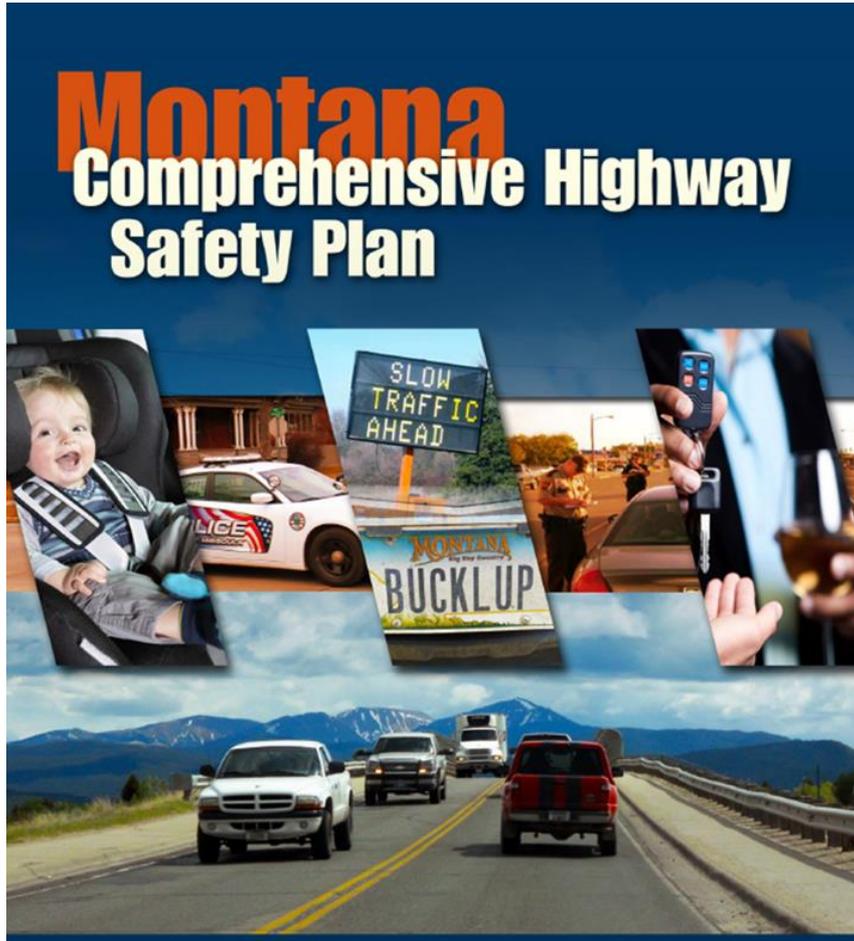


Roadway Departure & Intersection Crashes Emphasis Area



Roadway Departure & Intersection
Crashes Emphasis Area
The Gateway Center- Helena, MT
October 29, 2015

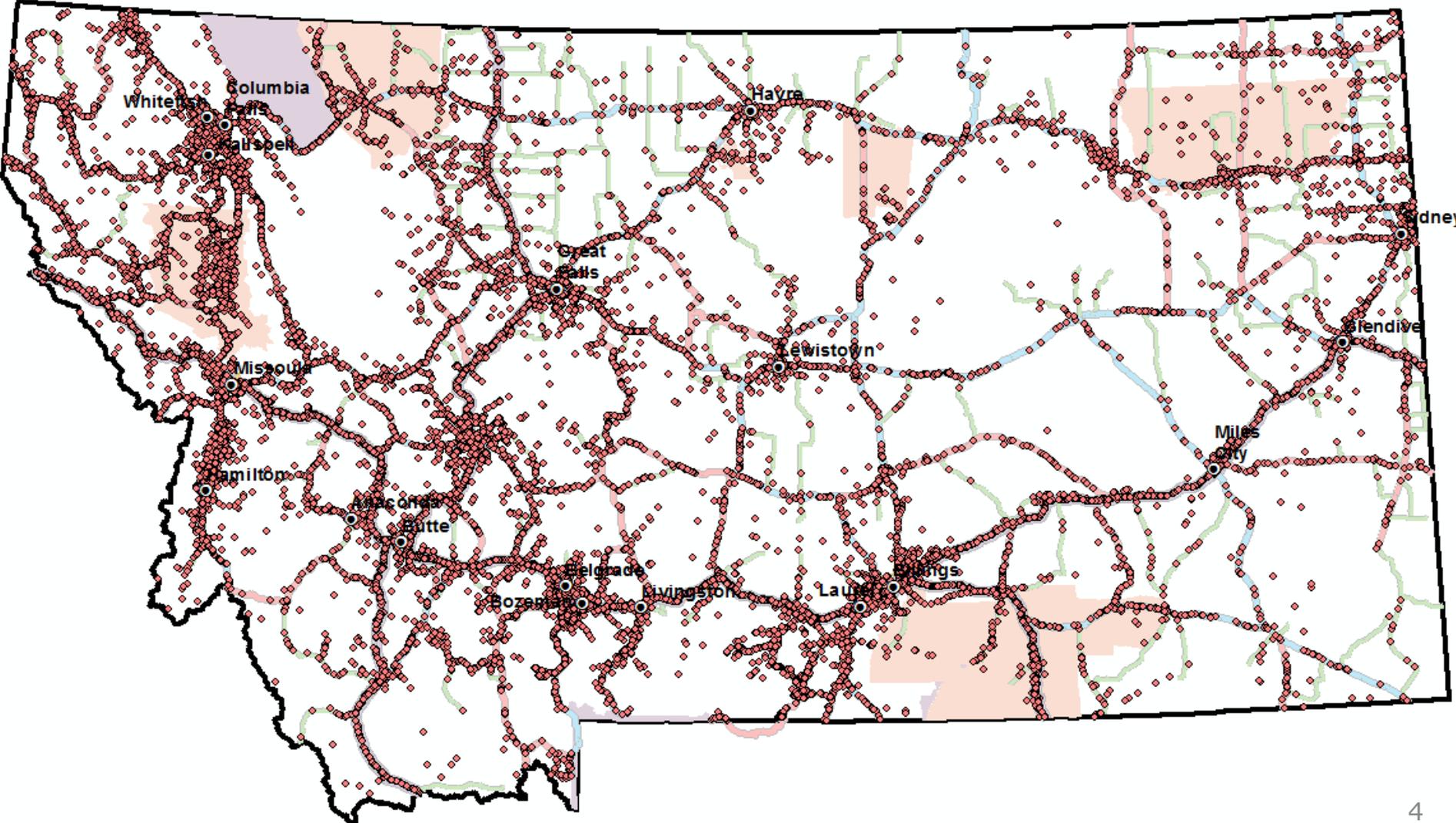
Roy Peterson, Bureau Chief,
Traffic & Safety - Engineering
Montana Department of
Transportation

Roadway Departure & Intersection Crashes Emphasis Area Team

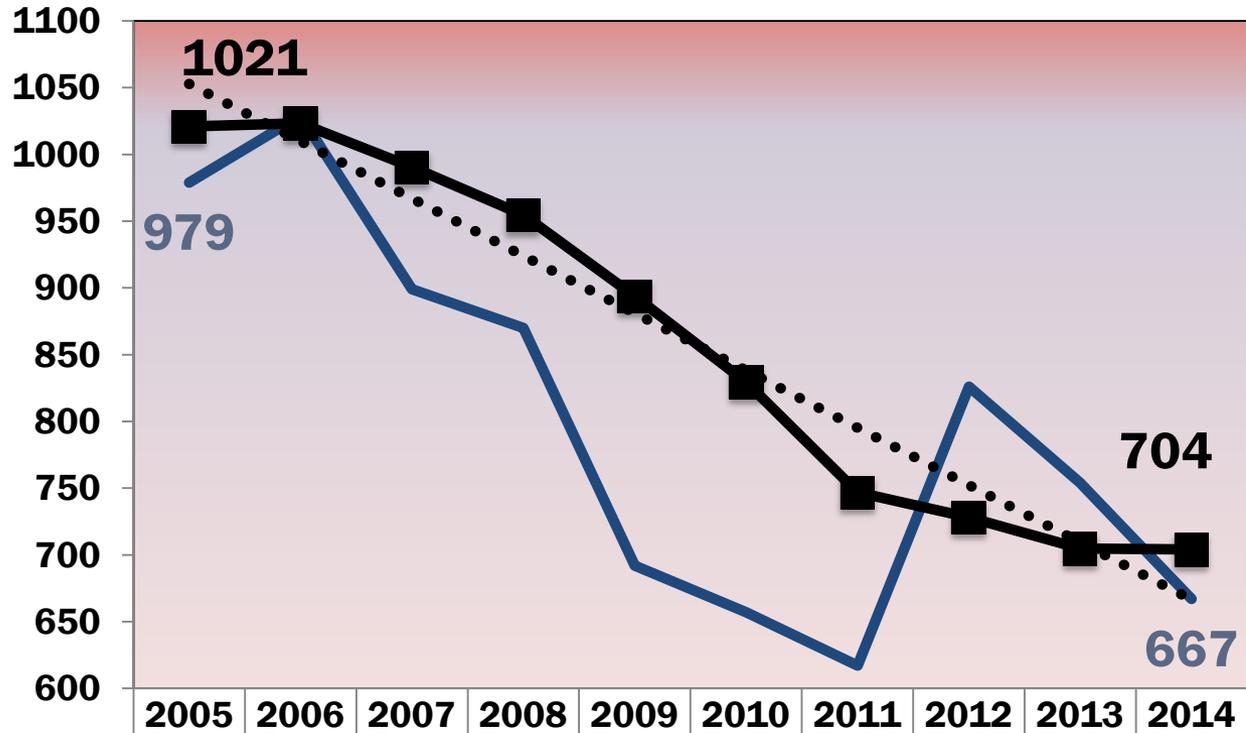
Safety Issues

Roadway departure crashes account for more than **two-thirds** of all Montana's roadway fatalities.

2005-2014 Rural RD Fatal & Injury Crashes



Roadway Departure



— Roadway Departure Fatalities and Serious Injuries	979	1029	899	870	692	657	617	826	754	667
■ 5 Year Average	1021	1023	991	955	894	829	747	728	705	704
Fatalities	175	167	194	143	146	121	142	158	151	126
Serious Injuries	804	862	705	727	546	536	475	668	603	541

Montana Comprehensive Highway Safety Plan
2015-2020

#VisionZeroMT
zero deaths | zero serious injuries

3-year Roadway Departure Severe Injury Trend – by Crash Factor

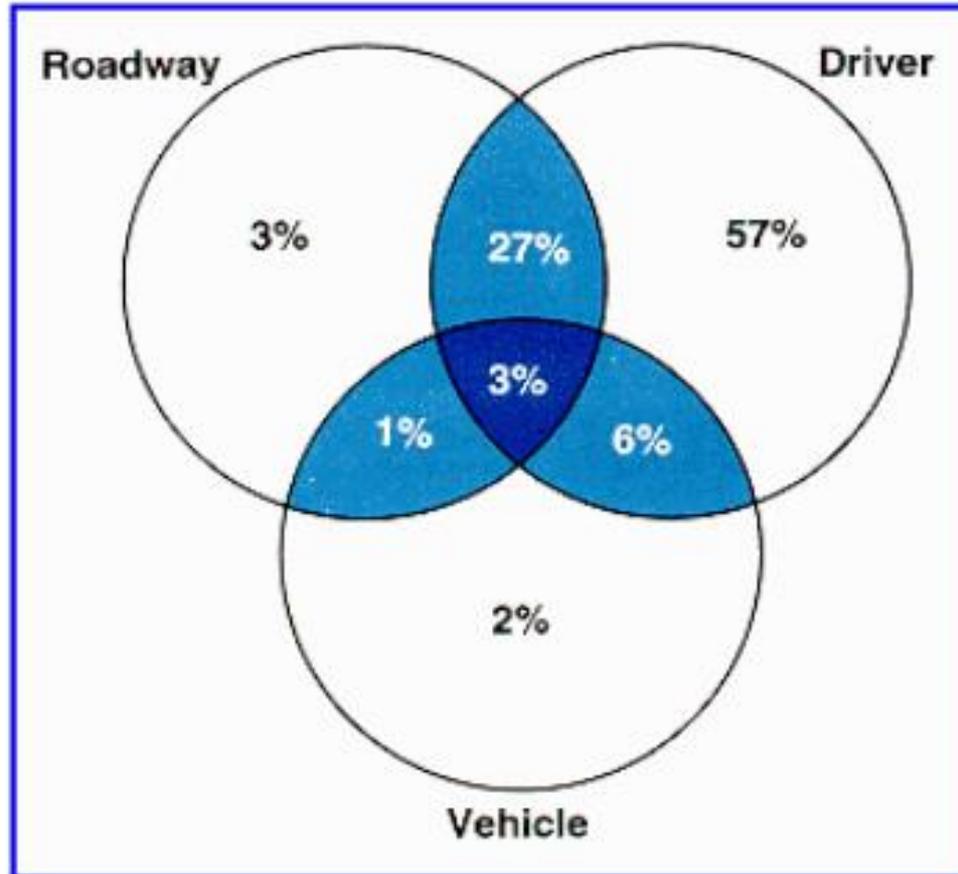
	2012	2013	2014
Fatalities	158	151	126
Serious Injuries	668	603	541
Severe Injuries	826	754	667
Impaired Driver Involved (~44%)	367	325	293
Unrestrained Occupant (~42%)	373	316	270
Young Driver Involved	141	119	113
Older Driver Involved	92	93	87
Male Driver Involved (~72%)	606	551	474
Female Driver Involved	262	246	232
Motorcyclist	75	98	77
Large Vehicle	27	32	35

