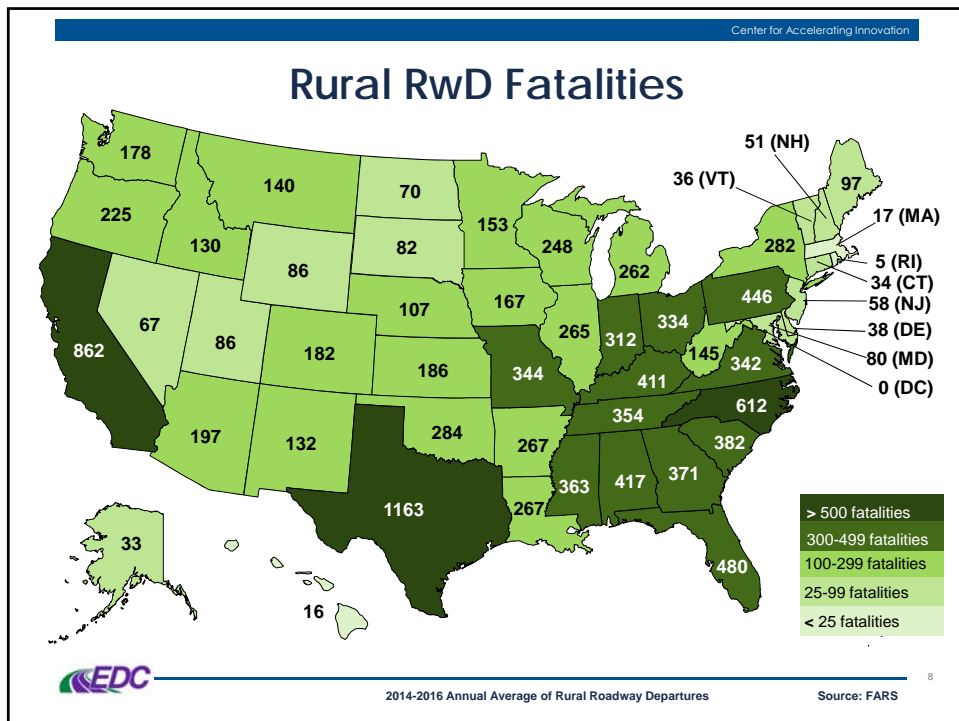
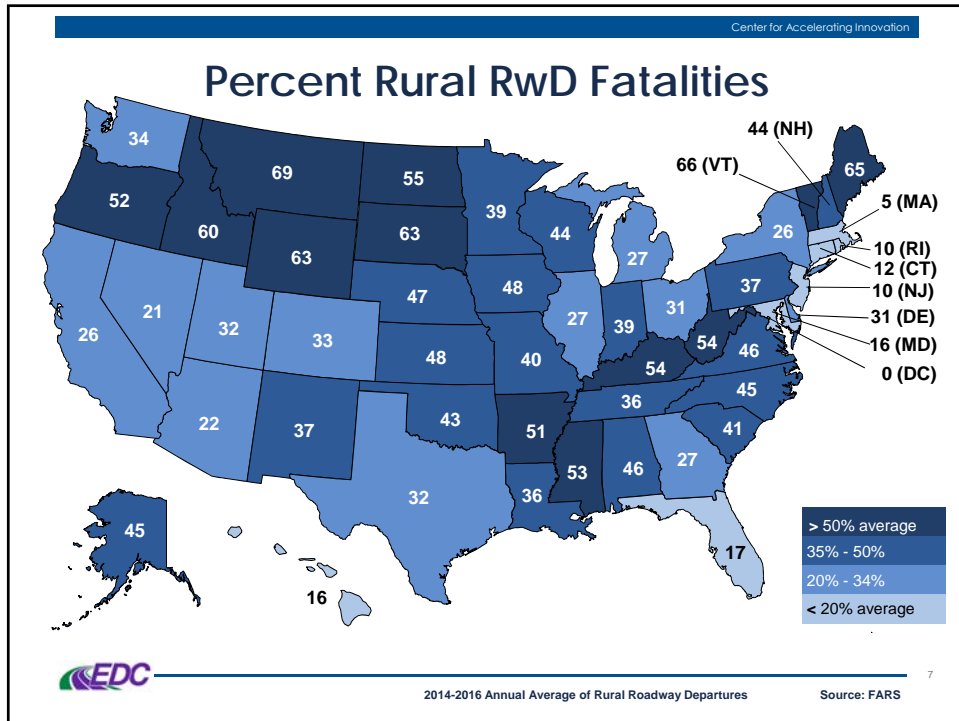
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## What is a Roadway Departure (RwD)?

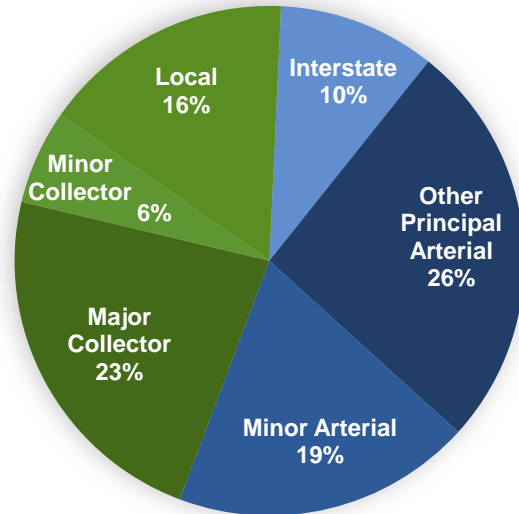
FHWA Definition: A crash in which a vehicle crosses an edge line, a center line, or otherwise leaves the traveled way.



