Making Safe Systems a Reality: Planning to Implementation

A Rural Highway Perspective

Victor Lund, PE, PTOE
Traffic Engineer
St. Louis County, MN
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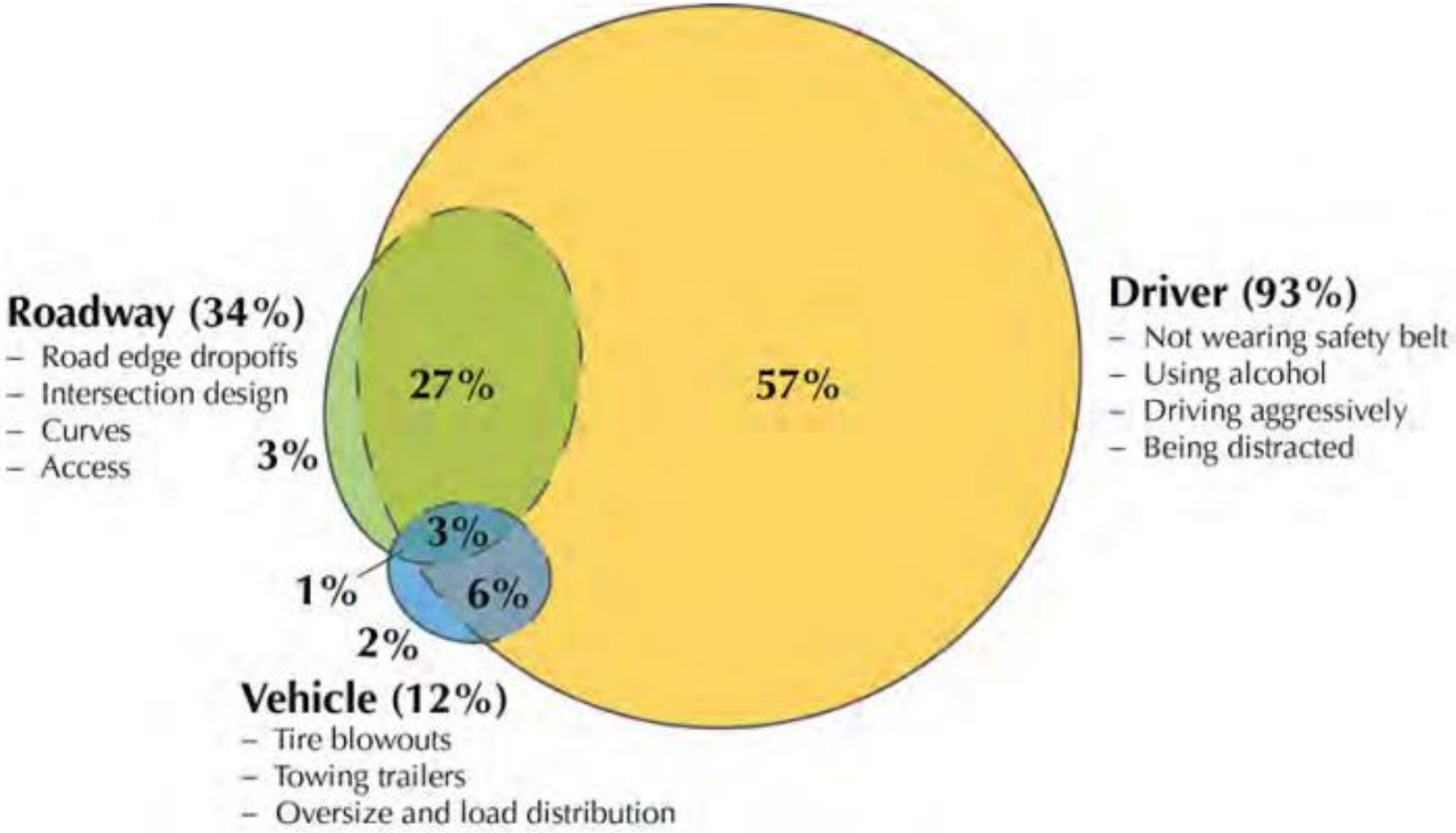
SAINT LOUIS COUNTY MINNESOTA