3-year Roadway Departure Severe Injury Trend – by Crash Factor

(continued)

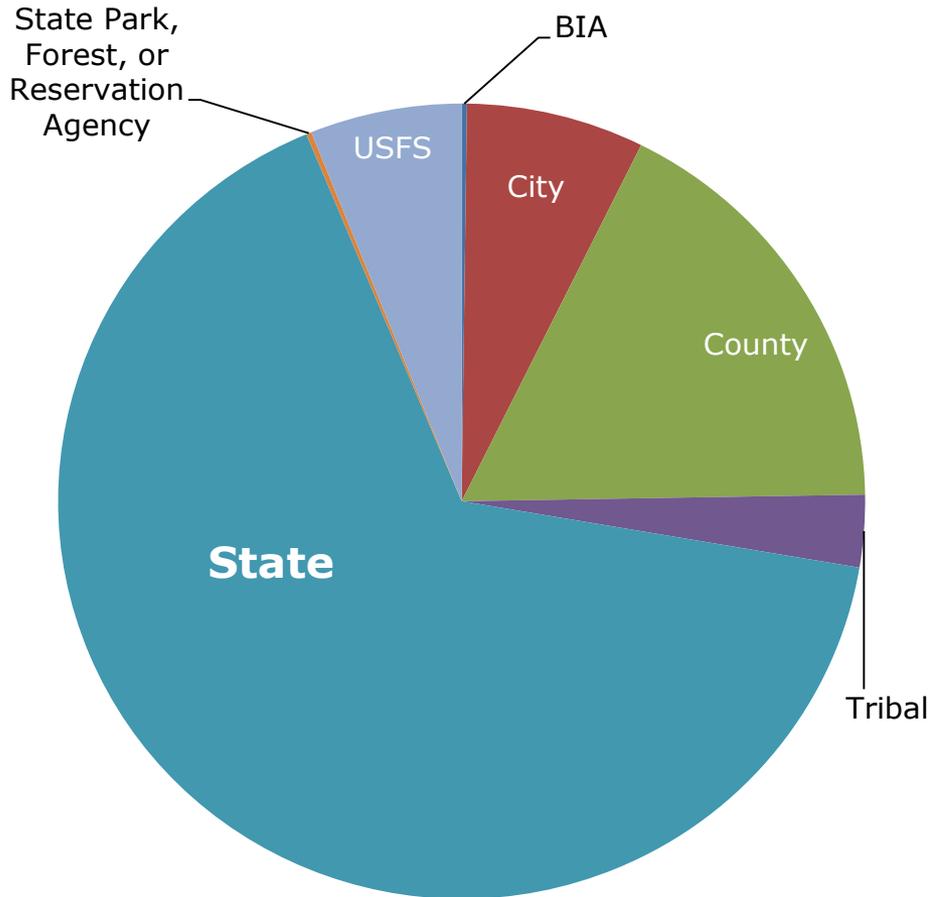
	2012	2013	2014
Fatalities	158	151	126
Serious Injuries	668	603	541
Severe Injuries	826	754	667
Rural Crash (~94%)	785	720	612
Urban Crash	41	34	55
June, July, and August(~36%)	278	293	233
Friday, Saturday, and Sunday (~53%)	445	399	354
Nighttime	305	279	221
Shoulder Width less than 4 feet	364	317	314
More than 2 lane roadway	224	216	99
Speed as a Factor	208	174	172

