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DESCRIPTIVE SAFETY ANALYSIS REPORT

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INTRODUCTION

This memo summarizes the results of the descriptive crash analysis conducted for Red Wing's Comprehensive Road Safety Action Plan (CSAP). This memo provides a data-driven basis for understanding the scope of fatal and injury (FI) and fatal and serious injury (FSI) crashes in Red Wing over the most recent ten years of crash data, representing the years 2014 through 2023. This memo focuses on high-level fatal and injury and fatal and serious injury crash trends and identifies city-wide areas of concern to identify opportunities to reduce crashes through proven, innovative, and comprehensive strategies.

SUMMARY OF KEY FINDINGS

Primary Study Period: 2014-2023

Total Crashes: 3,091

Fatal Crashes: 8

Serious Injury Crashes: 40

Minor Injury Crashes: 200

Total Fatal and Serious Injury (FSI) Crashes: 48

Total Fatal and Injury (FI) Crashes: 248

Crashes by Year: Looking in the extended study period of 2014 through 2023, in 2019, the City had the highest fatal and serious injury crash total (8), highest fatal and injury crash total (35), and the highest percentage of fatal and serious injury crashes (16.7%) compared to all crashes. Over the past 10 years, the amount of fatal and injury crashes is trending upward, the amount of fatal and serious injury crashes is trending slightly upward, and the number of crashes involving vulnerable road users (walkers and bicyclists) has been trending slightly downward.

Injury Severity: While most crashes are minor, an average of approximately 5 crashes per year have resulted in a death or serious injury in recent years.

Fatal and Injury Crashes by Mode:

- **Motor Vehicles:** Motor vehicle crashes account for 88% of all fatal and injury crashes in the City of Red Wing. There were 218 motor vehicle crashes that resulted in a fatality or injury over the 10-year span. This includes 7 fatal crashes, 33 serious injury crashes, and 178 minor injury crashes.
- **Vulnerable Road Users:** Of the 3,091 crashes in Red Wing over the ten-year period, 56 crashes (1.8%) involved a pedestrian or a bicyclist. But, of the City's 248 fatal and injury crashes, 30 (9.1%) involved a pedestrian or bicyclist (8 involved a fatal or serious injury and 22 others involved a minor injury).

Leading Fatal and Injury Collision Type: Angle crashes and single-vehicle run off road crashes produced the highest number of fatal and injury and fatal and serious injury crashes across the study period, each consisting of 23.8% of all fatal and injury crashes and 25% of fatal and serious injury crashes in Red Wing. Rear end crashes were the third-highest fatal and injury crash type (12.1%) and pedestrian crashes were the third-highest fatal and serious injury crash type (14.6%).

Environmental Characteristics:

- **Weather Conditions:** The majority of fatal and injury and fatal and serious injury crashes occurred in clear (66.1% and 68.8%, respectively) or cloudy (19.8% and 18.8%, respectively) conditions. There were two fatal and injury crashes involving Vulnerable Road Users reported in rainy, winter weather, or other weather conditions. This does not mean that weather and road conditions do not produce fatal and injury crashes, but that most active mode travel is completed in clear and cloudy conditions.
- **Pavement Conditions:** The majority of fatal and injury and fatal and serious injury crashes occurred in dry conditions (74.2% and 77.1%, respectively). The next-most common pavement condition types for fatal and injury and fatal and serious injury crashes was wet pavement (13.3% and 14.6%, respectively) and snow- or ice-covered pavement (combined 8.8% and 8.4%, respectively). There were eleven crashes involving Vulnerable Road Users reported in wet, snow-covered, or standing water conditions. Of these eleven crashes, four involved a minor injury and two involved a serious injury.
- **Lighting:** The majority of fatal and injury and fatal and serious injury crashes occurred in daylight conditions (70.6% and 66.7%, respectively). The next-most common pavement condition types for fatal and injury and fatal and serious injury crashes was dark conditions with streetlights on (20.2% and 25.0%, respectively) and dark conditions with no street lights (4.8% and 4.2%, respectively). There were 15 crashes involving Vulnerable Road Users reported in non-daylight conditions. Of these 15 crashes, five involved a minor injury and four involved a serious injury.
- **Hour of the Day:** Fatal and injury crashes tend to occur most frequently during the afternoon and evening periods and less commonly during morning and overnight periods. Additional information related to overall traffic volume distributions by time of day would be desirable to determine whether crashes during evening or overnight hours are overrepresented as a share of overall crashes.