Crash Causation Factors

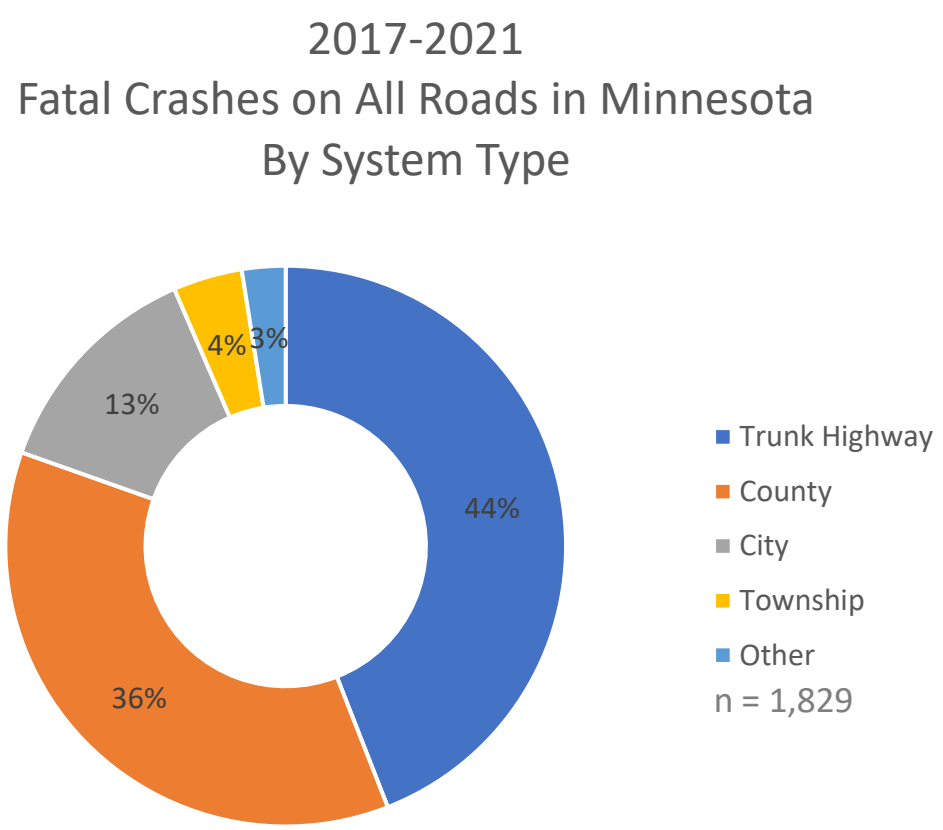
In this example, roadways are the sole contributing factor in 3% of crashes and the roadway and driver interaction is the factor in 27% of crashes.



The Role of Perceptual and Cognitive Filters in Observed Behavior, Kåre Rumar, 1985

Source: Minnesota Traffic Safety Fundamentals Handbook, Pg. A-7

Snapshot of the Problem in Minnesota

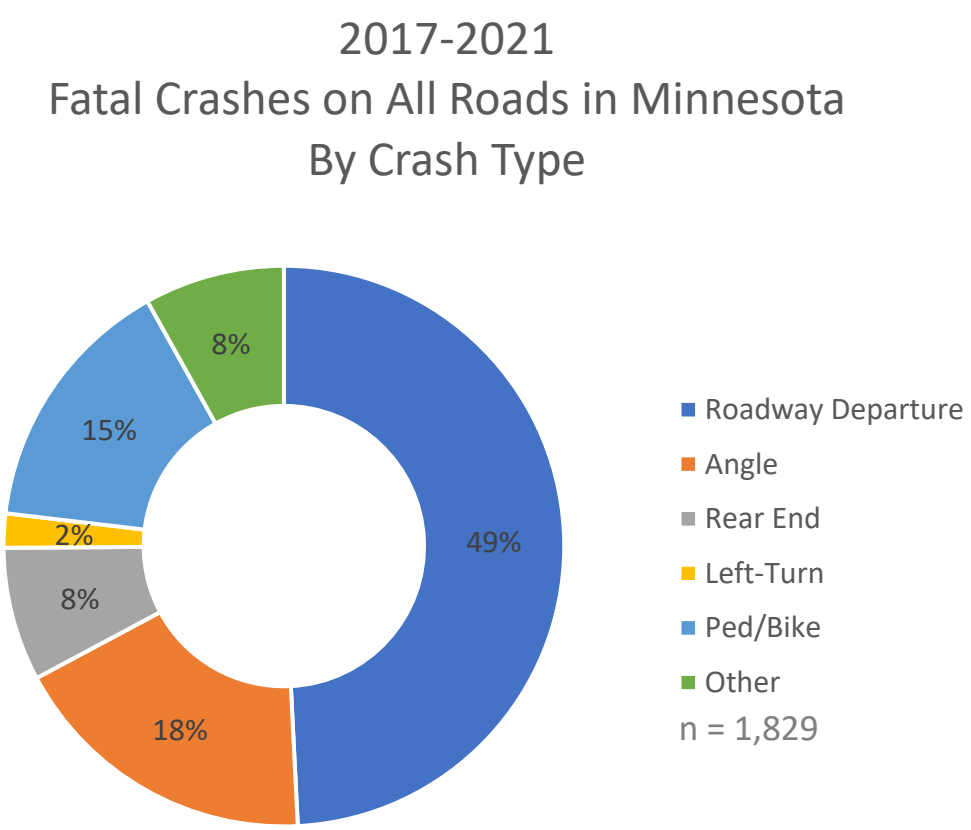


- 80% of all fatal crashes occur on the state and county systems.
- 53% of all fatal crashes are in rural Minnesota*.
- 60% of fatal crashes on the state and county systems are in rural Minnesota*.

Source: Minnesota CMAT

*Located outside of a city boundary.

Snapshot of the Problem in Minnesota



- Roadway departure type crashes generate the most fatal crashes.
- Roadway departure and angle type crashes represent 67% of all fatal crashes.