Crash Factor Interactions

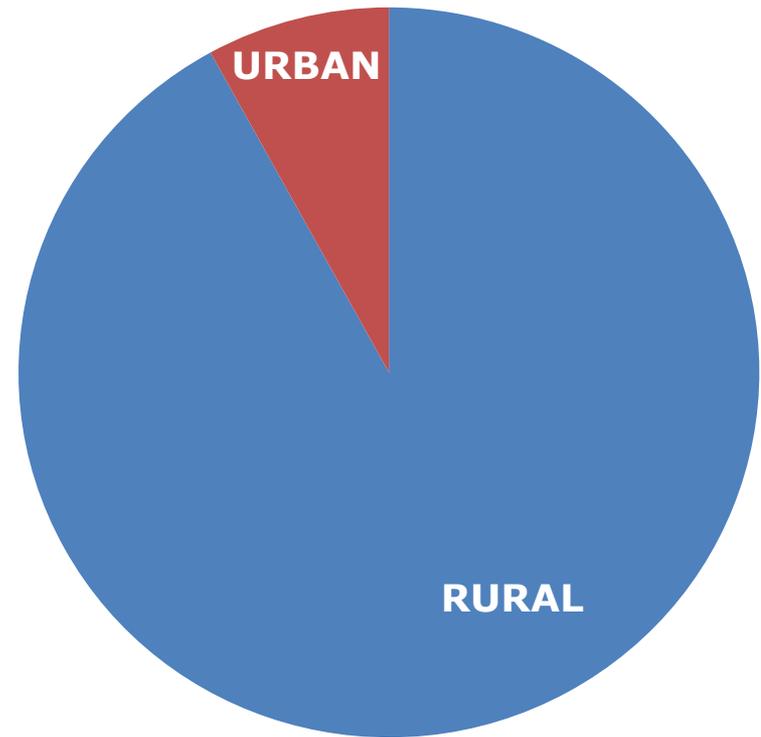


Roadway Departure Crashes Fatalities & Serious Injuries Top Risk Factors

2014 RD Severe Crashes
Roadway Ownership

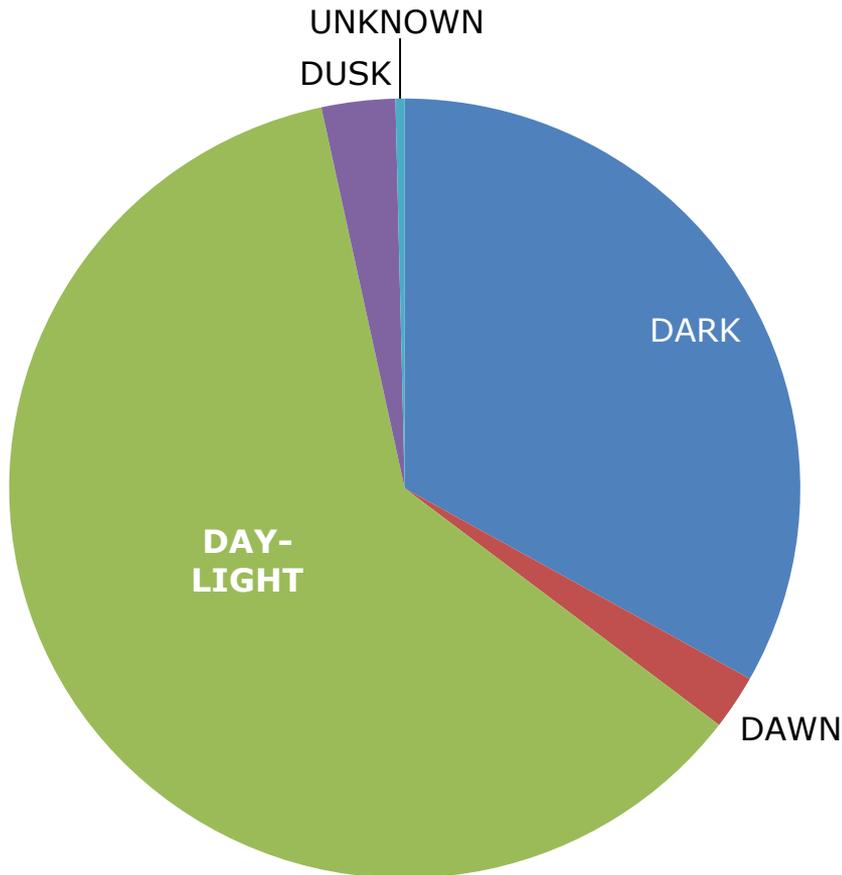


2014 RD Severe Crashes
Rural/Urban

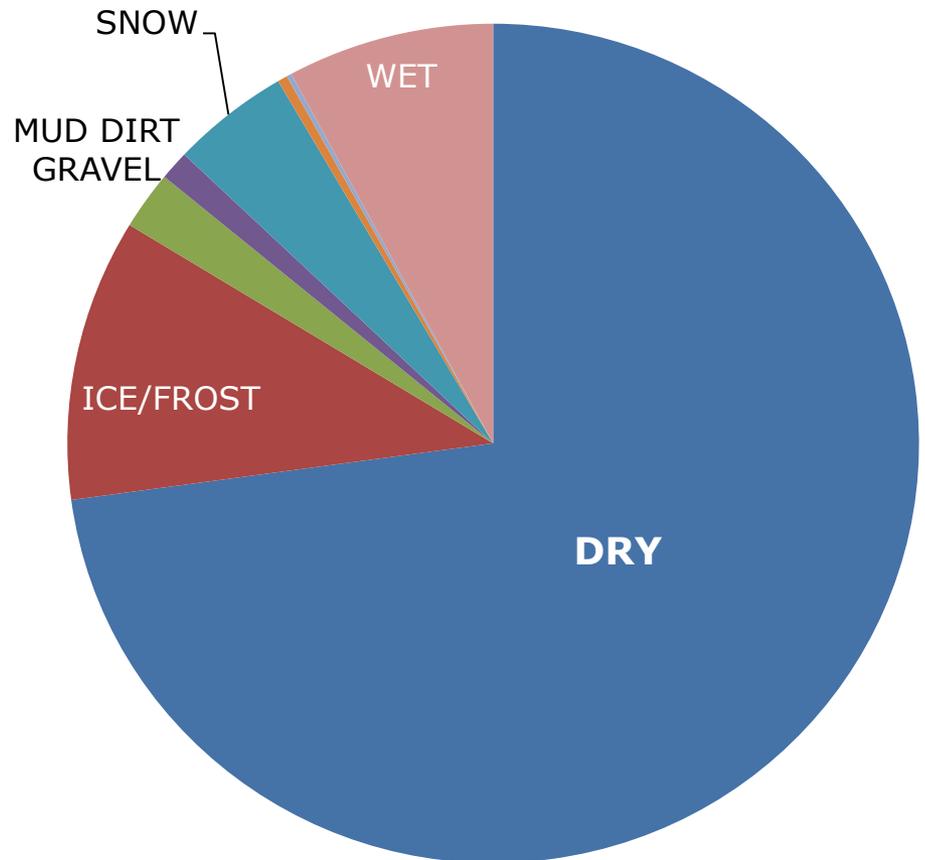


Roadway Departure Crashes Fatalities & Serious Injuries Top Risk Factors

2014 RD Severe Crashes
Light Conditions

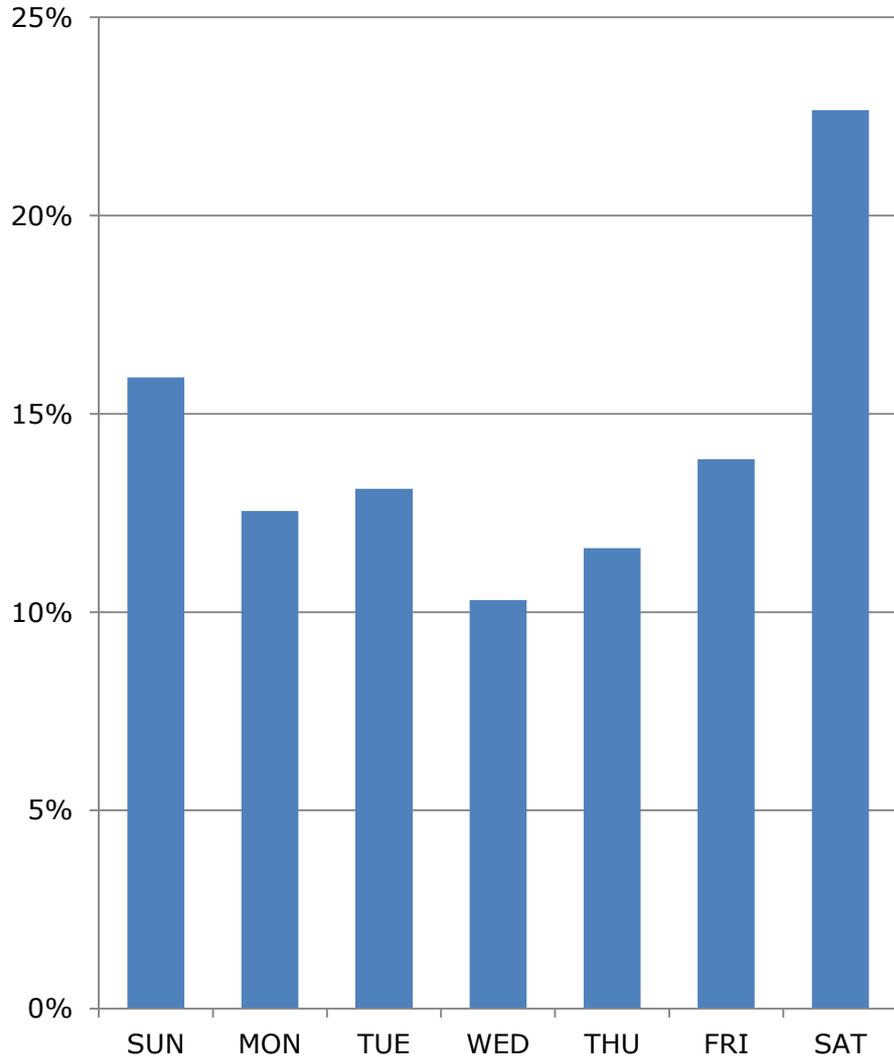


2014 RD Severe Crashes
Road Conditions

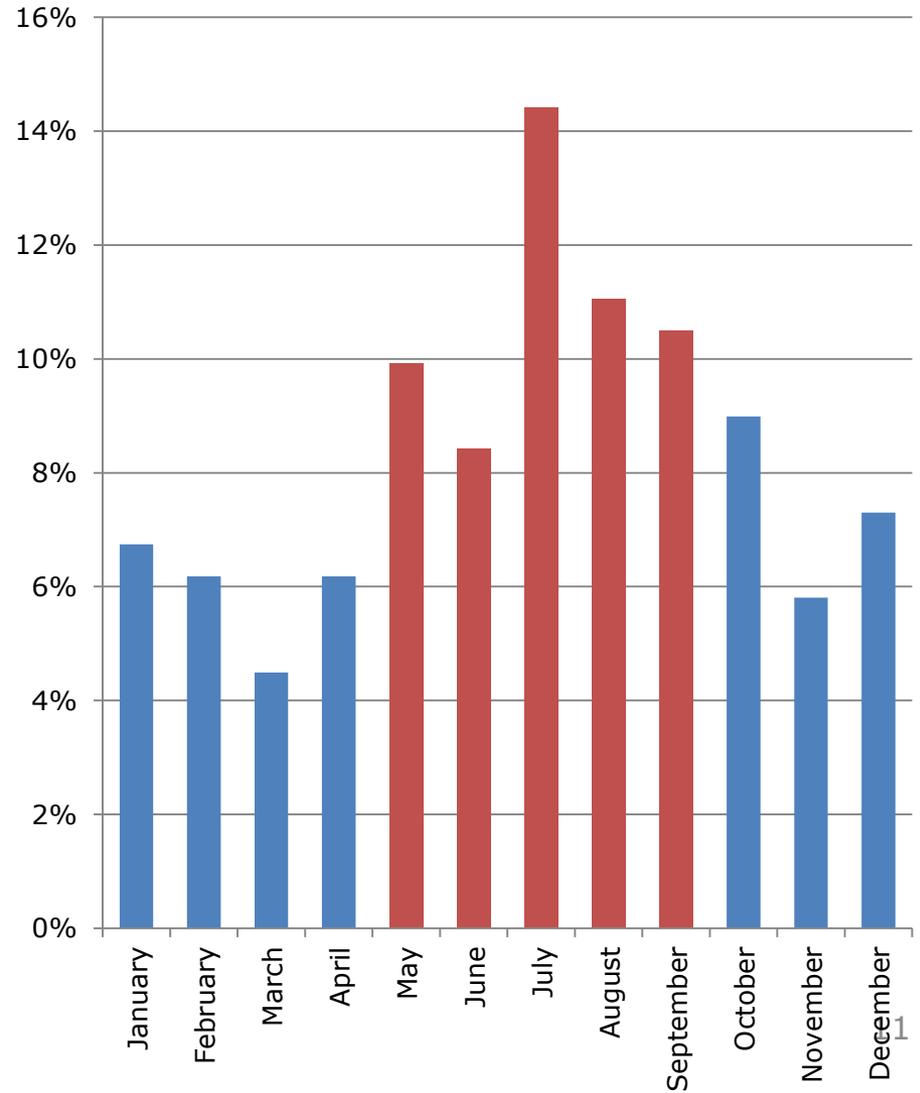


Roadway Departure Crashes Fatalities & Serious Injuries Top Risk Factors

2014 RD Severe Crashes
Day of Week

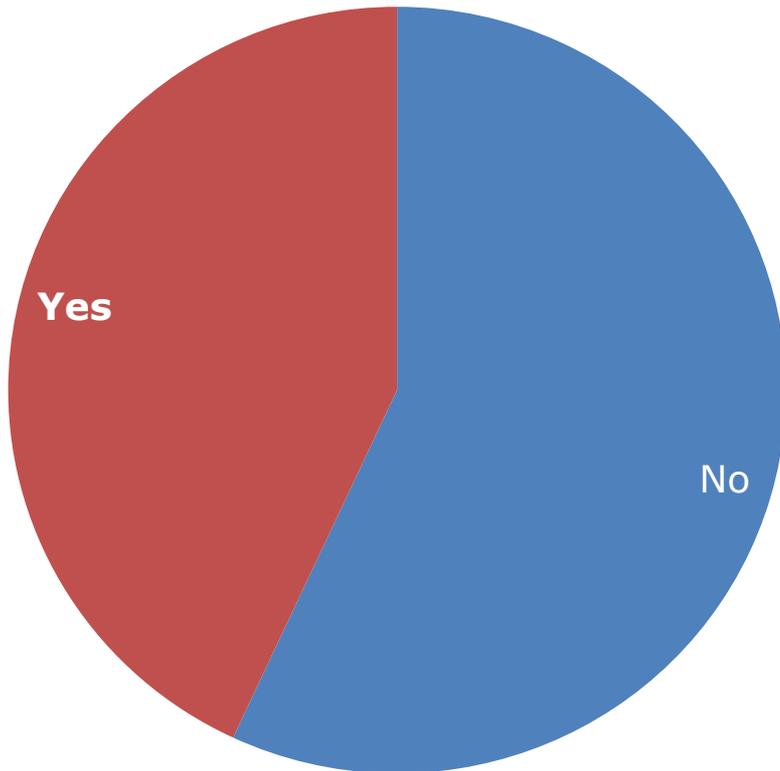


2014 RD Severe Crashes
Month

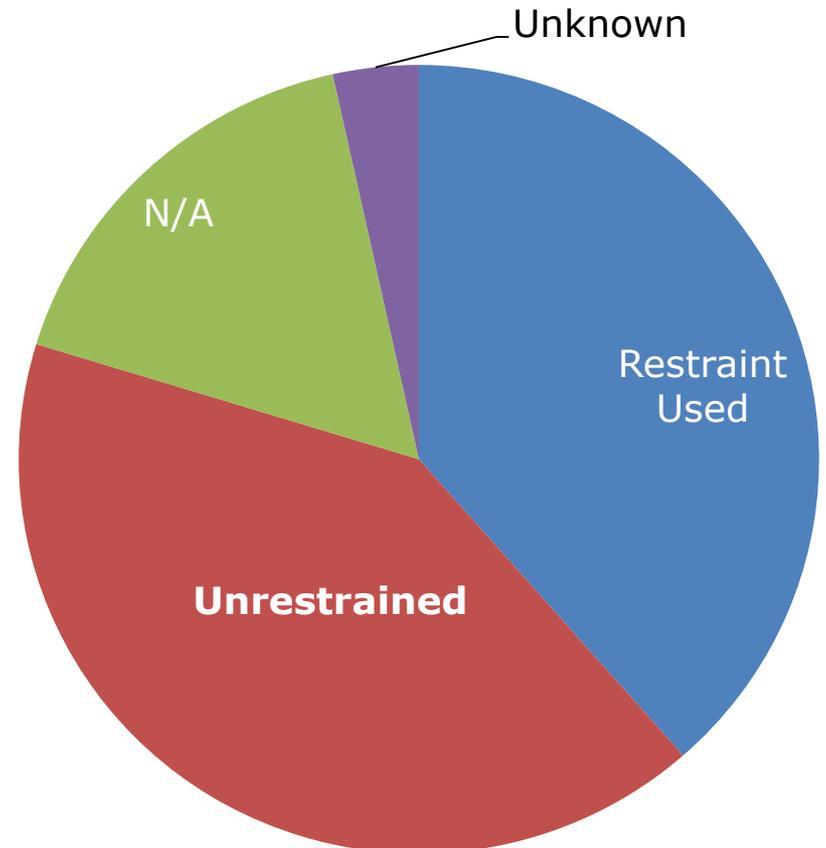


Roadway Departure Crashes Fatalities & Serious Injuries Top Risk Factors

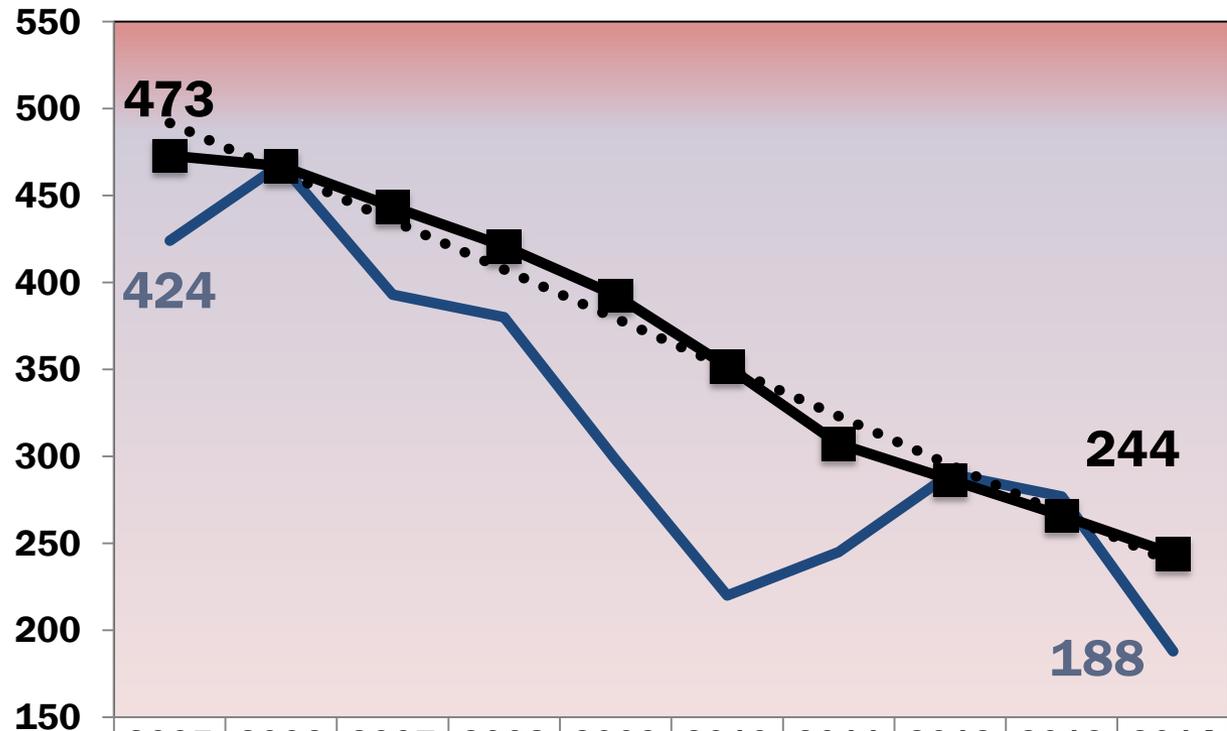
2014 RD Severe Crashes
Impaired Driver Crash



2014 RD Severe Crashes
Restraint by Occupants



Intersections



— Intersection Crash - Fatalities and Serious Injuries	424	468	393	380	298	220	245	290	277	188
■ 5 Year Average	473	467	444	421	393	352	307	287	266	244
Fatalities	29	40	37	37	32	30	30	17	27	20
Serious Injuries	395	428	356	343	266	190	215	273	250	168