DESCRIPTIVE CRASH ANALYSIS METHODOLOGY

The descriptive crash analysis methodology consisted of data collection, consolidation, and analysis based on provided crash data. A series of high-level descriptive summary tables and charts attempt to capture relationships between crash data factors and attributes. These statistics examine broader crash trends and patterns, providing insights to inform which variables deserve further examination. They also guide the development of new behavioral safety programs, policy modifications, and safety-focused engineering countermeasures. This report provides planners, engineers, and decision

makers with high-level data to help respond to historical crash patterns and determine which crash factors tend to produce the most crashes across the roadway system.

CRASH DATA OVERVIEW

Crash data used in this analysis was retrieved from the Minnesota Crash Mapping Analysis Tool (MnCMAT2), accessed on December 14, 2023 for crashes from 2014 to 2022 and on April 26, 2024 for 2023 crashes. It consists of all crash data from 2014 through 2023 within the City of Red Wing. However, this memo and analysis focus on fatal and injury crash data in the City of Red Wing during the years 2014 through 2023.

STUDY LIMITATIONS

EXPOSURE DATA

The analyses reported in this memo do not adjust for motor vehicle, pedestrian, or bicyclist exposure rates based on volumes for these modes. Therefore, results show crash events but not frequency of crashes normalized by level of traffic or pedestrian and bicycle volumes, which is also referred to as exposure.

As an example, pedestrian crashes are more common in daylight than in dark conditions. This does not mean that daylight conditions are inherently more dangerous than dark conditions. Rather, it indicates that people are more likely to walk in light conditions than in dark conditions.

DESCRIPTIVE CRASH ANALYSIS

GENERAL CRASH TRENDS

CRASHES BY YEAR

Figure 1 shows the number of fatal and serious injury crashes by year in the City of Red Wing from 2014 to 2023, while Figure 2 shows the number of fatal and injury crashes for the same period and Figure 3 shows vulnerable road user-related crashes for the same period. Each graph also shows the linear trendline for the 10-year period. Overall, fatal and injury crashes decreased during this time period in Goodhue County but remained relatively constant each year in Red Wing. Fatal and injury and fatal and serious injury crashes are trending upward over the 10-year period, while vulnerable road user crashes are trending slightly downward over the period.