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## Why all public roads?



Roads typically maintained by states = 55% of Rural Rwd fatalities

Roads typically maintained by locals = 45% of Rural Rwd fatalities



2014-2016 Annual Average of Rural Roadway Departures

Source: FARS

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## FY2019 High Risk Rural Roads Special Rule

Section 148(g)(1) of 23 U.S.C.

State	Amount	State	Amount
Alabama	\$4,124,978	Montana	\$1,389,760
Alaska	\$900,000	Nevada	\$1,487,814
Colorado	\$2,826,084	New Mexico	\$1,887,424
Georgia	\$6,299,452	Oregon	\$2,440,120
Idaho	\$1,294,798	Pennsylvania	\$5,766,894
Illinois	\$6,048,546	South Dakota	\$1,517,100
Kentucky	\$2,879,986	Utah	\$1,331,318
Louisiana	\$3,085,174	Virginia	\$4,459,774
		Washington	\$3,144,572



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## Why do drivers leave the roadway?

Roadway Condition

Polling Question

Vehicle Component Failure

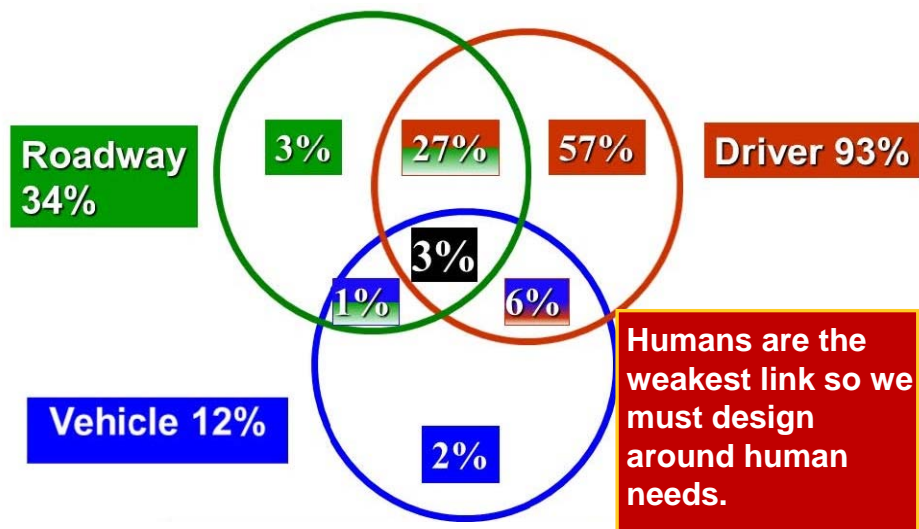
Collision Avoidance

Driver Error



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## Crashes Caused by Various Factors



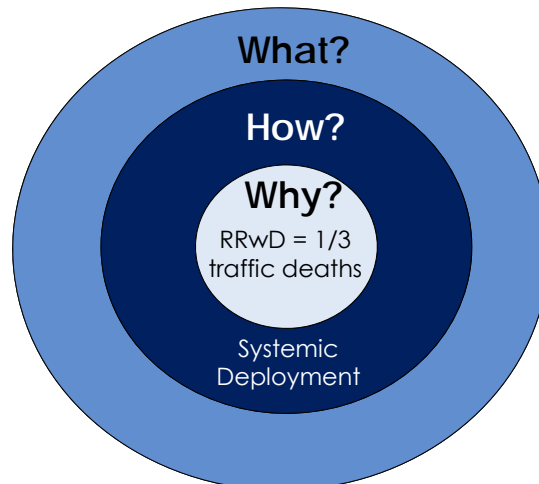
12

From: Lum & Reagan, Public Roads Magazine, Winter 1995, "Interactive Highway Safety Design Module"