3-year Intersection Severe Injury Trend – by Crash Factor

	2012	2013	2014
Fatalities	17	27	20
Serious Injuries	273	250	168
Severe Injuries	290	277	188
Impaired Driver Involved	78	61	32
Unrestrained Occupant	81	74	43
Young Driver Involved (~25%)	91	72	35
Older Driver Involved	56	64	37
Male Driver Involved (~80%)	224	239	146
Female Driver Involved (~55%)	159	151	103
Bike/Ped Involved	27	30	27
Motorcyclist	35	41	30
Large Vehicle	17	15	8

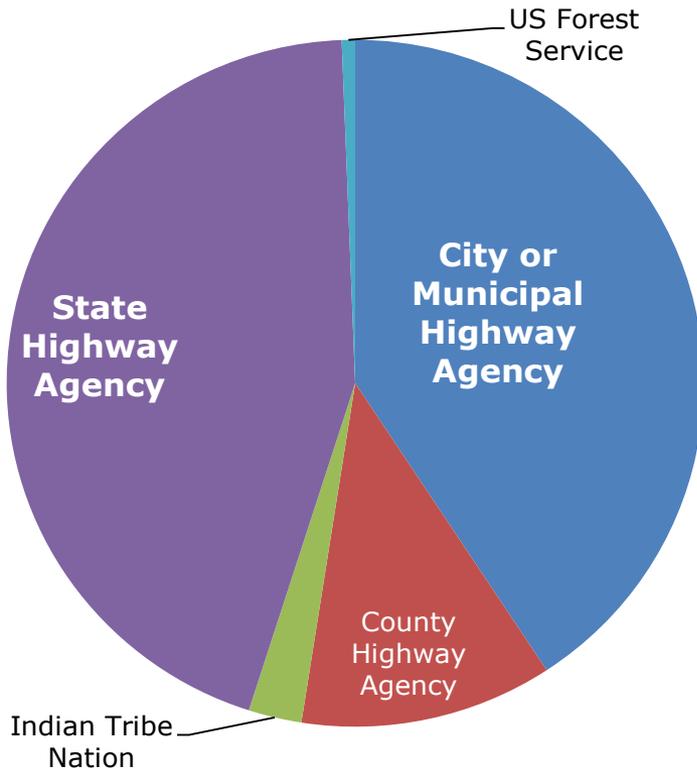
3-year Intersection Severe Injury Trend – by Crash Factor

(continued)

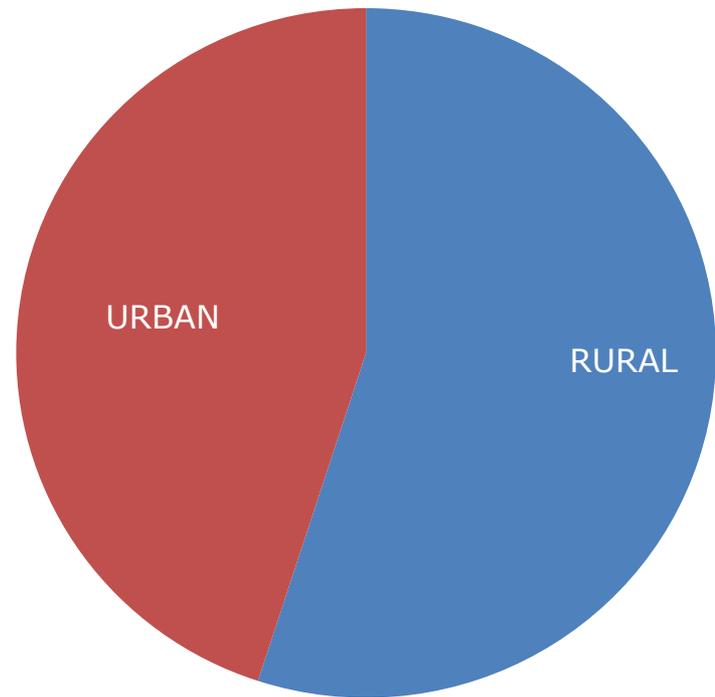
	2012	2013	2014
Fatalities	17	27	20
Serious Injuries	273	250	168
Severe Injuries	290	277	188
Rural Crash (~55%)	157	154	103
Urban Crash (~45%)	133	123	85
June, July, and August	84	105	57
Friday, Saturday, and Sunday (~41%)	118	122	74
Nighttime	75	62	41
Shoulder Width less than 4 feet	85	109	62
More than 2 lane roadway	95	81	47
Speed as a Factor	35	37	23

Intersection Crashes Fatalities & Serious Injuries Top Risk Factors

2014 Intersection Severe Crashes
Roadway Ownership



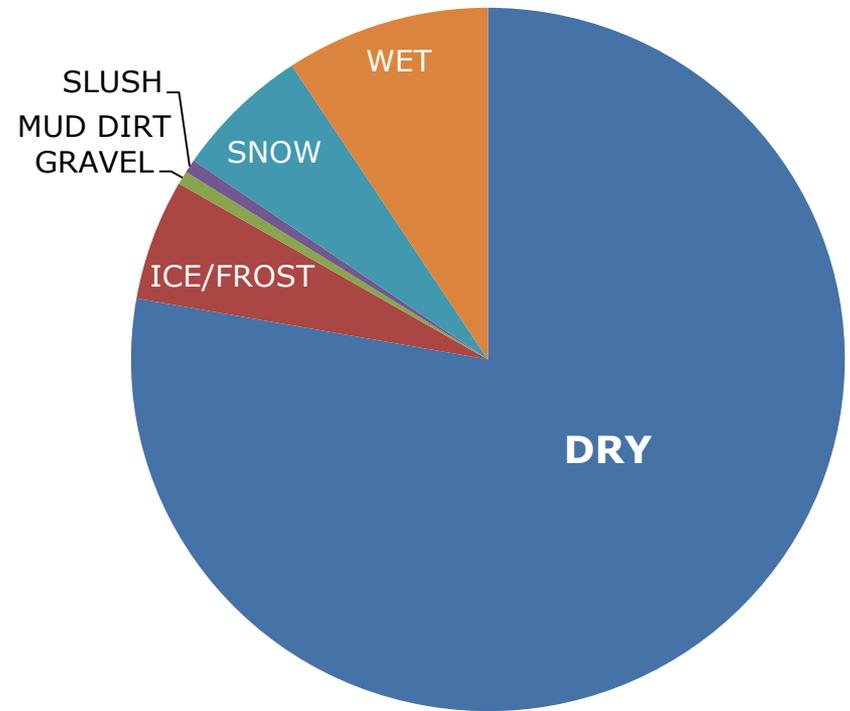
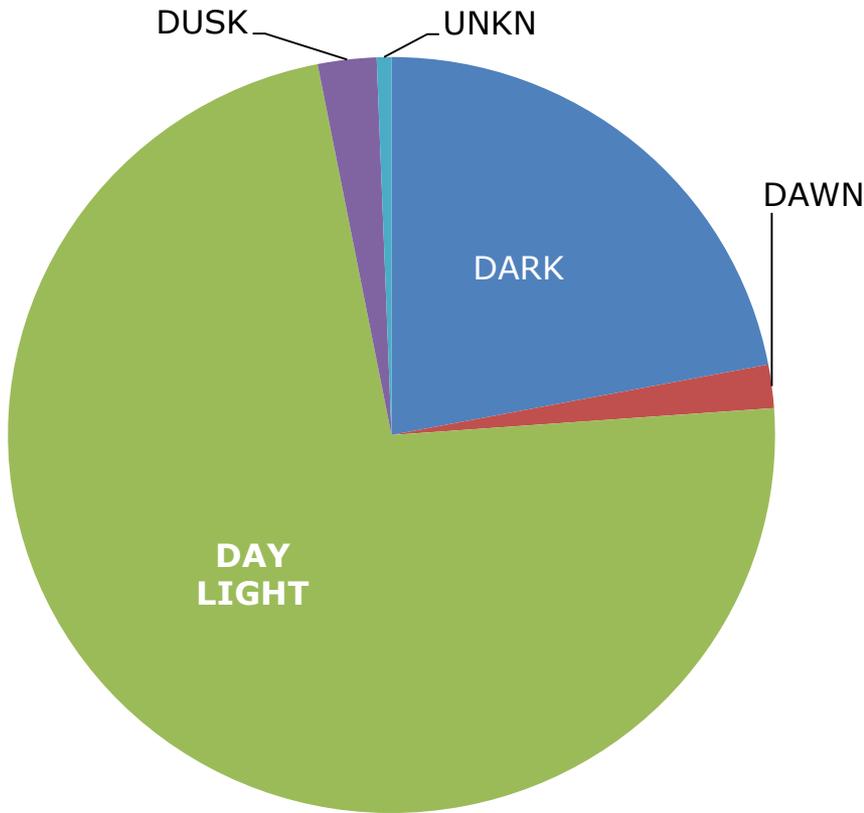
2014 Intersection Severe Crashes
Rural/Urban



Intersection Crashes Fatalities & Serious Injuries Top Risk Factors

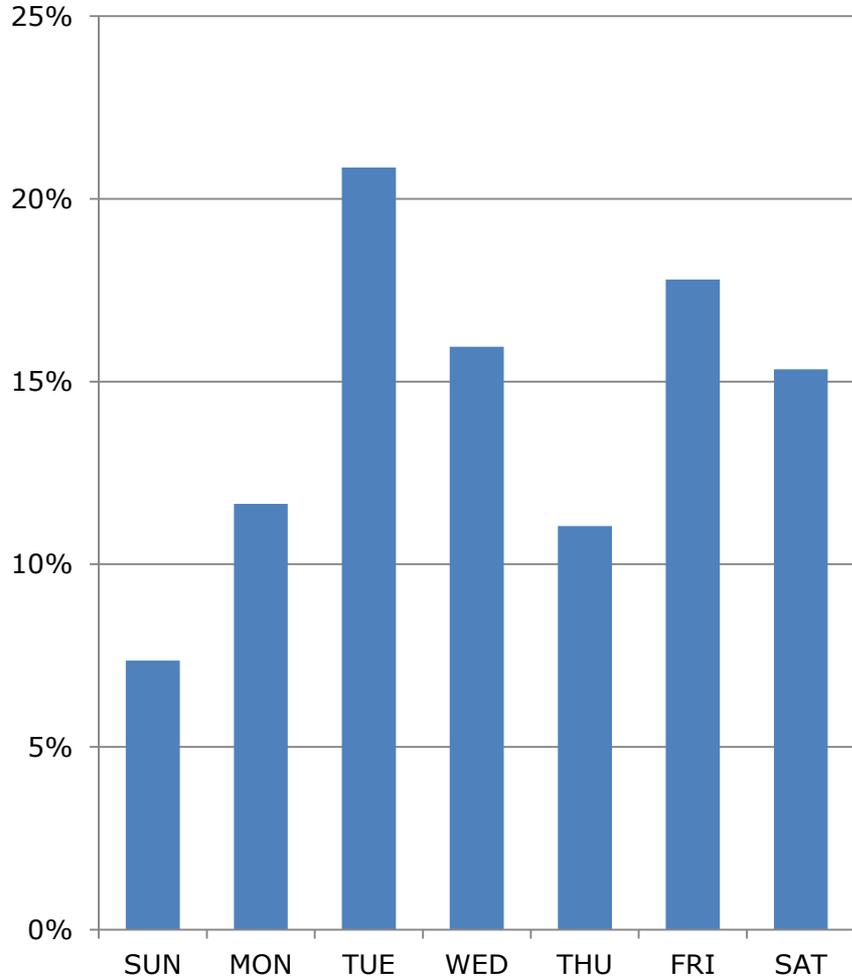
2014 Intersection Severe Crashes
Light Conditions