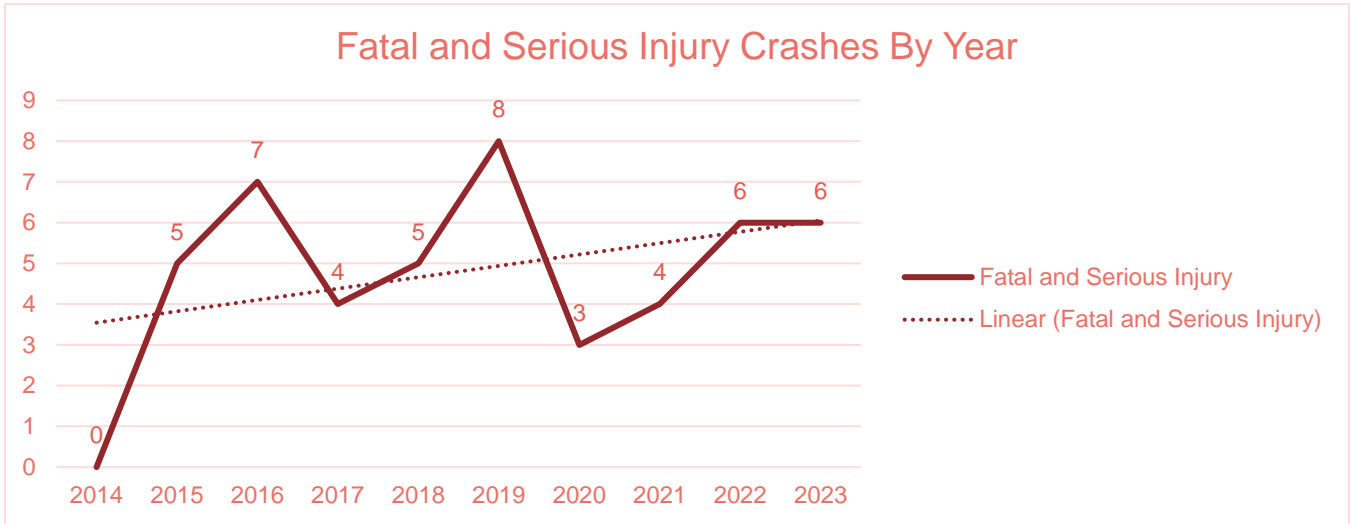


Figure 1: Fatal and Serious Injury Crashes by Year, 2014-2023

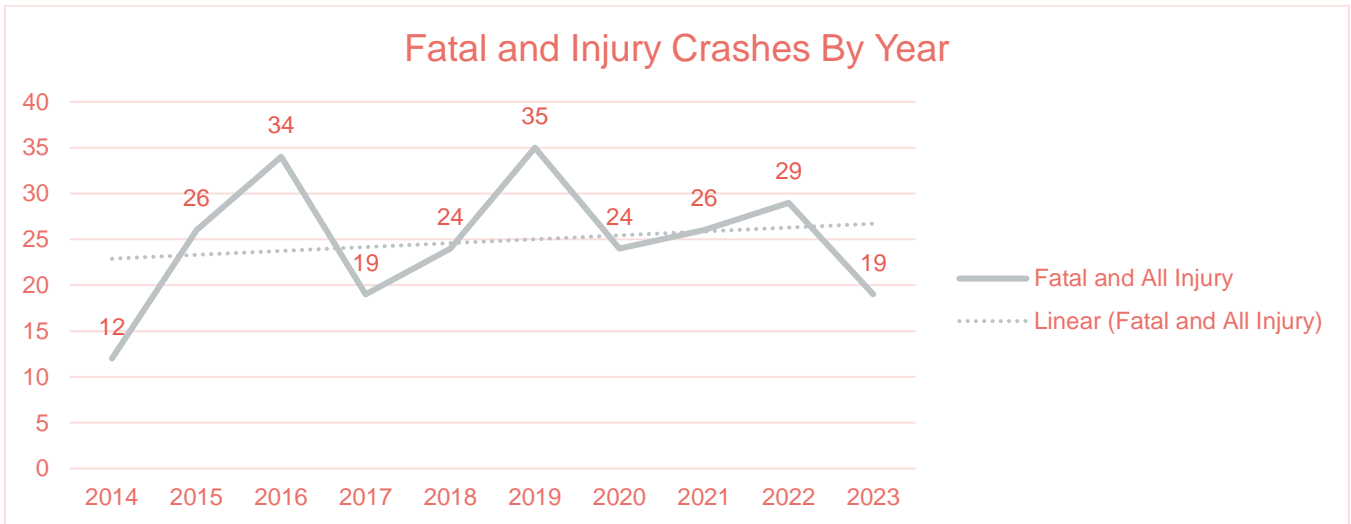


Figure 2: Fatal and Injury Crashes by Year, 2014-2023

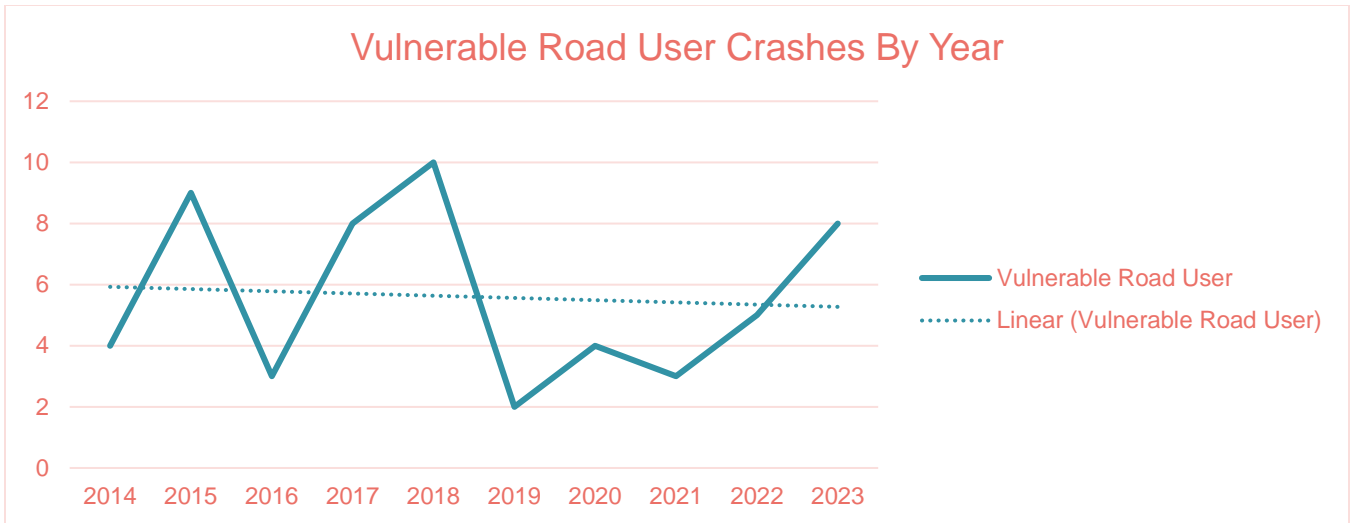


Figure 3: Vulnerable Road User Crashes by Year, 2014–2023

CRASHES BY MONTH

Figure 4 shows the number of crashes by month across all years analyzed. Generally, higher amounts of fatal and injury and fatal and serious injury crashes occurred in warmer weather months, likely corresponding to an increase in traffic volumes during those months from tourism and recreation traffic.

Vulnerable road user crashes are highest in February, August, and September. The increase in vulnerable road user crashes in August and September may be due in part to the beginning of school activities.