Source: Minnesota CMAT

Snapshot of the Problem in Minnesota

2017-2021 Crash Density by System Type

System Type	Miles[1]	Fatal Crashes[2]	Serious Crashes[2]	Fatal Crash Density[3]	Serious Crash Density[3]
Interstate	*914*	*130*	*389*	*0.028*	*0.085*
US Highway	*3,215*	*233*	*753*	*0.014*	*0.047*
State Trunk Highway	*7,549*	*443*	*1,340*	*0.012*	*0.036*
State Total	**11,678**	**806**	**2,482**	**0.014**	**0.043**
County State Aid Highway	*30,671*	*590*	*3,214*	*0.004*	*0.021*
County Road	*13,855*	*75*	*306*	*0.001*	*0.004*
County Total	**44,526**	**665**	**3,520**	**0.003**	**0.016**
City	**23,149**	**239**	**2,103**	**0.002**	**0.018**
Township	**55,548**	**73**	**411**	**0.000**	**0.001**
Other	**7,964**	**46**	**282**	**0.001**	**0.007**

1. MnDOT Roadway Data dated February 11, 2022
2. Reported from Minnesota CMAT
3. Crashes/mile/year

You would have to wait 333 years for the next fatal crash on an average 1-mile segment on the county road system.

You would have to wait 71 years for the next fatal crash on an average 1-mile segment on the state system.

What is the problem? Where do we go?

- It is…centered on the State and County highway systems.
- It is…mostly a rural phenomenon.
- It is…mostly composed of roadway departure and angle crashes.

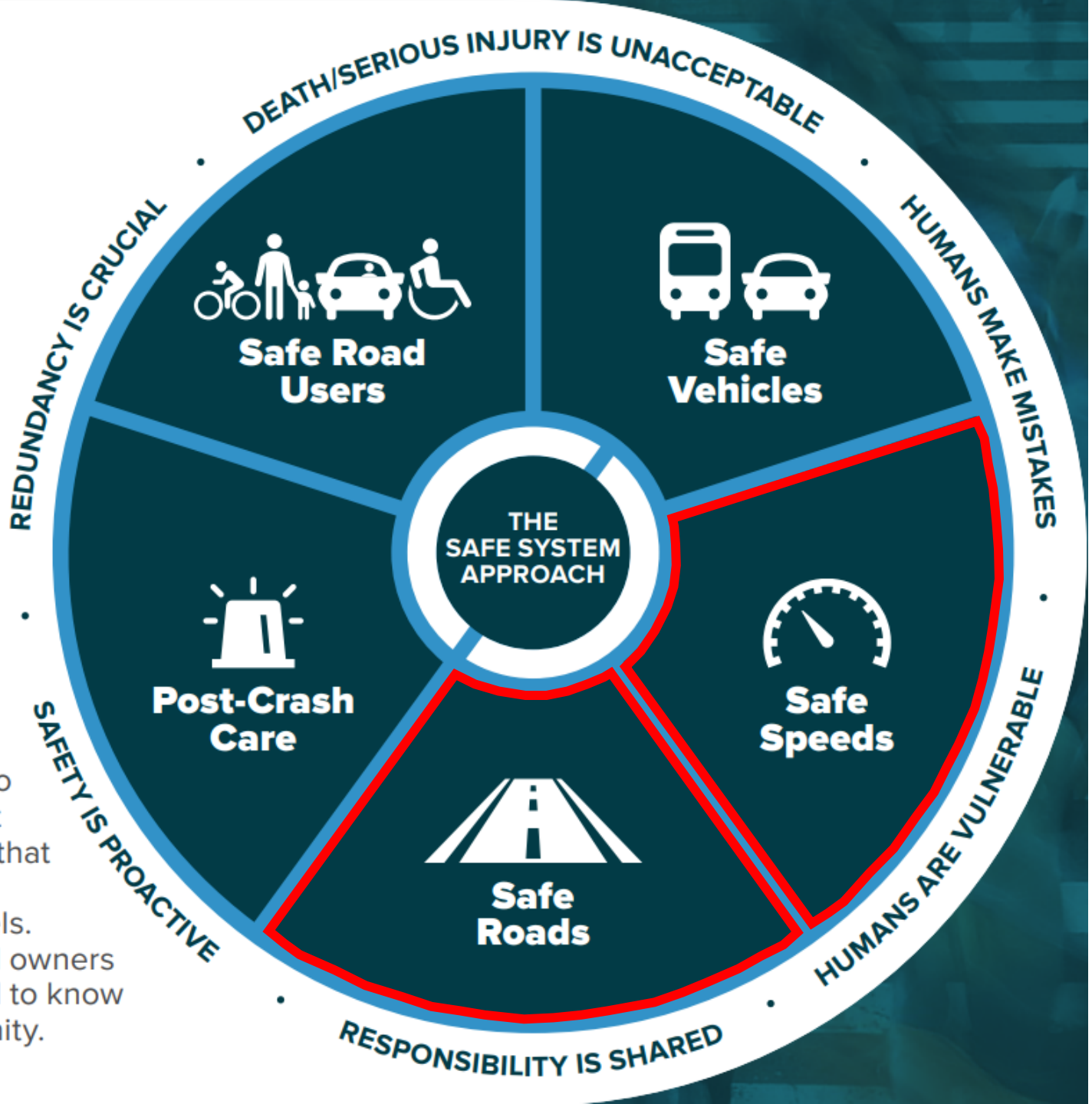
- Reactive to Proactive
- Localized to Systemic
- Events Based to Risk Based

THE SAFE SYSTEM

APPROACH

Zero is our goal. A Safe System is how we will get there.