2014 Intersection Severe Crashes
Road Conditions

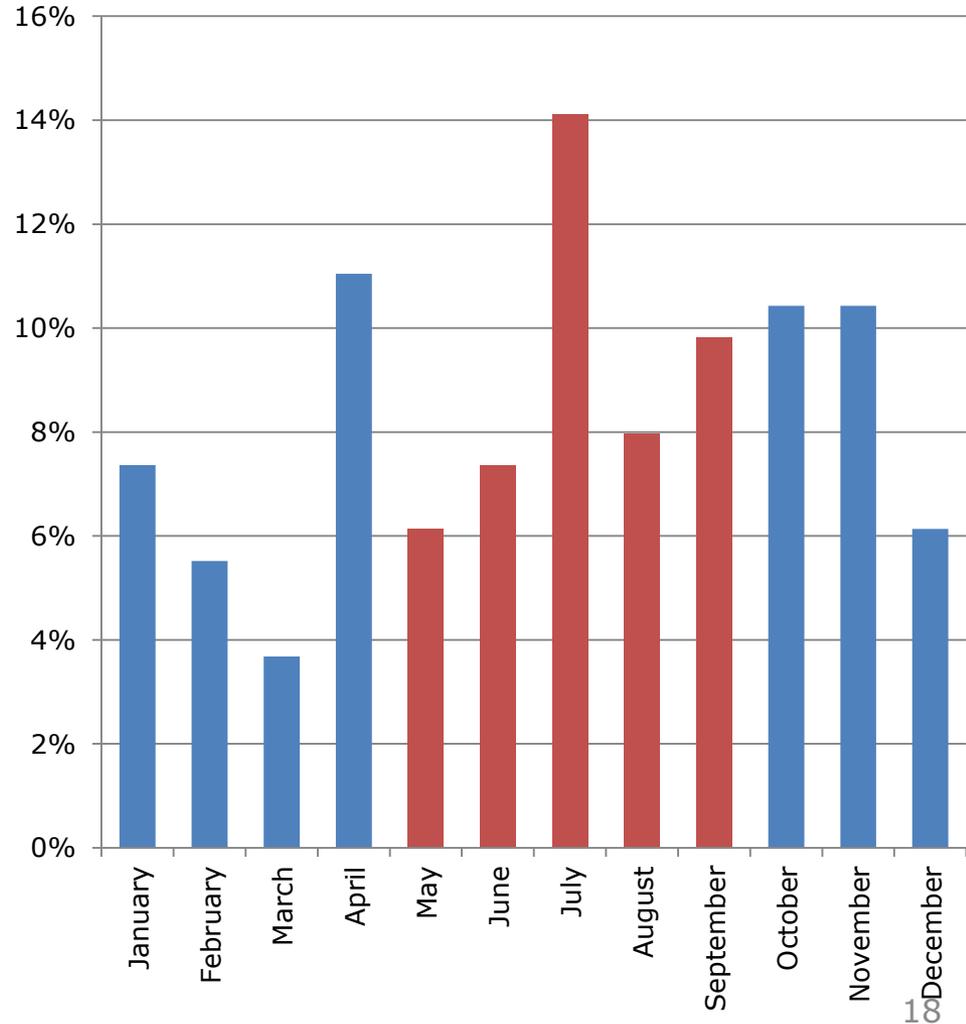


Intersection Crashes Fatalities & Serious Injuries Top Risk Factors

2014 Intersection Severe Crashes
Day of Week

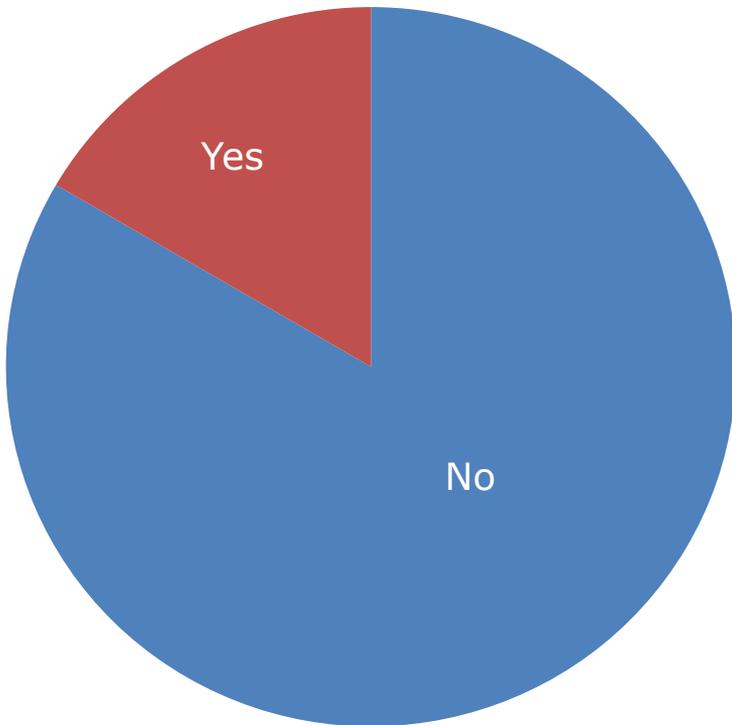


2014 Intersection Severe Crashes
Month

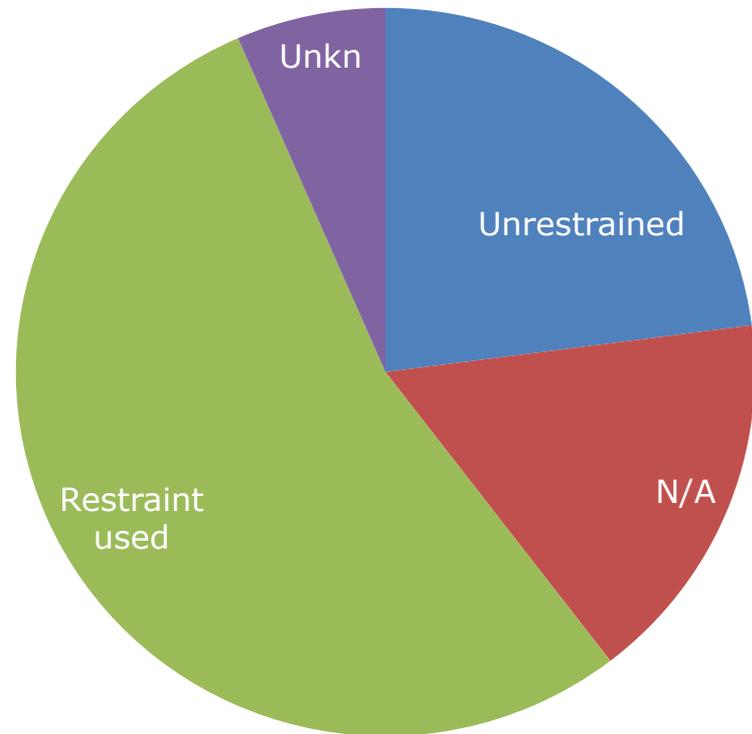


Intersection Crashes Fatalities & Serious Injuries Top Risk Factors

2014 Intersection Severe Crashes
Impaired Driver



2014 Intersection Severe Crashes
Restraint by Occupants



Overarching Strategies

- Improve the accuracy, completeness, integration, timeliness, uniformity, and accessibility of data used in traffic safety analysis;
- Support the essential role of EMS in reducing the severity of injury outcomes and the technologies and systems necessary to advance collaboration with all safety partners; and
- Collaborate across agencies, organizations and with the public to improve the safety culture and promote the institutionalization of Vision Zero.

Roadway Departure & Intersection Crashes Strategies

1

Reduce and mitigate roadway departure crashes through data-driven problem identification and the use of best practices.

2

Reduce and mitigate speed-related roadway departure/ intersection crashes

3

Reduce roadway departure and intersection crashes through education

4

Reduce and mitigate intersection crashes through data-driven problem identification and the use of best practices

Roadway Departure & Intersection Crashes Strategies

5

Support and increase enforcement of proper road use behaviors by all users in high-crash corridors and high-crash locations

6

Explore and implement best practices for reducing road departure, such as distracted driving and fatigued driving, in addition to other behavioral factors

7

Improve the prosecution and adjudication of all roadway user violations

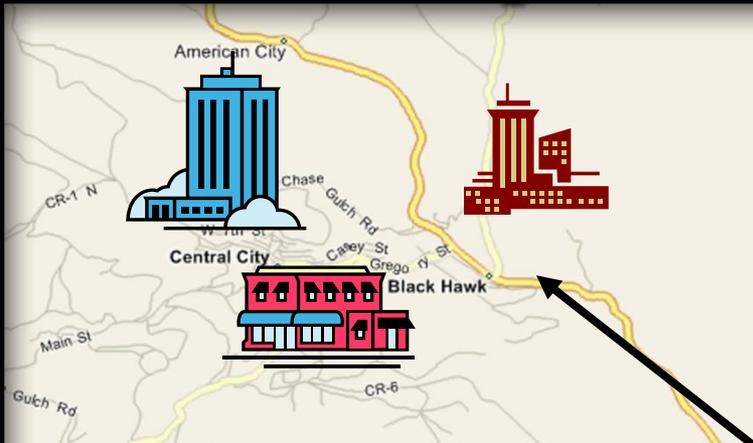
1

Reduce and mitigate roadway departure crashes through data-driven problem identification and the use of best practices.

- **Implement MDT's Roadway Departure Plan including systemic and hot spot treatments on rural state routes.**
- **Construct infrastructure improvements to mitigate road departure crashes, both on and off the state system.**
- **Evaluate new roadway prevention technologies on an ongoing basis for applicability to Montana's roadways.**
- **Conduct Roadway Safety Audits on corridors or locations identified as having safety Issues**

How To Measure Safety

**Crash Rate is
the Most Common
Measure of Safety**



Year	# Acc	AADT	Rate
1988	13	2,900	2.10
1989	11	2,900	1.78
1990	13	3,050	2.00
1991	23	3,400	3.17