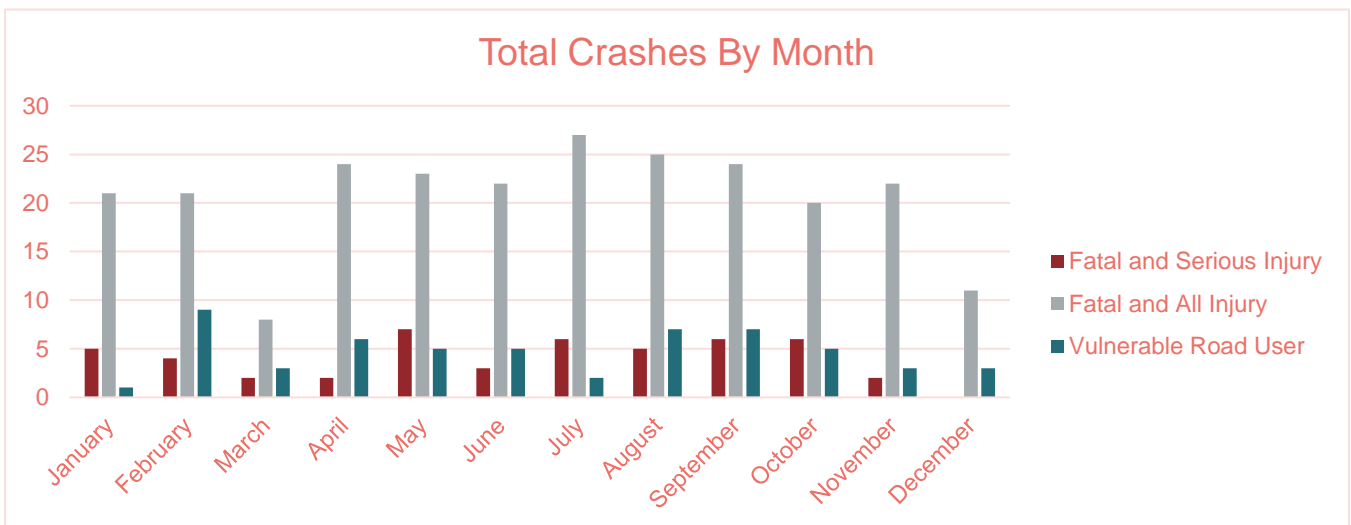


Figure 4: Crashes by Month (Fatal and Serious Injury, Fatal and Injury, and Vulnerable Road User), 2014–2023

Additionally, the percentage of crashes by month were compared between all crashes (including non-injury crashes) and fatal and serious injury, fatal and injury, and vulnerable road user crashes (see Figures 5, 6, and 7). A greater incidence of fatal and serious injury and fatal and injury crashes are occurring compared to all crashes during warmer weather months (May–October) than during colder weather months (November–April). Vulnerable road user crashes are more distributed throughout the year and peak at different times, likely tied more closely to the school year than general traffic volumes.

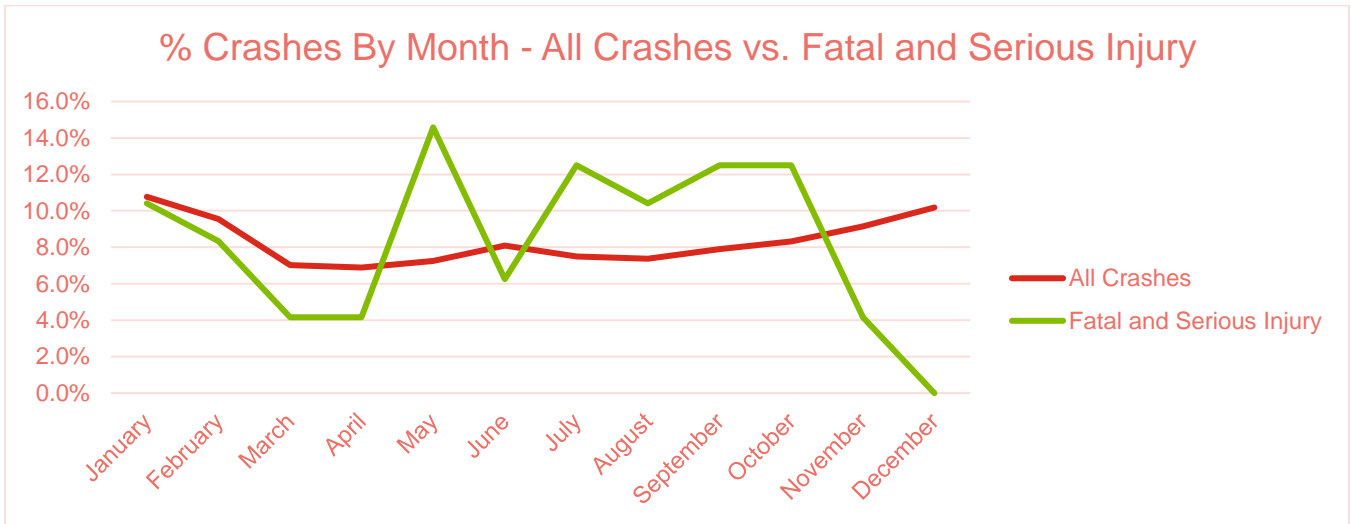


Figure 5: Percentage of Crashes by Month (All Crashes vs. Fatal and Serious Injury Crashes), 2014-2023