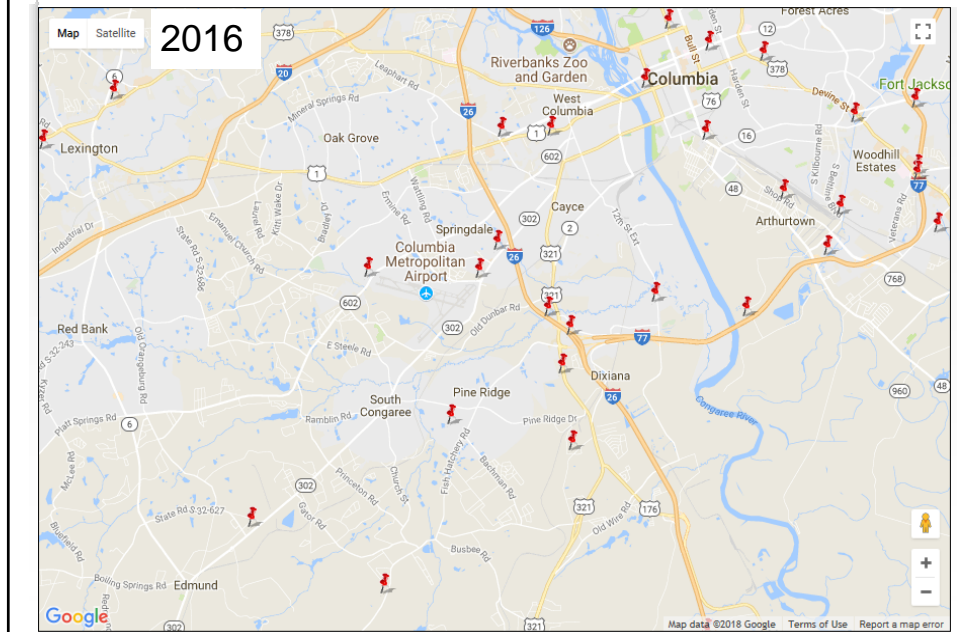


## How?

- Systemic Analysis
- Safety action plans
- Deployment based on risk factors



## Where would you invest safety funds?



## Most Harmful Event in Fatal Crashes

	2012	2013	2014	2015	2016
Motor Vehicle In-Transport	289	249	267	388	373
Tree & Shrub (Standing Only)	158	149	155	153	163
Rollover/Overturn	132	136	142	159	161
Pedestrian	110	97	100	121	137
Embankment & Ditch	29	23	18	17	22
Utility Pole/Light & Sign Support	25	30	15	23	21
Traffic Barrier	16	7	18	16	14
Fire/Explosion	14	5	12	13	14
Pedalcyclist	13	15	14	16	25
Other Object (not fixed)	9	12	12	11	15
Culvert	8	5	8	10	7
Other Fixed Object	8	8	18	10	15
Parked Motor Vehicle	7	4	4	4	5
Live Animal	5	3	3	7	2
Curb	5	2	5	4	3



Fatal crash locations  
are  
**random**



Source: Pexels

Fatal crash types are  
**predictable**



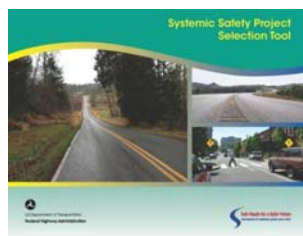
Source: Pixabay

## Systemic Safety Improvements

### Systemic

- Based on Risk
- Correlated with particular severe crash types

An improvement that is widely implemented based on high-risk roadway features that are correlated with particular severe crash types.

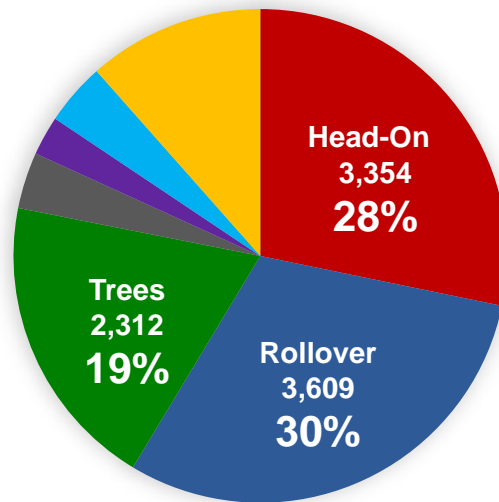


<http://safety.fhwa.dot.gov/systemic/index.htm>

### Poll question

- What are risk factors that you consider for roadway departures?

## Rural Roadway Departure Fatalities by Most Harmful Event



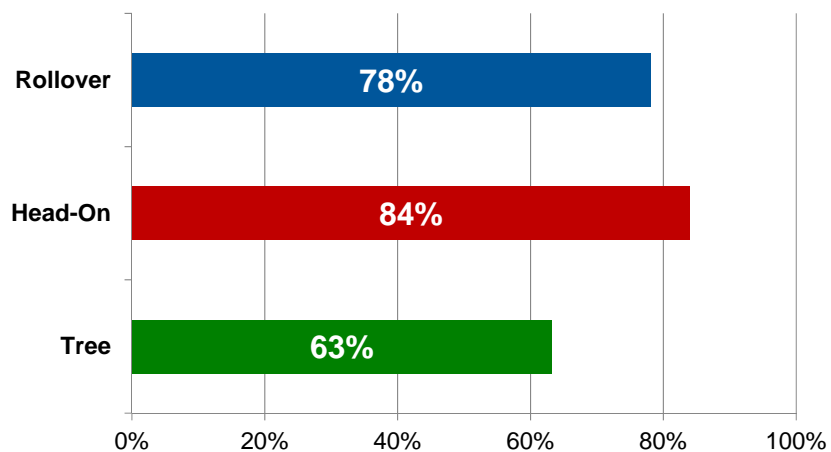
2014-2016 Annual Average of Rural RdDs by MHE

Source: FARS

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## Higher Speed is a Risk Factor