Imagine a world where nobody has to die from vehicle crashes. The Safe System approach aims to eliminate fatal & serious injuries for all road users. It does so through a holistic view of the road system that first anticipates human mistakes and second keeps impact energy on the human body at tolerable levels. Safety is an ethical imperative of the designers and owners of the transportation system. Here's what you need to know to bring the Safe System approach to your community.



Source: FHWA Safe System Approach Flyer

Safe Road Users

The Safe System approach addresses the safety of all road users, including those who walk, bike, drive, ride transit, and travel by other modes.

Safe Vehicles

Vehicles are designed and regulated to minimize the occurrence and severity of collisions using safety measures that incorporate the latest technology.

Safe Speeds

Humans are unlikely to survive high-speed crashes. Reducing speeds can accommodate human injury tolerances in three ways: reducing impact forces, providing additional time for drivers to stop, and improving visibility.

Safe Roads

Designing to accommodate human mistakes and injury tolerances can greatly reduce the severity of crashes that do occur. Examples include physically separating people traveling at different speeds, providing dedicated times for different users to move through a space, and alerting users to hazards and other road users.

Post-Crash Care

When a person is injured in a collision, they rely on emergency first responders to quickly locate them, stabilize their injury, and transport them to medical facilities. Post-crash care also includes forensic analysis at the crash site, traffic incident management, and other activities.

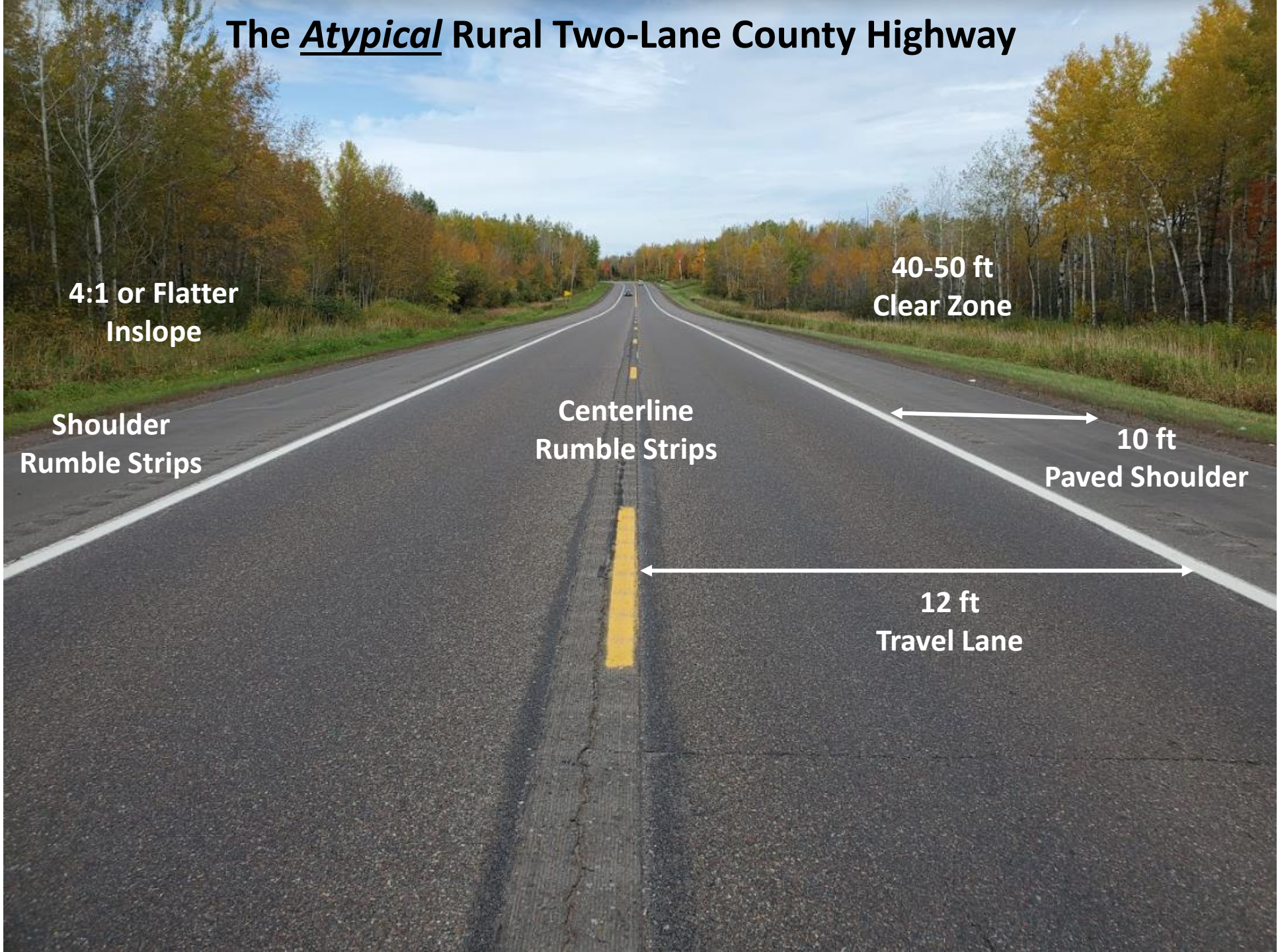
Vehicles will be operated by people for the foreseeable future.