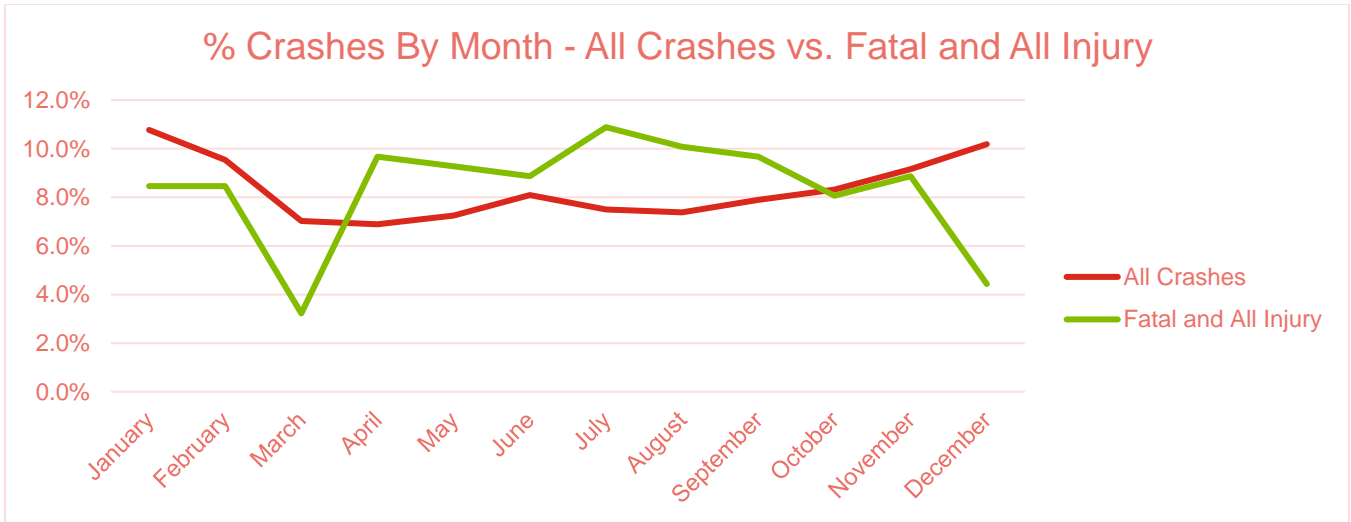


Figure 6: Percentage of Crashes by Month (All Crashes vs. Fatal and Injury Crashes), 2014-2023

