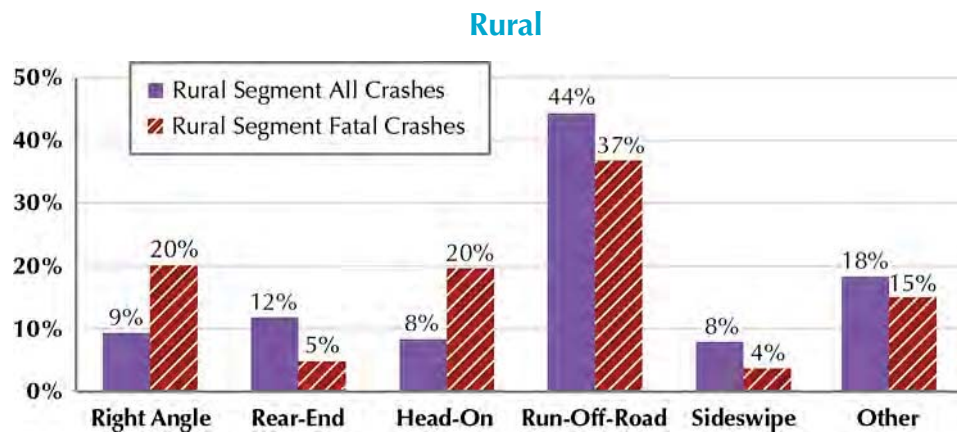
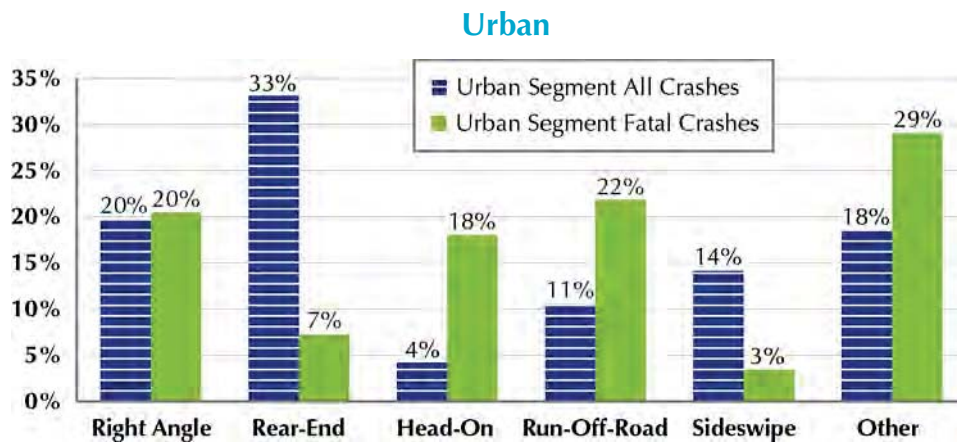