Rural RwD fatalities where speed limit is  $\geq 50$  MPH



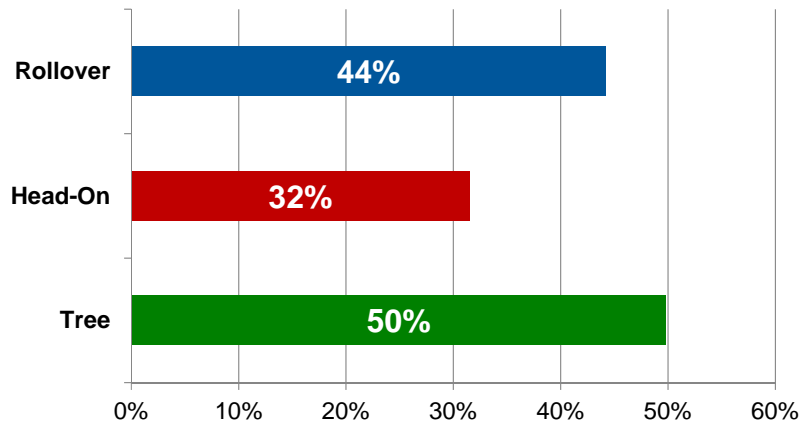
2014-2016 Annual Average of Rural Roadway Departures