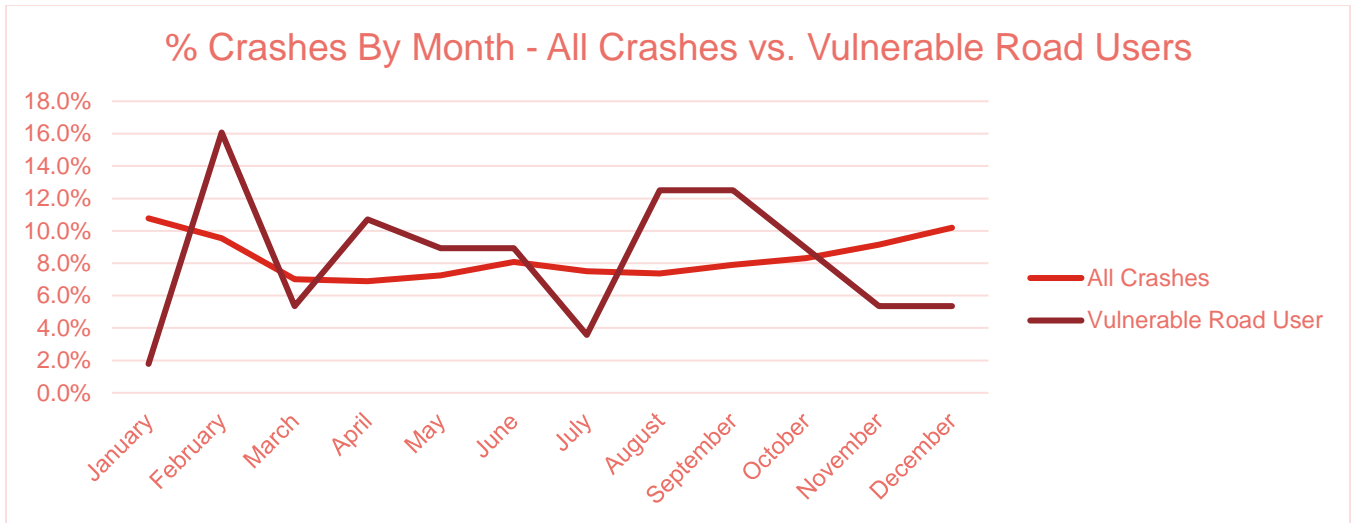


Figure 7: Percentage of Crashes by Month (All Crashes vs. Vulnerable Road User Crashes), 2014-2023

CRASHES BY TIME OF DAY

Figure 8 shows the total amount of crashes occurring at different times of day, and Figures 9-11 show percentage of crashes by time of day for fatal and serious injury, fatal and injury, and vulnerable road user crashes, respectively, to show what times of day are overrepresented in various times of the day. The times of each crash were sorted into 3-hour increments related to the amounts and types of activities typically occurring at those times:

- 12:00AM-3:00AM: Overnight (includes bar closing time)
- 3:00AM-6:00AM: Early morning (very little activity apart from some early commuting)
- 6:00AM-9:00AM: Morning commute (includes typical work and school start times, large stores opening)
- 9:00AM-12:00PM: Late morning (includes small shops opening, early lunch)
- 12:00PM-3:00PM: Lunch “rush”
- 3:00PM-6:00PM: Afternoon commute (includes dinner time)
- 6:00PM-9:00PM: Early evening (includes most after-school and recreational activities, small shops closing)
- 9:00PM-12:00AM: Late evening (includes large stores closing)

Generally, there is a higher incidence of fatal and serious injury, fatal and injury, and vulnerable road user crashes in the afternoon and evening hours compared to all crashes, and there is a lower incidence of fatal and serious injury, fatal and injury, and vulnerable road user crashes in the overnight and morning hours.