# Roadway Segment Crash Distribution by Rural vs. Urban

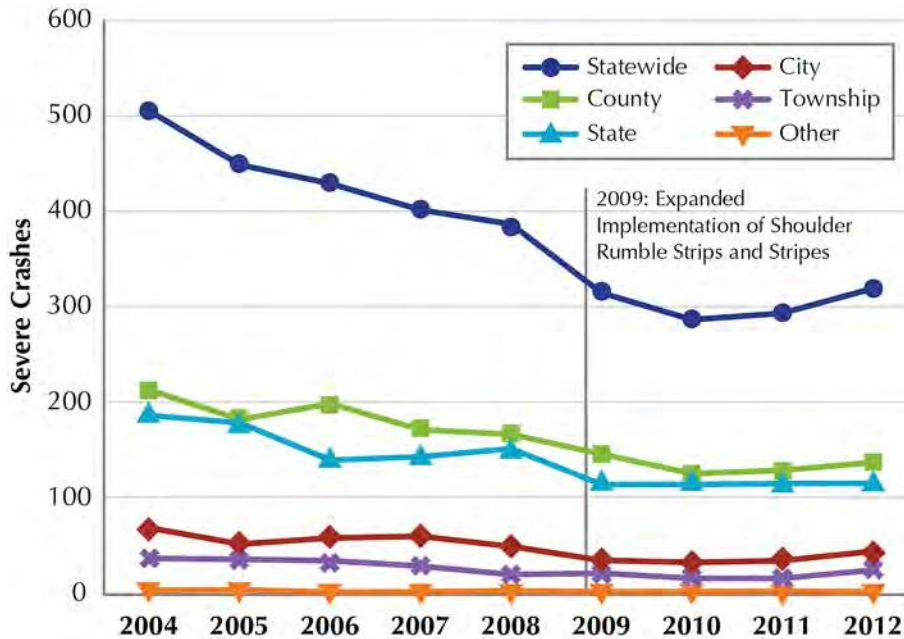


Minnesota Crash Mapping Analysis Tool, 2009-2013

## Highlights

- There is a significant difference in the types of crashes that occur on urban versus rural roads.
- Urban crashes are predominately two-vehicle (about 85%), and rural crashes are predominately single-vehicle (about 55%).
- The most common types of urban crashes include:
  - Rear-end – 33% of all crashes and 7% of fatal crashes
  - Right angle – 20% of all crashes and 20% of fatal crashes
- The most common types of rural crashes include:
  - Run-off-road – 44% of all crashes and 37% of fatal crashes
  - Rear-end – 12% of all crashes and 5% of fatal crashes
  - Right angle – 9% of all crashes and 20% of fatal crashes
- Some types of crashes are more severe than others. Only 8% of all rural crashes involve head-on collisions, but they account for 20% of the fatal crashes.
- Deer hits are underreported because they rarely result in injury to vehicle occupants. A conservative estimate is that as many as 24% of rural crashes involve hitting a deer. State Farm Insurance estimates indicate that there were approximately 40,000 deer hits in Minnesota in 2012. For more information about collisions involving a deer, see [www.deercrash.org](http://www.deercrash.org).
- The distribution of crashes reinforces the safety priorities established for both State and local system roadways – right angle and rear-end crashes in urban areas and run-off-road, right angle and head-on in rural areas.

# Infrastructure Focus Area – Lane Departure



2014-2019 Minnesota Strategic Highway Safety Plan

## Highlights

- Lane departure-related crashes account for approximately 45% of all severe crashes in Minnesota.
- The number of lane departure-related crashes fell steadily between 2004 and 2011 and then increased slightly.
- Roadway features that contribute to lane departure crashes include the lack of useable shoulders, steep slopes, and fixed objects in the ditches. One additional feature, the presence of curves, especially those with radii under 1,200 feet, is associated with single vehicle road departure crashes. On the county system more than one-half of these crashes occur along curves and approximately one-third of the state system.
- In response to these crashes, the State and County agencies implemented various lane departure safety strategies such as edgeline and centerline rumble strips and the addition of chevrons along rural horizontal curves.
- Disaggregated by system, County roadways have the greatest number of lane departure-related crashes, followed by State highways.

# Effectiveness of Safety Strategies

**Proven**

**Education**

- Graduated Drivers Licensing
- Safety Belt Enforcement Campaigns
- DWI Checkpoints
- Street Lights at Rural Intersections
- Access Management
- Roadside Safety Initiatives

**Enforcement**

- Pave/Widen Shoulders
- Roundabouts
- Exclusive Left Turn Signal Phasing
- Shoulder Rumble Strips
- Improved Roadway Alignment
- Cable Median Barrier

**Engineering**

- Removing Unwarranted Traffic Signals
- Removing Trees in Hazardous Locations
- Pedestrian Crosswalks, Sidewalks, and Refuge Islands
- Left Turn Lanes on Urban Arterial

**Tried**

**Engineering**

- Rumble Strips (on the approach to intersections)
- Neighborhood Traffic Control (Traffic Calming)
- Overhead Red/Yellow Flashers
- Increased Levels of Intersection Traffic Control
- Indirect Left Turn Treatments
- Restricting Turning Maneuvers
- Pedestrian Signals
- Improve Traffic Control Devices on Minor Intersection Approaches