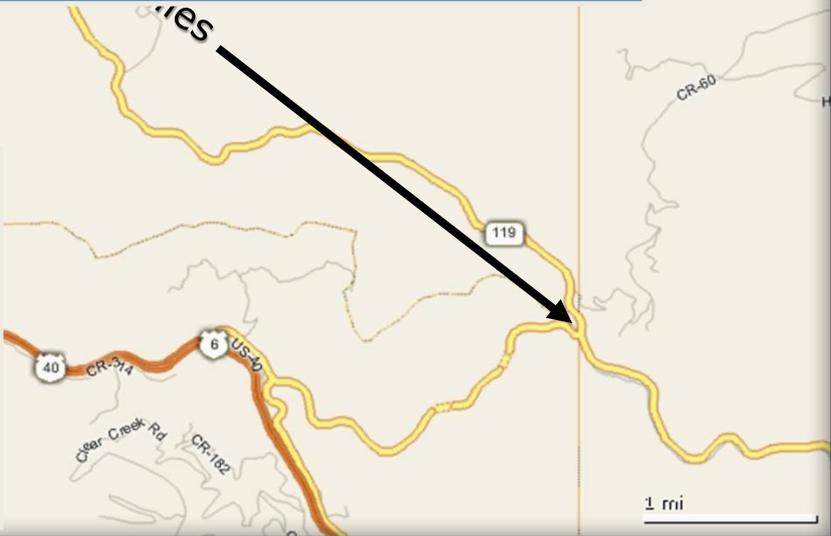
Average Rate = 2.26

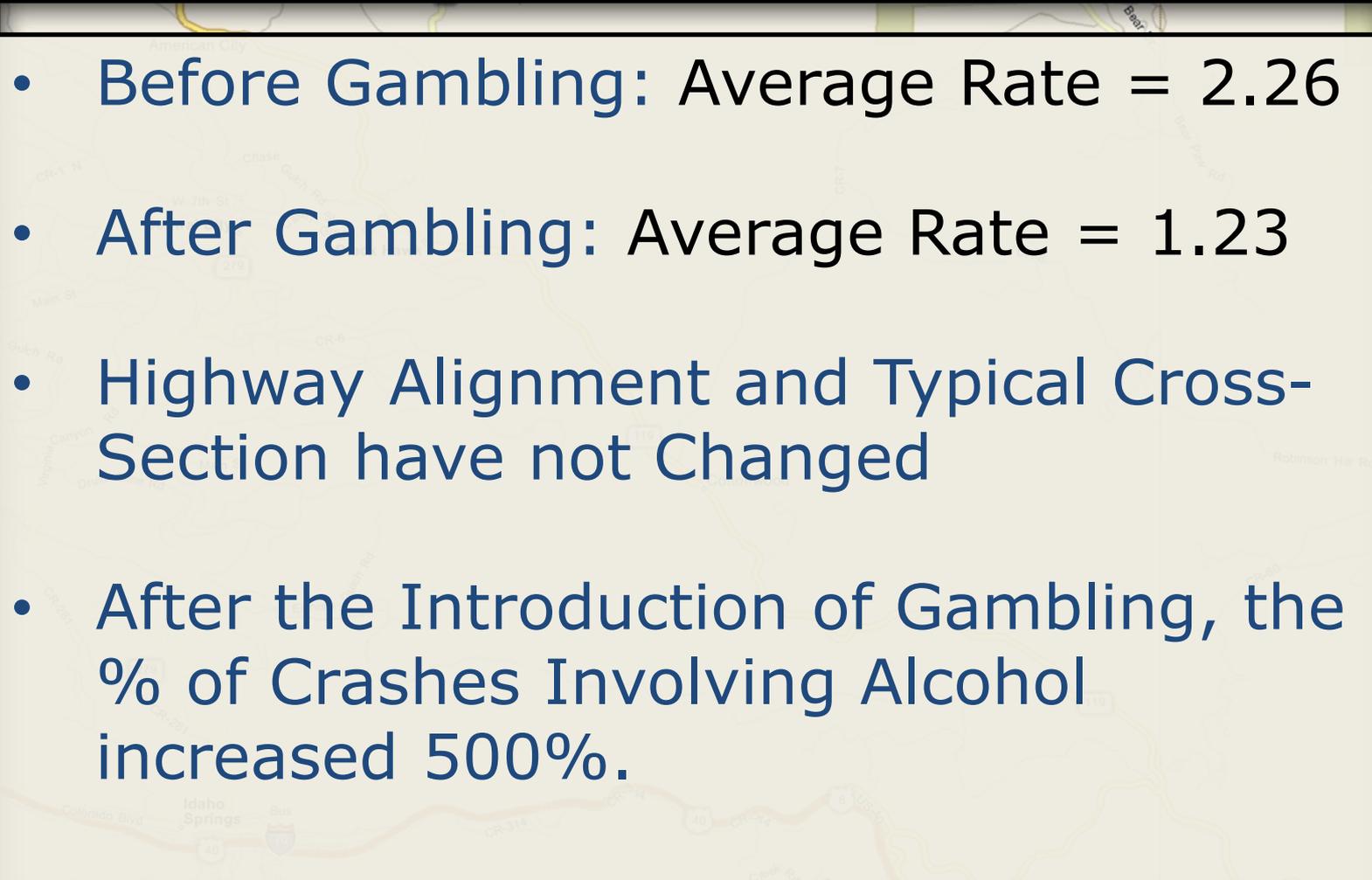
Gambling Introduced In 1992

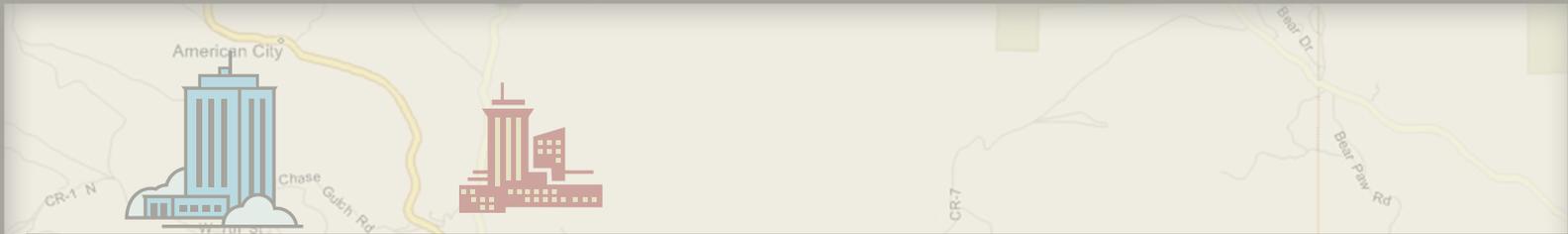
After Gambling

Year	# Acc	AADT	Rate
1992	30	10,618	1.32
1993	30	13,200	1.06
1994	36	14,300	1.18
1995	40	13,900	1.35

Average Rate = 1.23

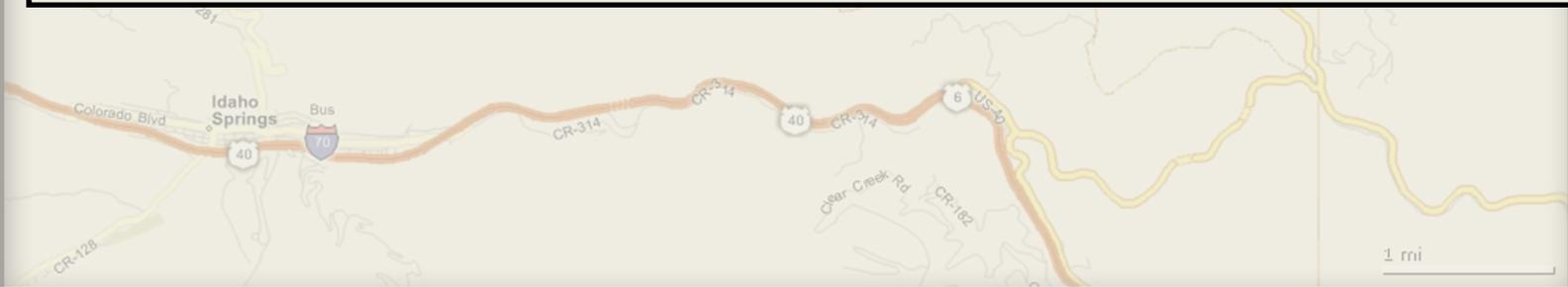


- 
- Before Gambling: Average Rate = 2.26
 - After Gambling: Average Rate = 1.23
 - Highway Alignment and Typical Cross-Section have not Changed
 - After the Introduction of Gambling, the % of Crashes Involving Alcohol increased 500%.



A map of the American City area showing roads like CR-1 N, Chase, Gulch Rd, CR-7, Bear Dr, and Bear Paw Rd. There are two building icons: a blue one and a red one.

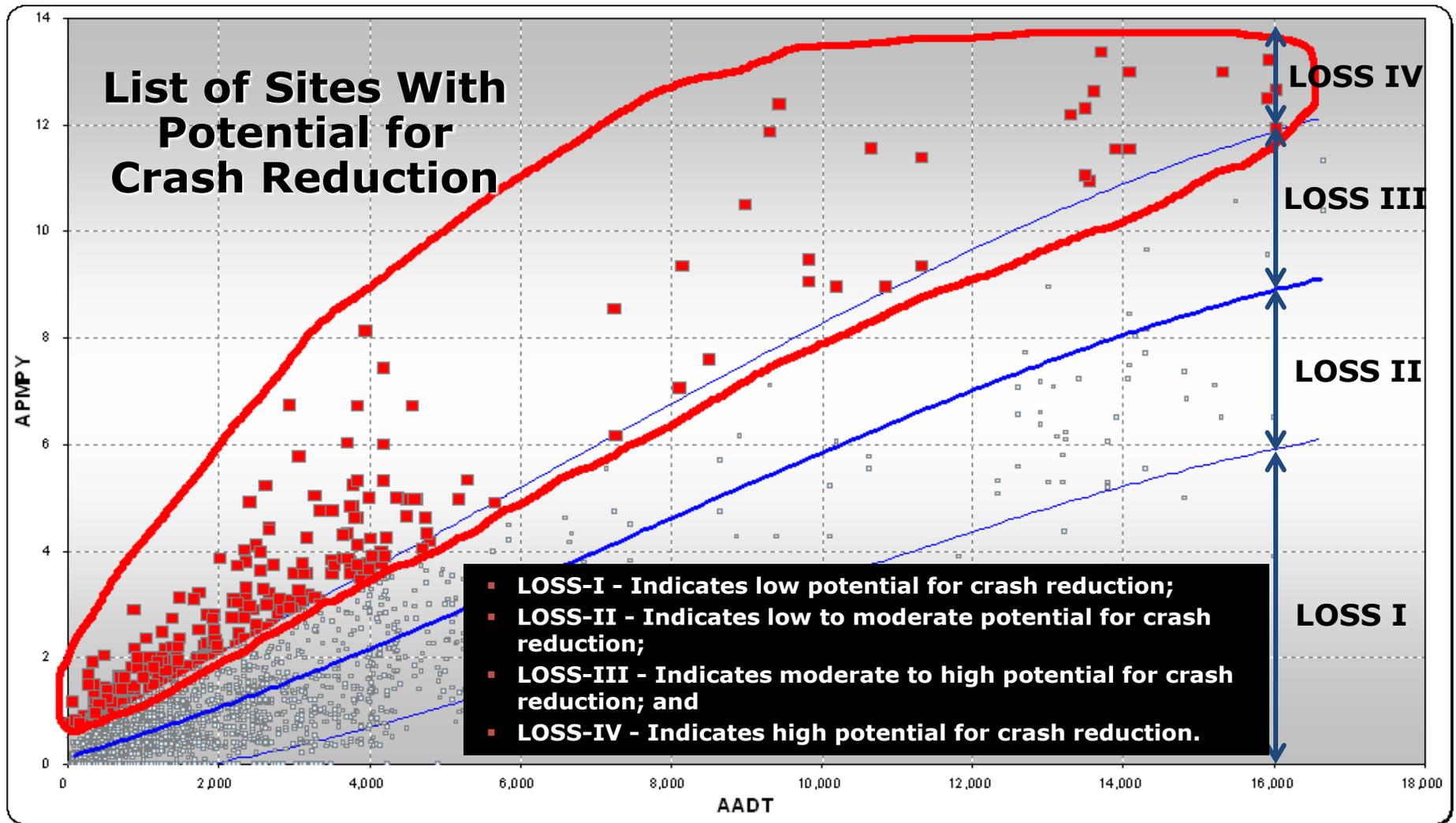
Is Drinking and Driving Plus Gambling Good for Highway Safety?



Safety Performance Functions

- In order to understand how the crash rate is changing, a relationship between safety and traffic exposure is needed.
- This relationship is reflected by a safety performance function (SPF).
- The SPF models provide an estimate of the normal or expected crash frequency and severity for a range of AADT among similar facilities.

Safety Performance Functions

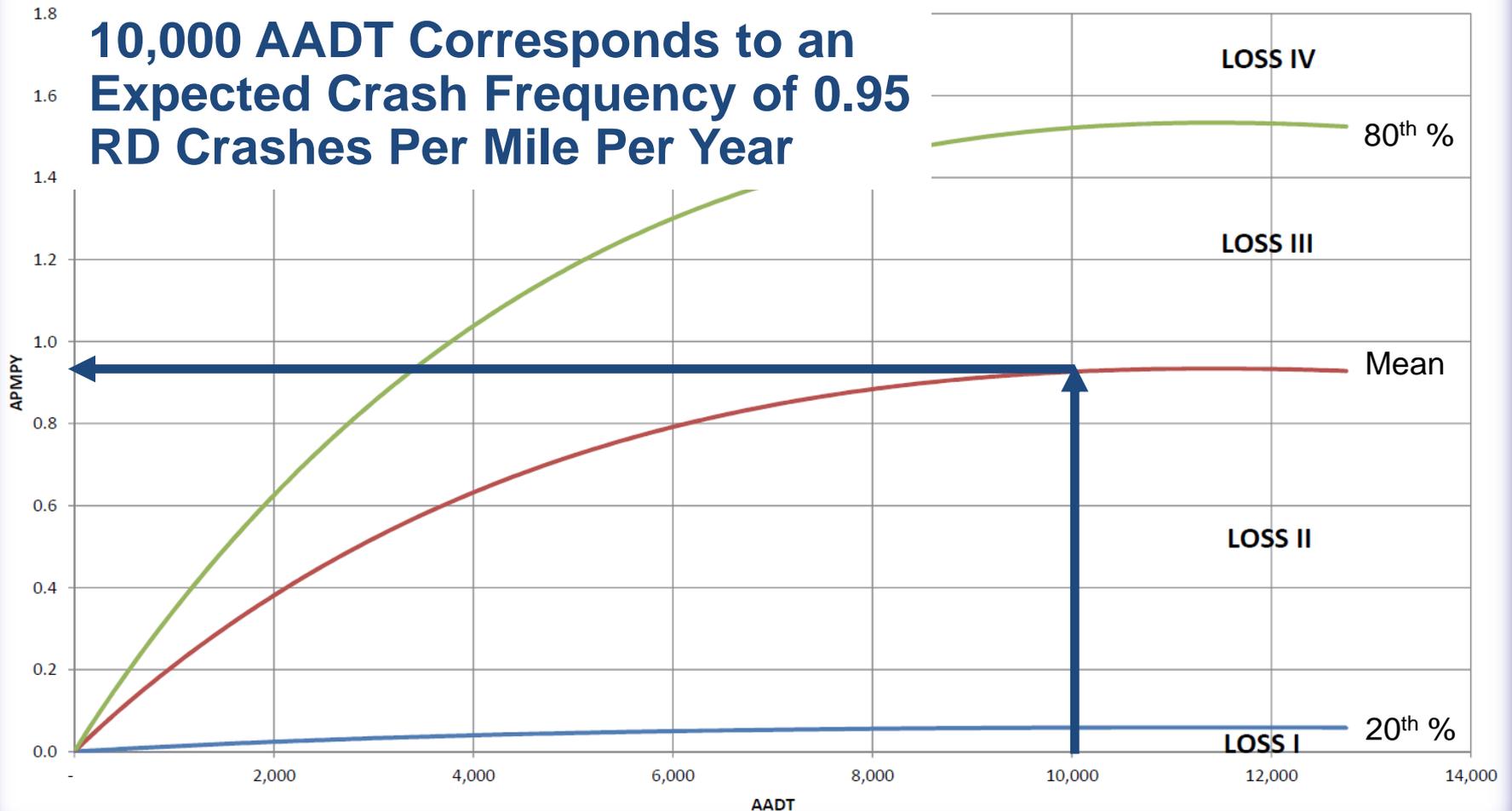


Rural 2-Lane Highway - RD Crashes

SPF - Rural Flat and Rolling 2-Lane UnDivided Highways (ROR)