The rural highway system will always have high speeds (high kinetic energy).

Most of the rural county highway system will never be reconstructed to meet modern engineering standards.

Source: FHWA Safe System Approach Flyer

The *Atypical* Rural Two-Lane County Highway



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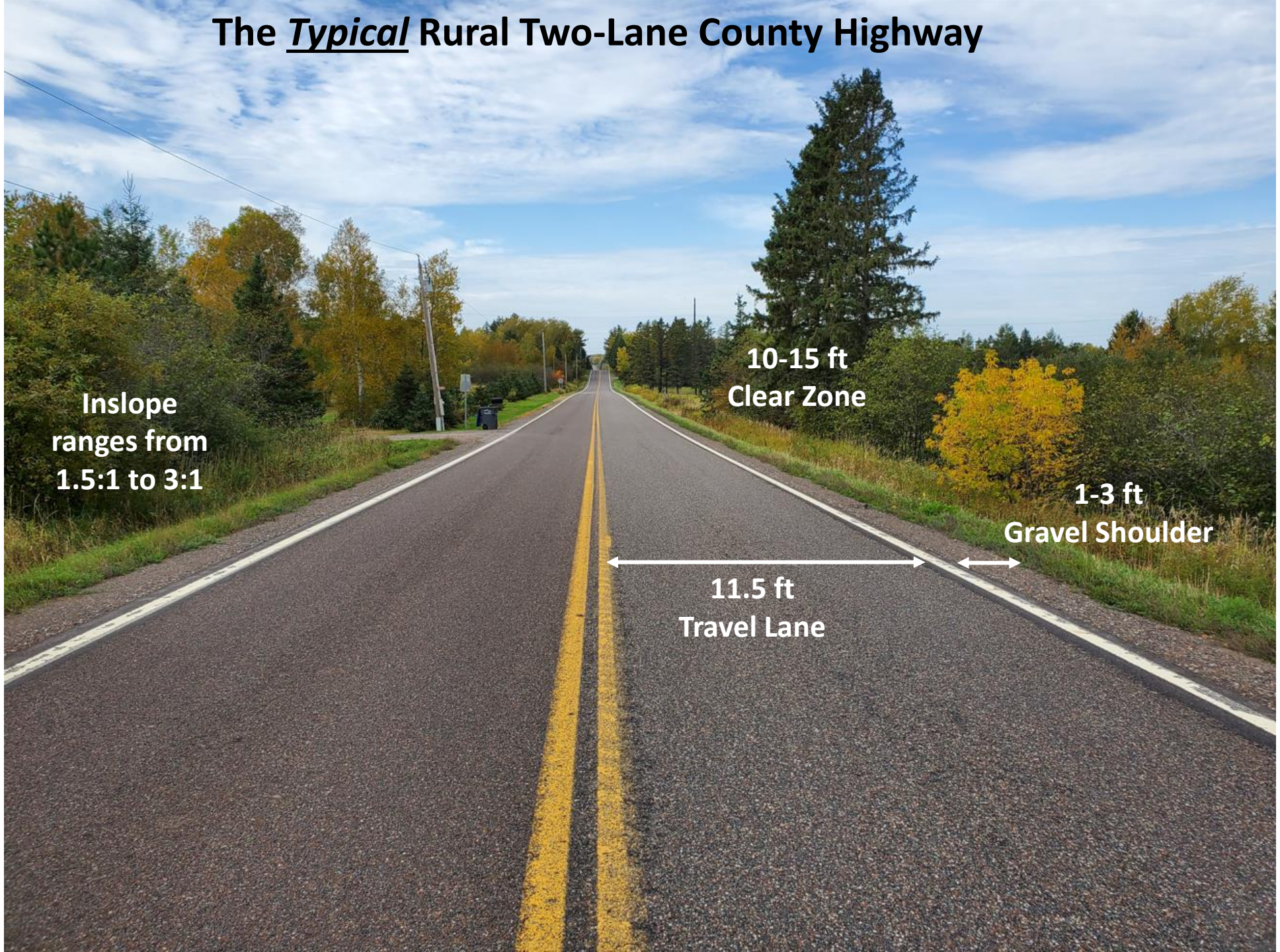


SAFE SYSTEM PRINCIPLES

Death/Serious Injury is Unacceptable

While no crashes are desirable, the Safe System approach prioritizes crashes that result in death and serious injuries, since no one should experience either when using the transportation system.

Humans Make Mistakes

People will inevitably make mistakes that can lead to crashes, but the transportation system can be designed and operated to accommodate human mistakes and injury tolerances and avoid death and serious injuries.

Humans Are Vulnerable

People have limits for tolerating crash forces before death and serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates human vulnerabilities.

Responsibility is Shared

All stakeholders (transportation system users and managers, vehicle manufacturers, etc.) must ensure that crashes don't lead to fatal or serious injuries.