**Experimental**

**Engineering**

- Turn and Bypass Lanes at Rural Intersections
- Dynamic Warning Devices at Horizontal Curves
- Static/Dynamic Gap Assistance Devices
- Delineating Trees in Hazardous Locations
- Marked Pedestrian Crosswalks at Unsignalized Intersections

## Highlights

- Traffic engineers have historically had a “tool box” of strategies that could be deployed to address safety concerns. The results of recent safety research studies suggest that the process for originally filling the tool box appears to have been primarily based on anecdotal information.
- The recent research efforts have subjected a number of safety measures to a comprehensive package of comparative and before vs. after analyses and rigorous statistical tests. The results of this research indicate that some safety measures should be kept in the tool box, some removed, some new measures added, and some continued to be studied.
- The 22 volumes that make up the NCHRP Series 500 Reports – Implementation of AASHTO’s Strategic Highway Safety Plan – identify over 600 possible safety strategies in categories including driver behavior (speeding, safety belt usage and alcohol), infrastructure related improvements (to reduce head-on, road departure, and intersection crashes) and providing emergency medical services.
- These NCHRP Reports have designated each of the strategies as either Proven (as a result of a rigorous statistical analysis), Tried (widely deployed but no statistical proof of effectiveness), or Experimental (new techniques or strategies and no statistical proof).
- It should be noted that virtually all of the strategies that have been designated in the NCHRP Series 500 Reports as either Proven, Tried, or Experimental are associated with engineering activities. This is due to the lack of published research quantifying the crash reduction effects of strategies dealing with education, enforcement, and emergency services.

# Effectiveness of Roadside Safety Initiatives



NOW	THEN		NOW	NOW
11.2	11.2	Length (Miles)	11.2	11.2
9	23	Total Crashes (5 Years)	51	10
3	11	PDO Crashes	25	5
5	12	Injury Crashes	26	5
1	0	Fatal Crashes	0	0
575	1,100	Volume (VPD)	1,100	1,200
11.75	22.48	MVM	22.48	24.53
0.8	1.0	Crash Rates (Crashes/MVM)	2.3	0.4
1.5	1.5	Severity Rate	4.1	0.7
1.0	1.3	Critical Crash Rates	1.3	0.9
3 (33%)	10 (43%)	SVRD Crashes	37 (73%)	8 (80%)
2	3	Hit Trees	30	3
0	8 (35%)	Passing Crashes	3 (6%)	0
4	2	Angle Crashes	4	1
2	6	Deer Hits	1	1
0	10 (43%)	Night	21 (41%)	4 (40%)

PDO Property Damage Only  
VPD Vehicles Per Day

MVM Million Vehicle Miles  
SVRD Single Vehicle Road Departure

Minnesota Crash Mapping Analysis Tool

## Highlights

- An estimate of the safety implications by evaluating two very similar segments of two-lane rural trunk highways in northern Minnesota: TH 6 and TH 38.
- Both roads have the following similar characteristics:
  - Have low volumes
  - Serve similar functions (recreational and logging)
  - Traverse the Chippewa National Forest
  - Have scenic qualities
- In 2008, TH 6 had been reconstructed and TH 38 had not. (Note: This segment of TH 38 has recently been reconstructed but a Before vs. After Study has not been completed.)
- The differences in crash characteristics TH 38 had are substantial:
  - More than twice as many crashes
  - More than twice as many injuries
  - A crash rate more than twice the average for two-lane rural roads (and 30% greater than the critical rate)
  - Almost four times as many SVRD crashes (and more than three the average for similar roads).
  - Ten times as many tree hits
  - More than twice as many nighttime crashes
- TH 38 has since been reconstructed and the crash reduction has been substantial – almost 80% reduction in the number and rate of crashes. TH 38 now has safety characteristics below the norms for similar roadways.
- During the same time period, TH 6 also experienced a crash reduction consistent with statewide trends and continues to operate within the typical range for two-lane rural roadways.