Source: FARS

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## Curves are a Risk Factor

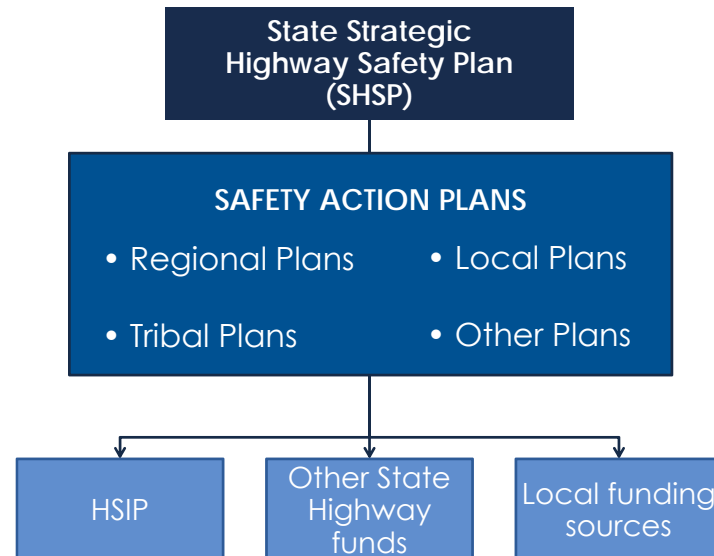
### Curve-related Rural RwD Fatalities



2014-2016 Annual Average of Rural Roadway Departures

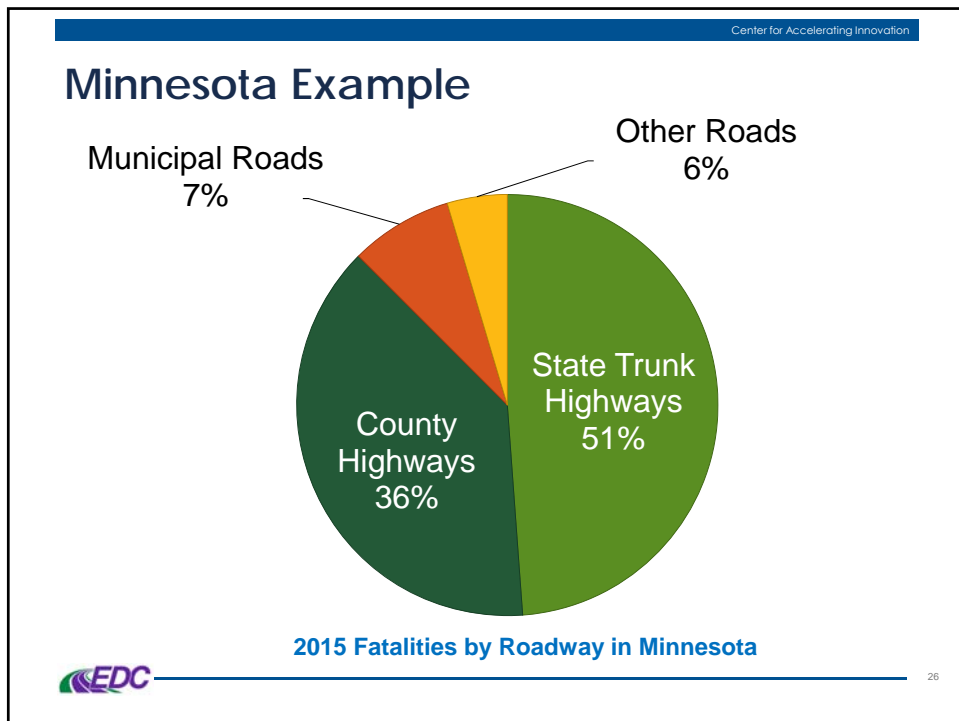
Source: FARS

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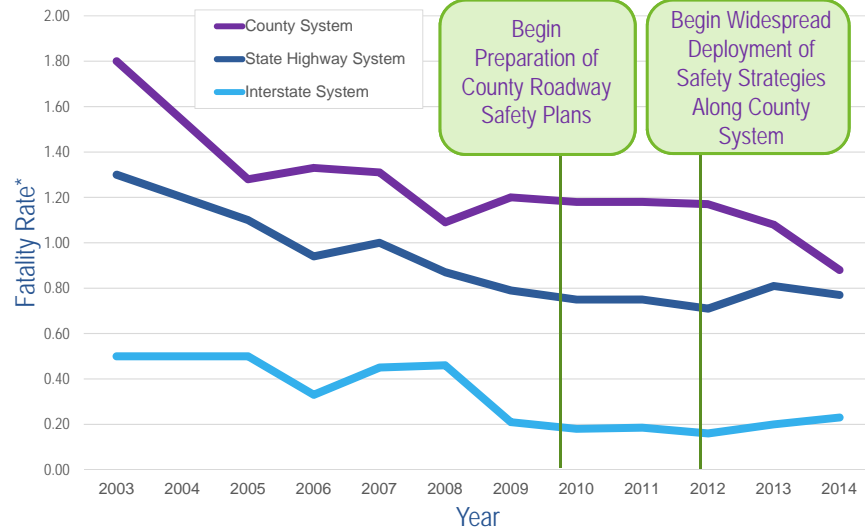


HSIP: 23USC 148(c), 23 CFR 924.7

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## Minnesota Results



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## Target zero

### Washington State County Road Safety



## Washington State Safety Facts

County  
State

16%  
roads

The fatal  
than on



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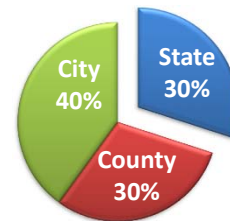
## How does Washington State support local road safety?

Provides training

Provides information

Provides 70% HSIP funding to local agencies

Over \$200 million awarded to locals since 2009



Percent Fatal & Serious Collisions



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## Crash Information

- ✓ Provided by DOT
- ✓ First Step in process
- ✓ Easy to Use
- ✓ Can quickly ID priorities

2011-2015 County X Data		Fatal/Nonfatal Injury Crashes Only									
All Public Roads		All Counties		Ward Counties		County X					
	2011-2015	2011	2015	2011	2015	2011	2012	2013	2014	2015	2016
1. Total # of Crashes	11,001	1,000	1,951	108	108	108	108	108	108	108	108
2. # of Fatal Crashes	1,000	100	100	10	10	10	10	10	10	10	10
3. # of Nonfatal Injury Crashes	10,001	900	1,851	98	98	98	98	98	98	98	98
4. # of Property Damage Only Crashes	10,001	900	1,851	98	98	98	98	98	98	98	98
5. Total # of Fatalities	1,000	100	100	10	10	10	10	10	10	10	10
6. Total # of Injuries	10,001	900	1,851	98	98	98	98	98	98	98	98



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## County Road Safety Program Results

Over **80%** of Washington State Counties have local road safety plans now

**All** the plans were completed by county staff

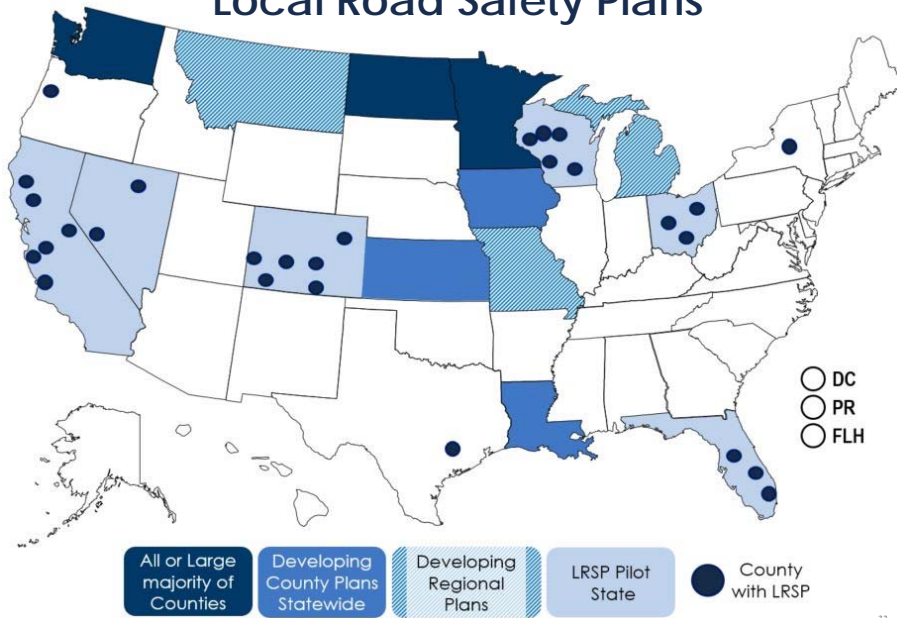
For more information contact Matthew Enders at  
[EndersM@wsdot.wa.gov](mailto:EndersM@wsdot.wa.gov) or visit  
<http://www.wsdot.wa.gov/LocalPrograms/Traffic/FedSafety.htm>