Safety is Proactive

Proactive tools should be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards.

Redundancy is Crucial

Reducing risks requires that all parts of the transportation system are strengthened, so that if one part fails, the other parts still protect people.

Source: FHWA Safe System Approach Flyer

Resolution
of the
Board of County Commissioners
St. Louis County, Minnesota
Adopted on: September 13, 2016 Resolution No. 16-569
Offered by Commissioner: Boyle

Implementation of the County Road Safety Plan and other Highway Safety Strategies on the St. Louis County Road System

WHEREAS, The first priority listed in the St. Louis County Public Works Department mission statement is safety; and

WHEREAS, St. Louis County believes that traffic-related deaths on St. Louis County Roads are unacceptable and is supportive of and active in the Minnesota Toward Zero Deaths partnership; and

WHEREAS, St. Louis County has been recognized by the Minnesota Department of Transportation as a champion of implementing its County Road Safety Plan with its investment of $3.8 million in highway safety projects between 2009 and 2015 on St. Louis County Roads; and

WHEREAS, As a result of the cumulative efforts of educators, enforcement, engineering and emergency response professionals, there has been a 57 percent reduction in serious crashes on St. Louis County Roads between the years of 2003 and 2015; and

WHEREAS, St. Louis County plans to invest $6.2 million in additional highway safety projects between 2016 and 2020 to further reduce serious crashes on County Roads; and

WHEREAS, St. Louis County intends to update its County Road Safety Plan in cooperation with the Minnesota Department of Transportation to identify additional highway safety strategies;

THEREFORE, BE IT RESOLVED, That the St. Louis County Board of Commissioners fully supports the efforts of the Public Works Department to continue the implementation of the County Road Safety Plan and other highway safety strategies through multiple funding sources on St. Louis County Roads;

RESOLVED FURTHER, That the St. Louis County Board authorizes the Public Works Director/Highway Engineer to apply for and accept highway safety related grants from federal, state and other sources that are consistent with implementation of the County Road Safety Plan.

Commissioner Boyle moved the adoption of the Resolution and it was declared adopted upon the following vote:
Yeas – Commissioners Jewell, Boyle, Dahlberg, Rukavina, Stauber, Nelson and Chair Raukar – 7
Nays – None

STATE OF MINNESOTA
Office of County Auditor, ss.
County of St. Louis

I, **DONALD DICKLICH**, Auditor of the County of St. Louis, do hereby certify that I have compared the foregoing with the original resolution filed in my office on the 13th day of September, A.D. 2016, and that this is a true and correct copy.

WITNESS MY HAND AND SEAL OF OFFICE at Duluth, Minnesota, this 13th day of September, A.D., 2016.

DONALD DICKLICH, COUNTY AUDITOR

By

Deputy Auditor/Clerk of the County Board

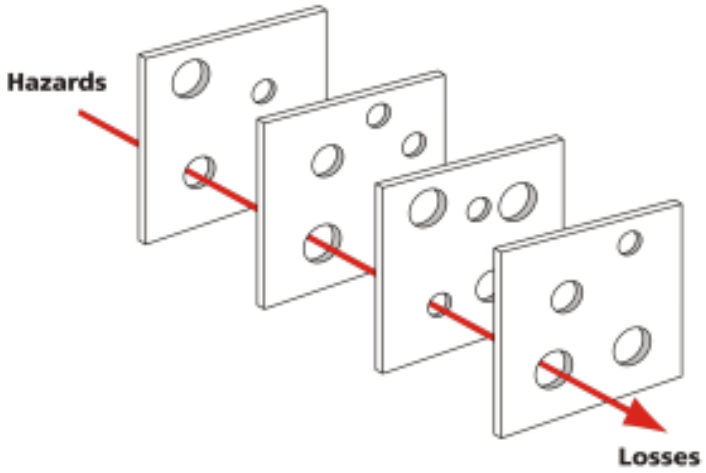
A Traffic Safety Program Model

Future Crash Event

Reactive Approach (Traditional)

Proactive Approach (Systemic)

System Wide Approach (Systematic)



Reactive Approach (Traditional)

- Focus on high crash locations that exceed familial system averages.
- Tend to be higher cost projects.
- Projects are selected that meet or exceed a minimum benefit/cost value.

→ **High Impact, Limited Coverage**

Reactive Approach (Traditional)

- Example rural projects…
  - Reduced Conflict Intersections (RCIs)
  - Roundabouts
  - Left-turn lanes
  - Single-T curves
  - Regrade for larger curve radius
  - Regrade for paved shoulders
  - Regrade to improve intersection sight distance
  - Realign intersection to remove skew
  - Railroad crossing closures and grade separations
  - Separated trails

Proactive Approach (Systemic)

- Focus on presence of risk factors.
- Tend to be lower cost projects.
- Projects are selected if they contain a higher number of risk factors.

Low to Medium Impact, Greater Coverage

Proactive Approach (Systemic)

- Example rural projects…
  - Curve warning signing
  - 6-inch edgeline markings (including wet-reflective)
  - High Friction Surface Treatment (HFST)
  - Shoulder and centerline rumble strips
  - Intersection lighting
  - Upgrade pavement markings and signing at intersections

System Wide Approach (Systematic)

- Policy based.
- Cost varies widely based upon project type and packaging.
- Typically incorporated into construction or maintenance type projects.