— LOSS I/II Lower Limit (20th%) — LOSS II/III Mean (Severity) — LOSS III/IV Upper Limit (80th%)

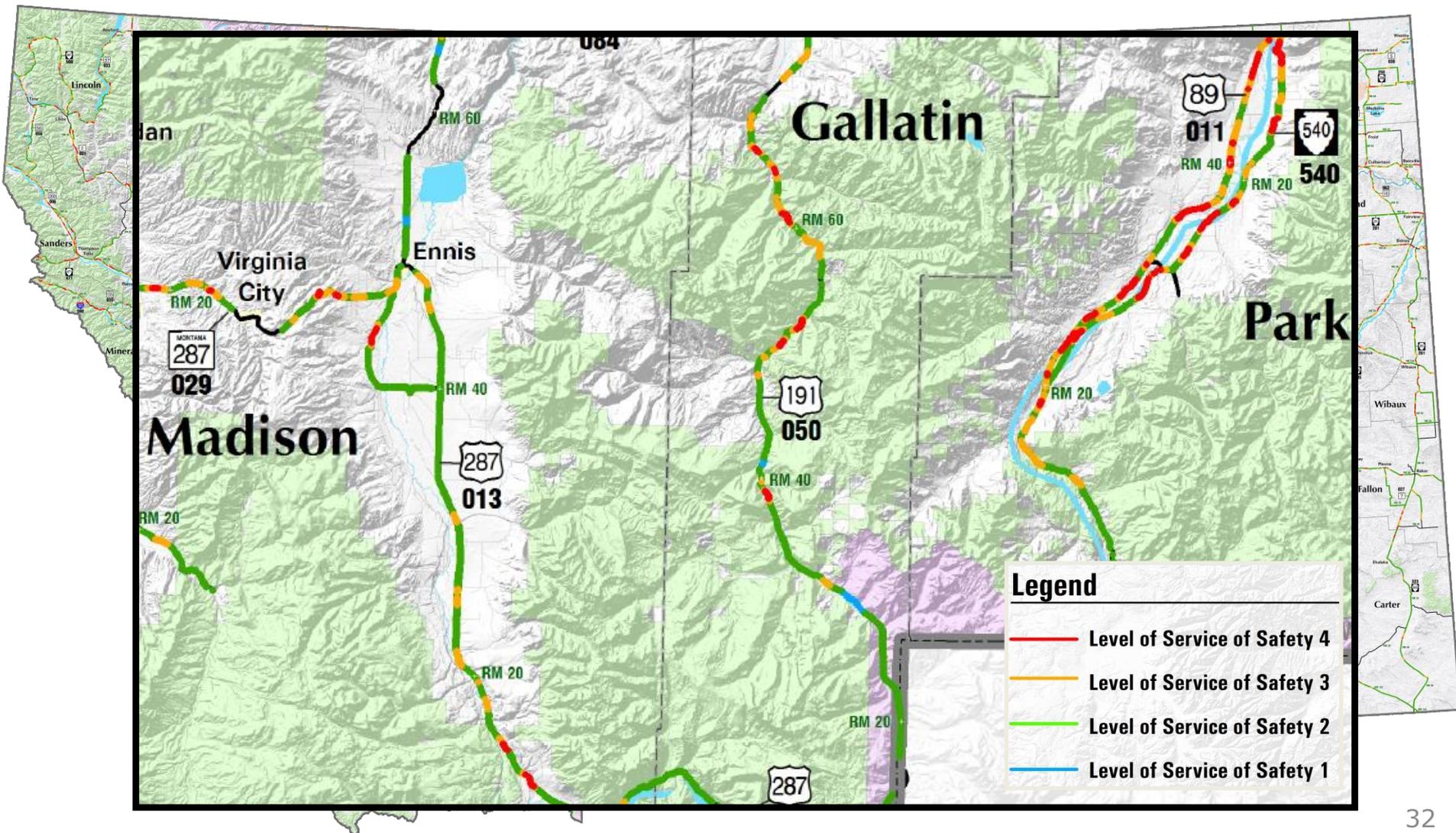
10,000 AADT Corresponds to an Expected Crash Frequency of 0.95 RD Crashes Per Mile Per Year



Crash Patterns

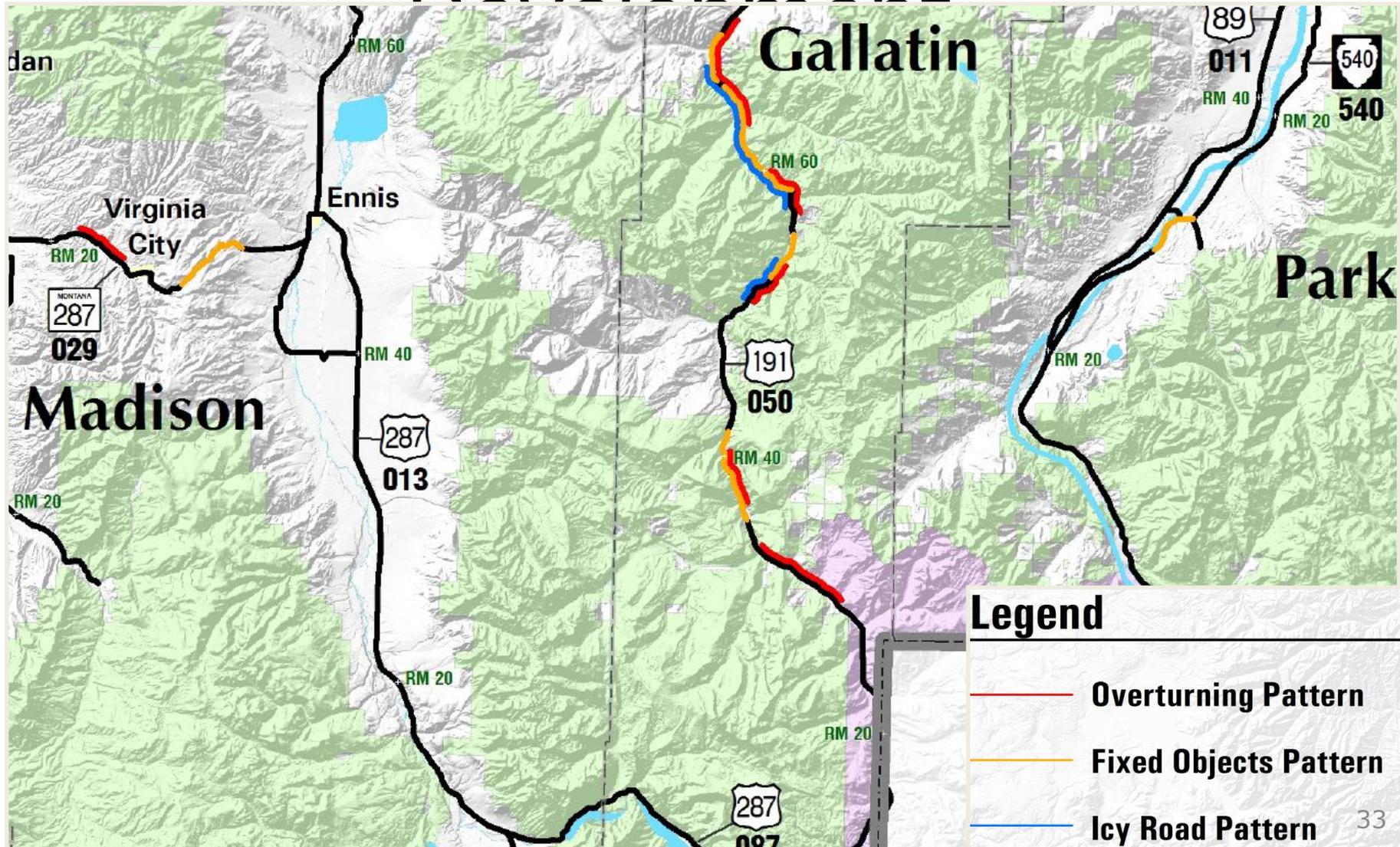
Montana Rural Flat and Rolling 2-Lane Undivided Highways								
Description	0 - 3000 ADT		3000 - 8000 ADT		> 8000 ADT		All Totals	
	Accidents	Percent	Accidents	Percent	Accidents	Percent	Accidents	Percent
Severity								
PDO	6,951	66.96%	2,320	73.14%	470	76.42%	9,741	68.75%
INJ	3,157	30.41%	798	25.16%	140	22.76%	4,095	28.90%
FAT	273	2.63%	54	1.70%	5	0.81%	332	2.34%
Persons Injured	4,585	N/A	1,124	N/A	214	N/A	5,923	N/A
Persons Killed	307	N/A	62	N/A	6	N/A	375	N/A
Number of Vehicles								
Single Vehicle Accidents	9,079	87.46%	2,487	78.40%	388	63.09%	11,954	84.37%
Two Vehicle Accidents	1,217	11.72%	622	19.61%	194	31.54%	2,033	14.35%
Three or more Vehicle Accident	85	0.82%	63	1.99%	33	5.37%	181	1.28%
Unknown Number of Vehicles	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Location								
On Road	5,524	53.21%	1,947	61.38%	427	69.43%	7,898	55.75%
Off Road	3,041	29.29%	671	21.15%	82	13.33%	3,794	26.78%
Off Road Left	1,275	12.28%	242	7.63%	31	5.04%	1,548	10.93%
Off Road Right	1,766	17.01%	429	13.52%	51	8.29%	2,246	15.85%
Off Road at Tee	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Off Road in Median	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Unknown Road Location	1,816	17.49%	554	17.47%	106	17.24%	2,476	17.48%
Accident Type								
Overtuning	2,968	28.59%	490	15.45%	53	8.62%	3,511	24.78%
Other Non Collision	337	3.25%	98	3.09%	8	1.30%	443	3.13%
School Age Pedestrians	0	0.00%	0	0.00%	0	0.00%	0	0.00%
All Other Pedestrians	18	0.17%	9	0.28%	0	0.00%	27	0.19%
Broadside	152	1.46%	82	2.59%	21	3.41%	255	1.80%
Head On	135	1.30%	71	2.24%	15	2.44%	221	1.56%
Rear End	396	3.81%	281	8.86%	135	21.95%	812	5.73%
Sideswipe (Same Direction)	191	1.84%	53	1.67%	14	2.28%	258	1.82%
Sideswipe (Opposite Direction)	241	2.32%	95	2.99%	20	3.25%	356	2.51%
Approach Turn	7	0.07%	7	0.22%	4	0.65%	18	0.13%
Overtaking Turn	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Parked Motor Vehicle	29	0.28%	12	0.38%	2	0.33%	43	0.30%
Railway Vehicle	4	0.04%	1	0.03%	0	0.00%	5	0.04%
Bicycle	2	0.02%	1	0.03%	0	0.00%	3	0.02%
Motorized Bicycle	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Domestic Animal	468	4.51%	55	1.73%	5	0.81%	528	3.73%
Wild Animal	2,653	25.56%	1,127	35.53%	229	37.24%	4,009	28.30%