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## Local Road Safety Plans



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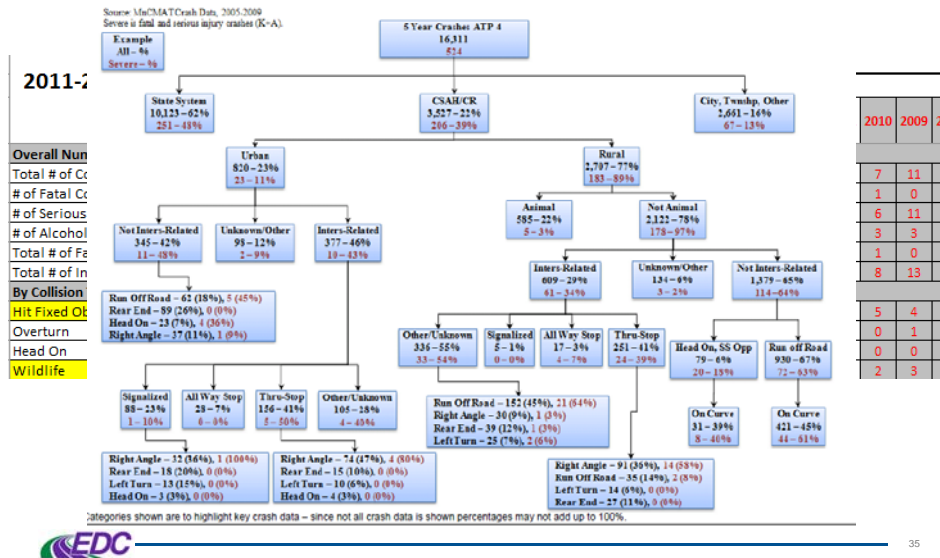
## Many Data Sources

*"Do what you can, with what you have, where you are."*  
 – Theodore Roosevelt



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## Quantitative Crash Analysis Methods



## Qualitative Approach to Risk

Use qualitative ratings when needed:

- *Good, Fair, Not-So-Good (curve radius, roadside, etc.)*
- *High, Medium, Low (traffic volumes, pedestrian volumes, crash frequency, etc.)*

It is important to include the risk factors that are key to your roadway network



### Poll question

- Do you have a data-driven plan for your agency to reduce rural roadway departures?
- If so, has it been useful to get projects funded?



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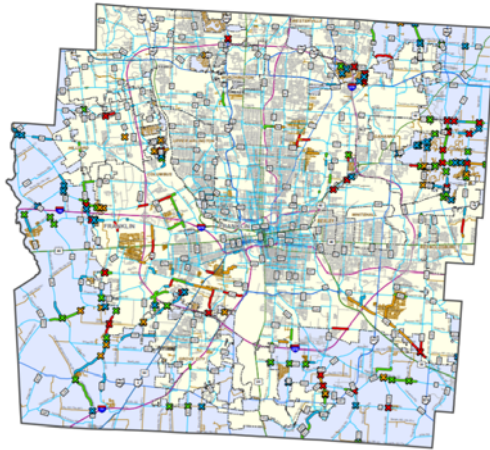


## FRANKLIN COUNTY ENGINEER'S OFFICE

### Roadway Departure Programs

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2018 County Road High Crash Locations  
Franklin County



Location Location Location

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Incremental approach from simple to expensive. Based primarily on the human factor's research of Ohio University researcher **Helmut Zwahlen**



Signs on both sides/speed bars/chevrons



Signs on both sides/ Flashing Signs



Small hot spot  
Small systemic



Raised Pavement Markers



6" Center and Edge Lines



Chevrons and Guardrail Reflectors

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## FRANKLIN COUNTY HIGH CRASH CURVES

Top Ten 2017 - Crash Rate Based



Crash curve rankings



Multi-disciplinary Safety Audits



Innovative/Active warning  
signs (w/Iowa State Research)



Medium hot spot  
Medium systemic

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Realignment of curves



Roundabout at intersection at curves




Large hot spot

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# THURSTON COUNTY

Local Road Safety Plan Case Example



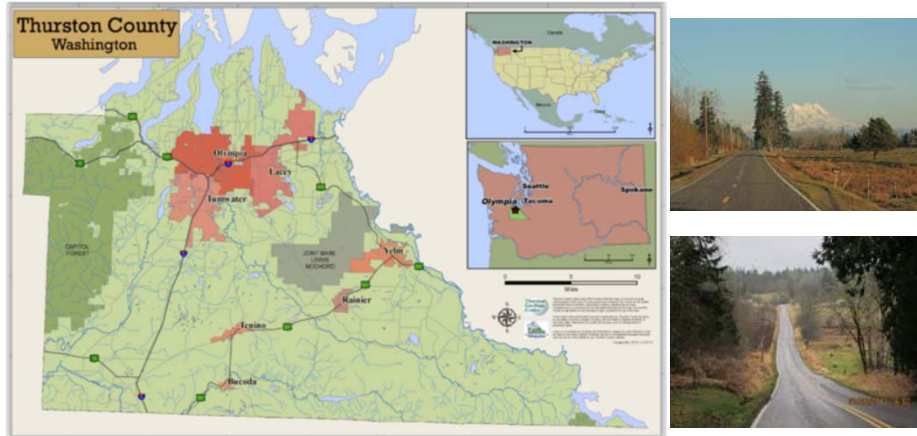

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Thurston County Public Works