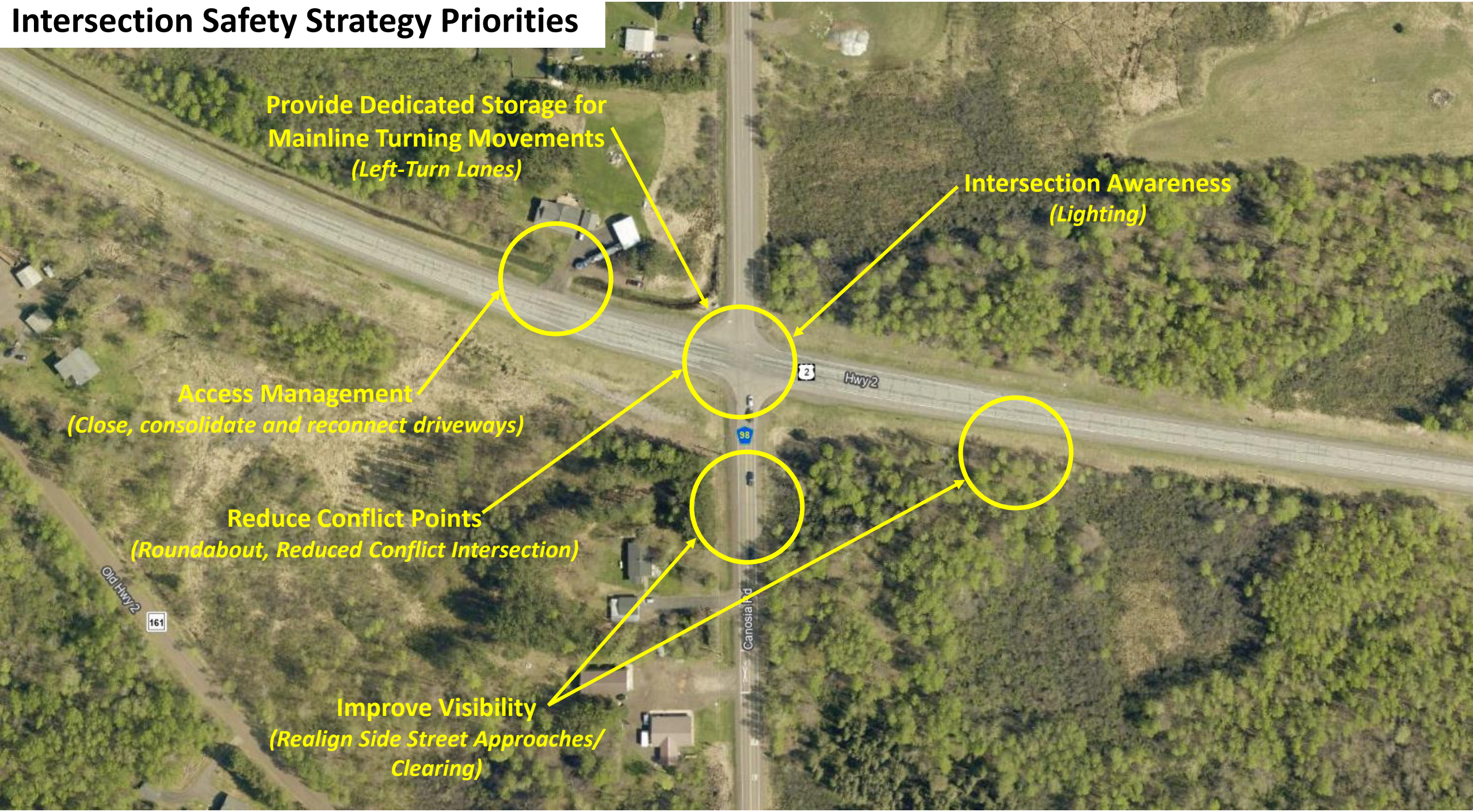
→ **Low to Medium Impact, Greatest Coverage**

System Wide Approach (Systematic)

- Example rural projects…
  - Roadside clearing (tree removal)
  - Pavement safety edge
  - Guardrail installation/upgrades
  - Sign maintenance and management (implement a sign policy)
  - 6-inch edgeline markings (consider by system type)
  - Shoulder and centerline rumble strips (consider by system type)
  - Curve warning signing

Roadway Departure Safety Strategy Priorities

Intersection Safety Strategy Priorities



Questions?