Potential Uses – System Level Planning and Program Development



Potential Uses – System Level Planning and Program

Development



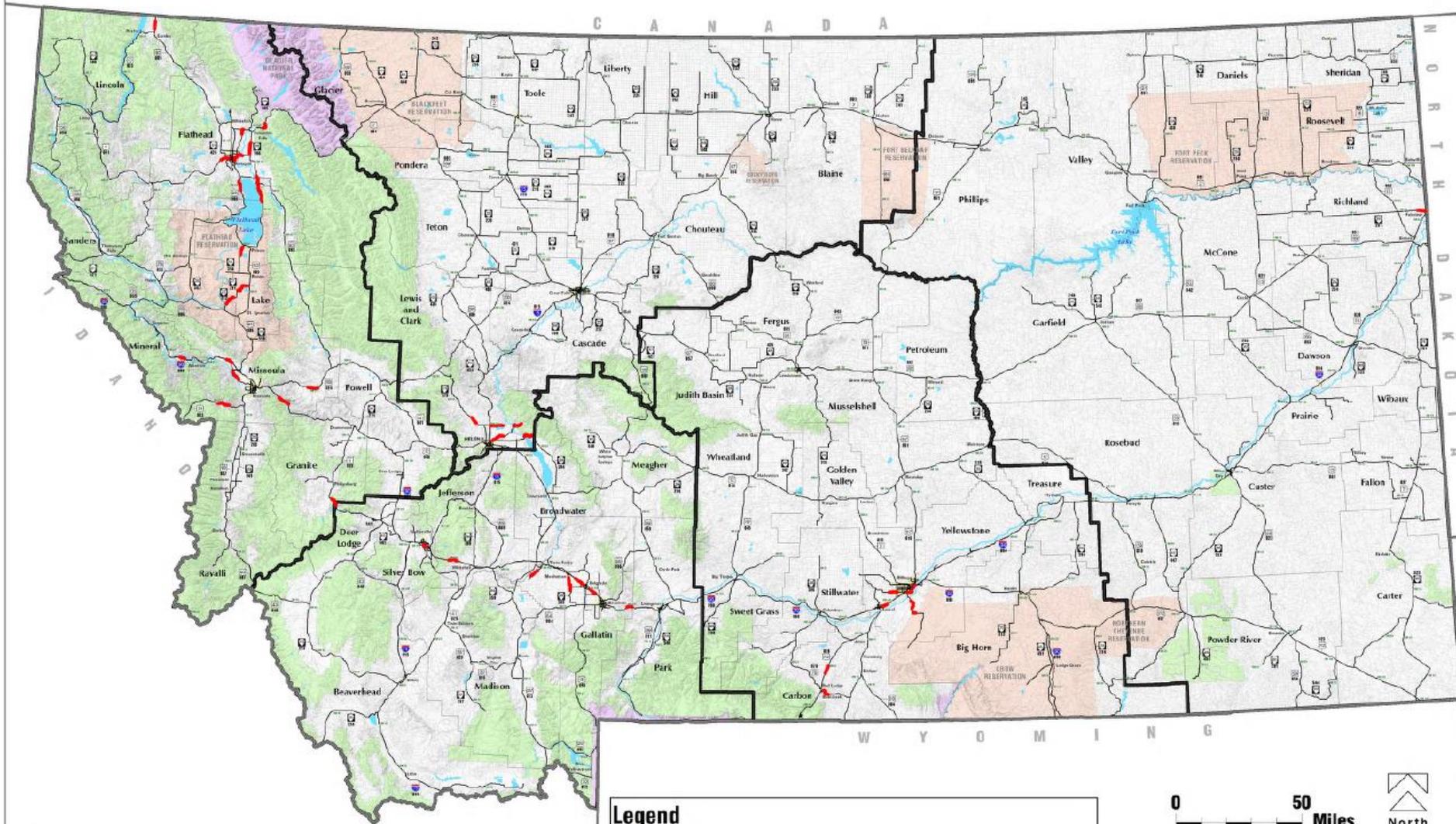
2

Reduce and mitigate speed-related roadway departure/ intersection crashes

- **Complete the “Safety Impact of Differential Speed Limits on Rural Two-Lane Highways in Montana” research study**
- **Support targeted enforcement based on demonstrated crash patterns and high-risk drivers.**

Roadway Departure Safety Implementation Plan

ALCOHOL CRASH PATTERNS



Map prepared May, 2014 by Felsburg Holt & Ulløvig in coordination with DiExSys. Alcohol involved crash patterns were determined through modeling produced/revised in May, 2014 by DiExSys™. Map produced in ESRI ArcMap 10.2. Land jurisdiction and highway information provided by MDT Hillshade provided by USGS. Mapped using lookup table (provided by MDT) for conversion between reference marker (RM) and true distance (DCMI) linear referencing systems. Map reduced from 34" x 44".

3

Reduce roadway departure and intersection crashes through education

- Enhance awareness of and encourage increased participation of evidence-based roadway user skills training.
- Research underlying beliefs and behaviors of high-risk groups to better understand , develop focused strategies , an by using proven and innovative communication channels.
- Conduct public awareness/education about roadway conditions, yellow flashing signals, roundabouts, bicycle lanes, pedestrian signals, operations around EMS responders, and right-of-way rules at stop-controlled and uncontrolled intersections, etc.
- Promote/support evidence-based teen peer-to-peer education re: risky driving behavior, consequences of distracted driving, impaired driving, and not using seat belts, among others.

Road Departure Media Campaign – Social Media

PartnersCreative

Sponsored · 🌐



Don't get bucked off the road. Drive safely, buckle up and arrive alive.



Stay between the lines

7 Montana Road Trip Reminders

www.mdt.mt.gov

[Learn More](#)



Like



Comment



Share

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Keep that festival vibe going. Drive safely and be sure you and your friends arrive alive.



Focus on the road

7 Montana Road Trip Reminders

www.mdt.mt.gov

[Learn More](#)



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Keep the tradition alive. Drive safely, buckle up and arrive alive.



Stay in control

7 Montana Road Trip Reminders

plan2live.mt.gov

[Learn More](#)



Like



Comment



Share

http://plan2live.mt.gov/road_trip.shtml

Road Departure Media Campaign – Social Media

plan2live
a safety movement from the Montana Department of Transportation

7 MONTANA ROAD TRIP REMINDERS

Shockingly, summer is the deadliest time on Montana roads, despite dry roadways and bluebird skies. Here are seven reasons why.

1

"I have to get around this guy!"

Unsafe passing, swerving and speeding increase when roads are good and all of us — drivers and motorcyclists alike — are eager to get out and enjoy Montana. In fact, many of Montana's deadliest crashes are speed related. So slow down, enjoy the scenery and arrive alive.

3

"Ugh, I got ketchup on my shirt!"

Ketchup down the front of your new Patagonia shirt could be the least of your worries. Eating and drinking while driving can lead to losing control and crashing. So enjoy those summer eats sans the wheel.

5

"Better text Emma."

We all know that using our cellphones while driving is dangerous. So don't do it. Pull over to text or talk. It only takes a minute and it could save your life.

6

and arrive alive.

2

"Sit, Brutus, sit!"

Sure, it's fun to pile the whole family in and go for a drive, but distractions like ol' Brutus can cause you to reach, making you 8 times more likely to crash. So keep the dog in the back and your rig on the road.

4

"Dude, keep it between the lines."

Overcorrection is a leading cause of rollover crashes. People drive too fast, let their attention lapse and have to make sudden maneuvers. So as the song goes, "Keep your eyes on the road, your hands upon the wheel."

6

"I'm okay to drive ... really."

Whether you've been drinking beer on the river or you're tired from a long hike, hand over the keys. Hundreds of deadly and serious crashes are caused each year in Montana by drunk or tired drivers.

7

"I'm just going to the store."

Think you don't need your seat belt for short trips? So did dozens of other Montanans killed or injured in crashes last year. No matter where you're going or how long the trip is, always buckle up.

#VisionZeroMT
zero deaths | zero serious injuries

Road Departure Media Campaign - Billboards

LIFE SHATTERED
watch your speed



Montana Department
of Transportation

Road Departure Media Campaign - Billboards

LIFE SHATTERED
watch your speed



Montana Department
of Transportation

4

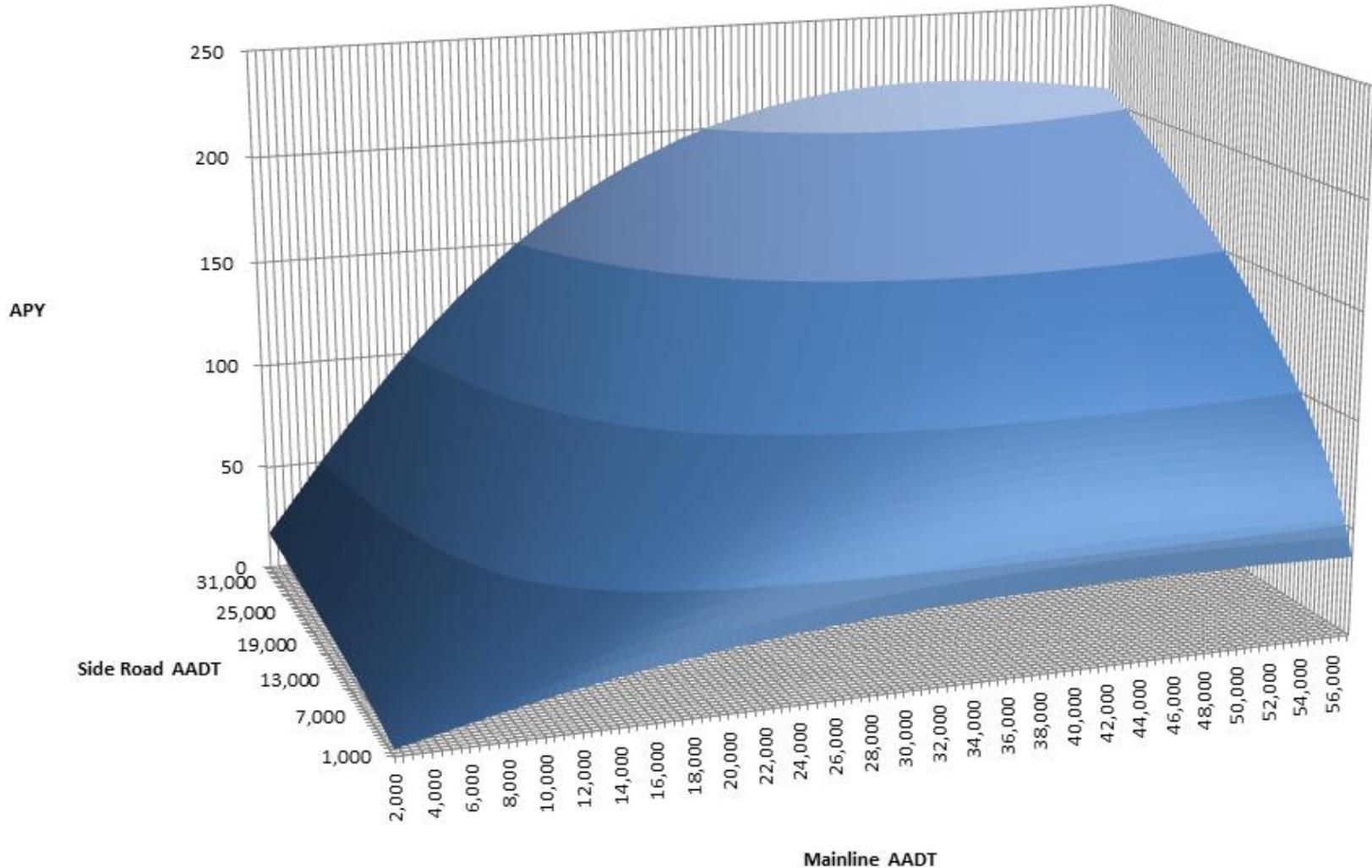
Reduce and mitigate intersection crashes through data-driven problem identification and the use of best practices

- **Develop and implement an intersection safety plan.**
- **Construct infrastructure improvements to mitigate intersection-related crashes.**
 - **Some examples: turn lanes; signal phasing/timing; flashing yellow arrows; retroreflective back plates on signals; sight distance improvements; roundabouts or pedestrian improvements; midblock crossings; bicycle improvements; signal coordination and timing improvements; enhanced/improved lighting or signing.**

Intersection Safety Plan

Intersection SPF (Total)

0-50 50-100 100-150 150-200 200-250



5

Support and increase enforcement of proper road use behaviors by all users in high-crash corridors and high-crash locations

- **Implement technologies and equipment to aid law enforcement in conducting enforcement**
- **Implement and support targeted enforcement efforts to prevent intersection and roadway departure crashes.**

6

Explore and implement best practices for reducing road departure, such as distracted driving and fatigued driving, in addition to other behavioral factors

- **Implementation steps to be determined as best practices are identified.**
 - **2015 MDT Rumble Strip Design Guidance**
 - **Centerline Rumble Strip Projects**

7

Improve the prosecution and adjudication of all roadway user violations

- **Increase education and training for law enforcement, prosecutors, and the judiciary to ensure consistent citing and adjudication of traffic offenses and consideration of alternative sentencing (i.e., safety education).**

Strategy Prioritization

- **Strategies 1,2,4, & 6 -**
Have a strong engineering focus and are easier to prioritize
- **Strategies 3,5, & 7 -**
Need Strategy Leaders to determine appropriate level of prioritization and timeline.

Implementation

Reaching Vision Zero calls for ***strong leadership & active engagement*** of all safety partners at all levels –

- From state, local, and tribal road departments and engineering agencies;
- State, local, and tribal enforcement;
- High schools, colleges, and universities; &
- All community members

Engineering a Safer Drive

MDT's *Traffic and Safety Bureau* provides management, design, and technical support for traffic and safety engineering; and is responsible for traffic signal operations. This team of professionals looks carefully at road designs to ensure the safest possible drive.

TRAFFIC AND SAFETY BUREAU »



Roy Peterson, Chief
Traffic & Safety Bureau, Engineering
Montana Department of Transportation
406-444-9252, roypeterson@mt.gov

Comprehensive Highway Safety Plan <http://www.mdt.mt.gov/visionzero/plans/chsp.shtml>
Pam Langve-Davis, CHSP Coordinator, 406-444-7646, plangvedavis@mt.gov