## WHERE IS THURSTON COUNTY?



<https://www.thurstoncountywa.gov/tchome/Pages/default.aspx>



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Thurston County Public Works

## THURSTON COUNTY SAFETY FACTS

Thurston County maintains over 1000 miles of roads

131 severe crashes were reported from 2012 to 2016

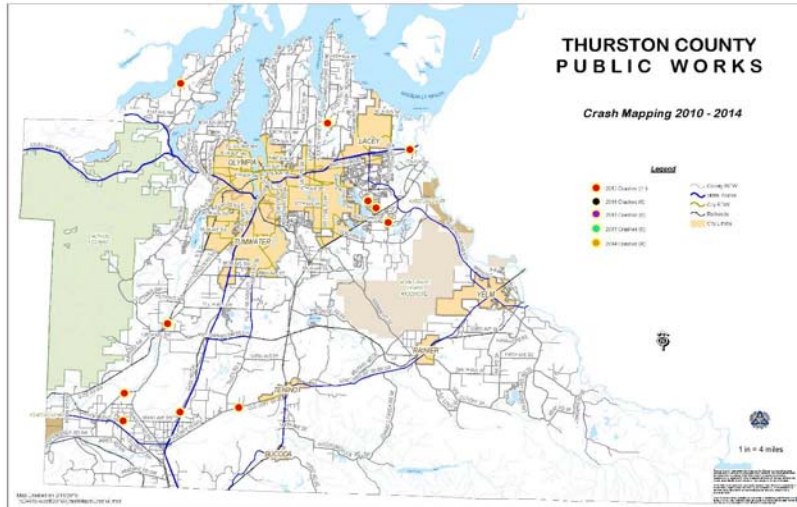
Over 70% of the severe crashes are reported to be lane departures



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Thurston County Public Works

## CRASH DATA CHALLENGES



Thurston County Public Works

## DATA ANALYSIS – SYSTEMIC SAFETY PROJECT SELECTION TOOL



<https://safety.fhwa.dot.gov/systemic/>



Thurston County Public Works



## EMPHASIS AREAS

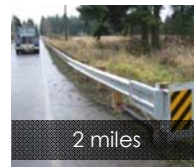
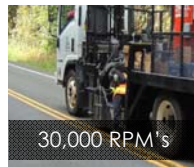
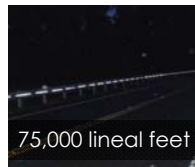
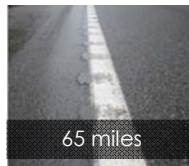
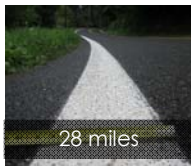
2006-2010 Collision Data	Fatal/Serious Injury Crashes Only		
	All Roads	All Counties	Thurston County
Angle (left-Turn)	16% (2175)	13% (468)	9% (16)
Intersection-Related	33% (4557)	22% (812)	19% (34)
Horizontal Curve	26% (3674)	39% (1419)	45% (80)



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Thurston County Public Works

## IMPLEMENTATION



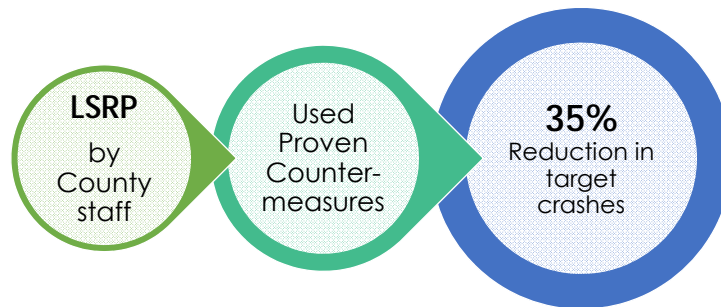
Note: Improvements were completed over several HSIP funding programs and also through local forces



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Thurston County Public Works

## RESULTS



### Thurston County Local Road Safety

For more information regarding Scott Davis at [davissa@co.thurston.wa.us](mailto:davissa@co.thurston.wa.us) or see case study at <https://safety.fhwa.dot.gov/systemic/tc.cfm>



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Thurston County Public Works

Center for Accelerating Innovation



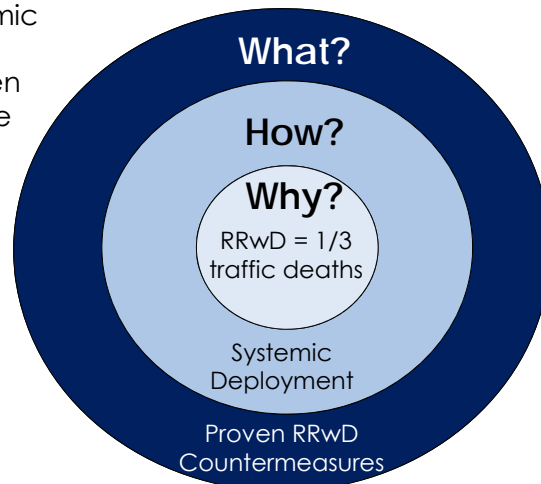
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## Poll question

- What data do you use?