Victor Lund, PE, PTOE
Traffic Engineer
St. Louis County, Minnesota
218-625-3873
lundv@stlouiscountymn.gov

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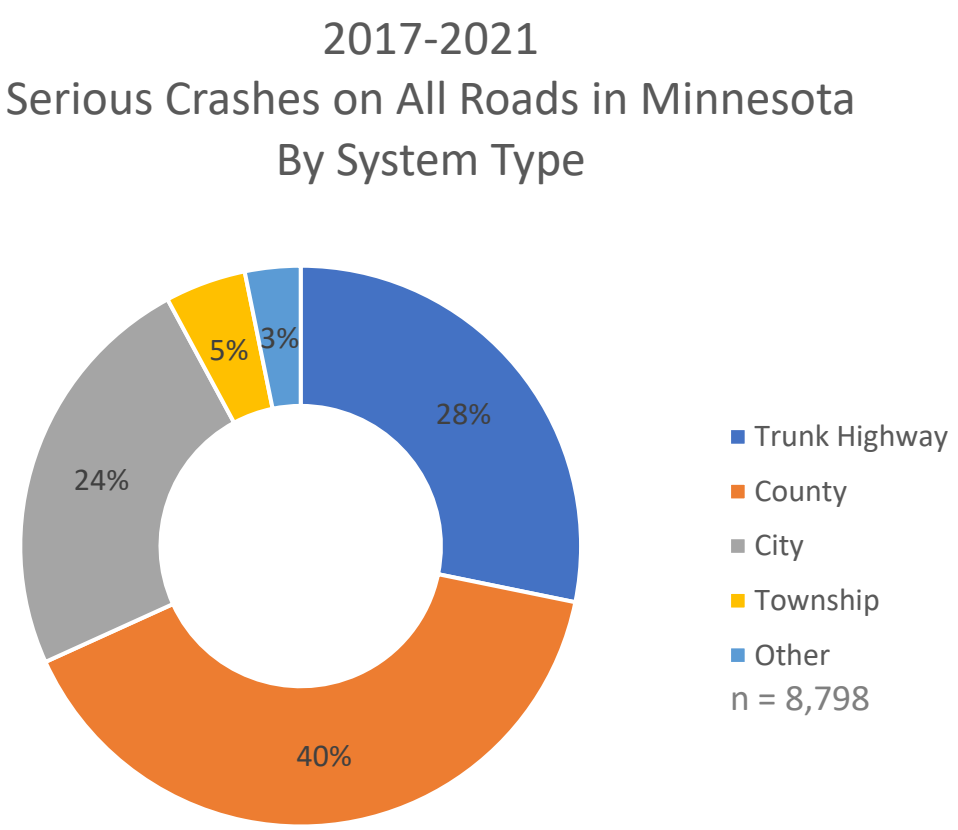

- 68% of all serious crashes occur on the state and county systems.
- 41% of all serious crashes occur in rural Minnesota*.
- 53% of serious crashes on the state and county systems occur in rural Minnesota*.

Source: Minnesota CMAT

Serious crashes defined as incapacitating injury or fatality.
*Located outside of a city boundary.

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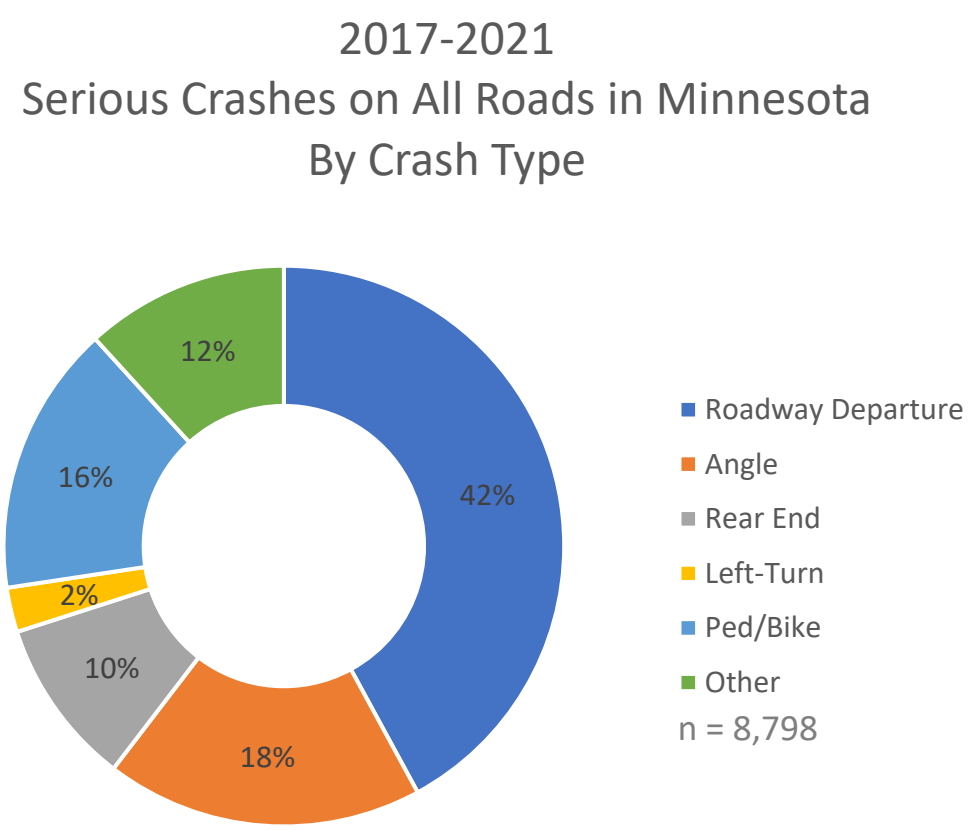

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