## WHAT?

- Widespread, systemic deployment of underutilized proven roadway departure countermeasures



## Roadway Departure Objectives

1<sup>st</sup> - Keep vehicles on the road



2<sup>nd</sup> - Reduce the potential for crashes



3<sup>rd</sup> - Minimize the severity



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1<sup>st</sup> - Keep vehicles on the road

Improved curve delineation

Friction treatments in curves and other spot locations

Edge line, shoulder & center line rumble strips.



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## Improved Curve Delineation



### Chevron Signs:

**25% Reduction in nighttime crashes**

**16% Reduction in non-intersection fatal and injury crashes**



Source: CMF Clearinghouse, CMF IDs 2438 and 2439

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## High Friction Surface Treatment (HFST)

### Wet road crashes reduced

**52% on Curves**

**86% on Ramps**

### Total crashes reduced

**24% on Curves**

**35% on Ramps**



<http://www.fhwa.dot.gov/publications/research/safety/14065/14065.pdf>

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## Edge & Center Rumble Strips



**Center Line Rumble Strips**  
Head-on, opposite-direction,  
and sideswipe fatal and  
injury crashes reduced by  
**44-64%**



**Shoulder Rumble Strips**  
Reduction in Single vehicle,  
run-off-road fatal and injury  
crashes reduced by  
**13-51%**



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[http://safety.fhwa.dot.gov/roadway\\_dept/pavement/rumble\\_strips/t504040/](http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504040/)  
[http://safety.fhwa.dot.gov/roadway\\_dept/pavement/rumble\\_strips/t504039/](http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504039/)

## 2<sup>nd</sup> - Reduce the potential for crashes

SafetyEdge<sup>SM</sup>

Maintained clear zones

Traversable roadside slopes



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## SafetyEdge<sup>SM</sup>



With SafetyEdge



Without SafetyEdge

### Crash Reduction Factors

Drop-off's crashes **34%**  
Head-on crashes **19%**

Run-off-Road crashes **21%**  
Fatal and injury crashes **11%**

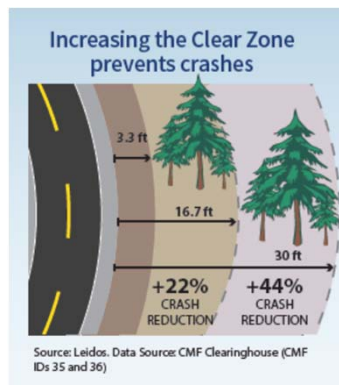


[https://safety.fhwa.dot.gov/provencountermeasures/safety\\_edge/fhwa17044/](https://safety.fhwa.dot.gov/provencountermeasures/safety_edge/fhwa17044/)

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## Establish and Maintain Clear Zones

AASHTO Definition — The unobstructed, traversable area provided beyond the edge of the through traveled way for the recovery of errant vehicles



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## Traversable Roadside Slopes

Slopes that are flatter than 3H:1V are traversable

- 1V:2H to 1V:4 H → **10%** reduction in SVROR
- 1V:3H to 1V:6 H → **19%** reduction in SVROR



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Source: AASHTO Highway Safety Manual

## 3<sup>rd</sup> - Minimize the severity

### Breakaway Features

- Signs and luminaire supports
- Utility poles

### Barriers to shield obstacles including:

- Trees and shrubbery
- Other fixed objects
- Slopes



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## Polling Questions on systemic application

- Which of the following have you applied systemically on rural roads?
- For the ones you did not select, what are the reasons?



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## EDC-5 Offerings and Products

### Technical Assistance

- Local and Regional Safety Action Plans
- Systemic analysis
- Peer exchanges
- Focus groups on implementation

### Training

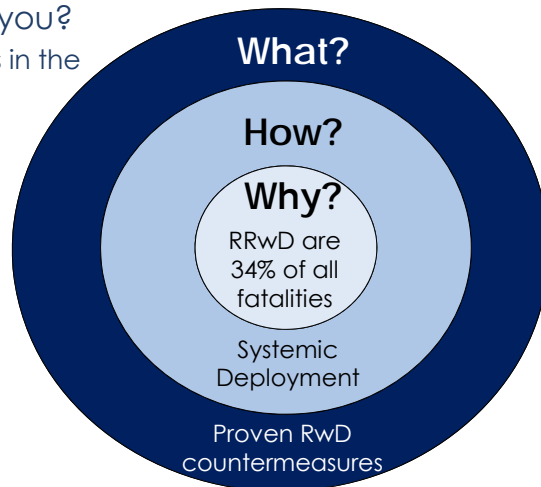
- Webinars
- Existing, revised, and new training
- Train-the-trainer
- LTAP resource packet



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## Poll Question

- How can we help you?
- Please type your answers in the chat pod



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## EDC-5 Funding Opportunities:

### ☐ **State Transportation Innovation Council (STIC) Incentive**

- ✓ Up to \$100,000 per STIC per year to standardize an innovation
- ✓ <https://www.fhwa.dot.gov/innovation/stic/>

### ☐ **Accelerated Innovation Deployment (AID) Demonstration**

- ✓ Up to \$1 million available per year to deploy an innovation not routinely used
- ✓ <https://www.fhwa.dot.gov/innovation/grants/>

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## Innovation Deployment News



Weekly newsletter



Bi-monthly magazine

To Subscribe:

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