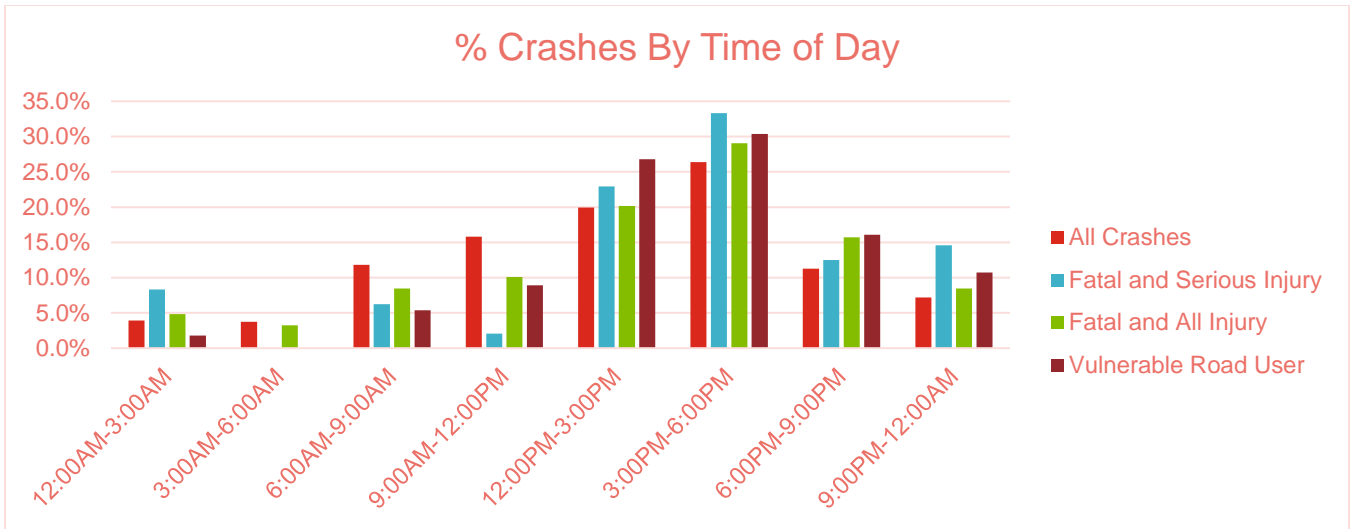


Figure 8: Total Crashes by Time of Day, 2014-2023

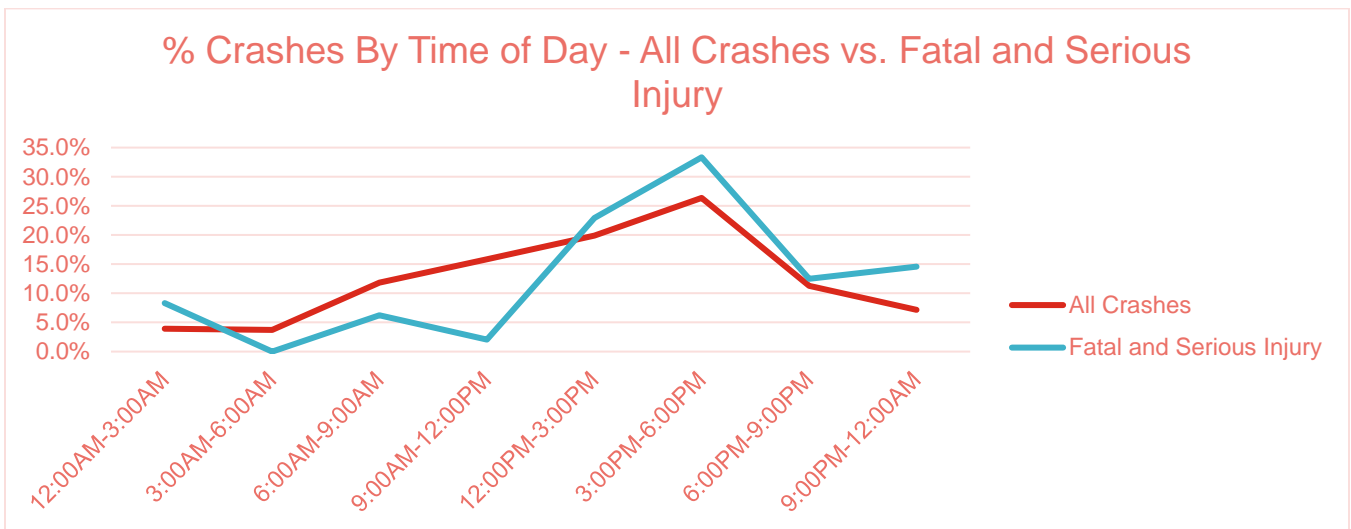


Figure 9: Percentage of Crashes by Time of Day (All Crashes vs. Fatal and Serious Injury Crashes), 2014-2023

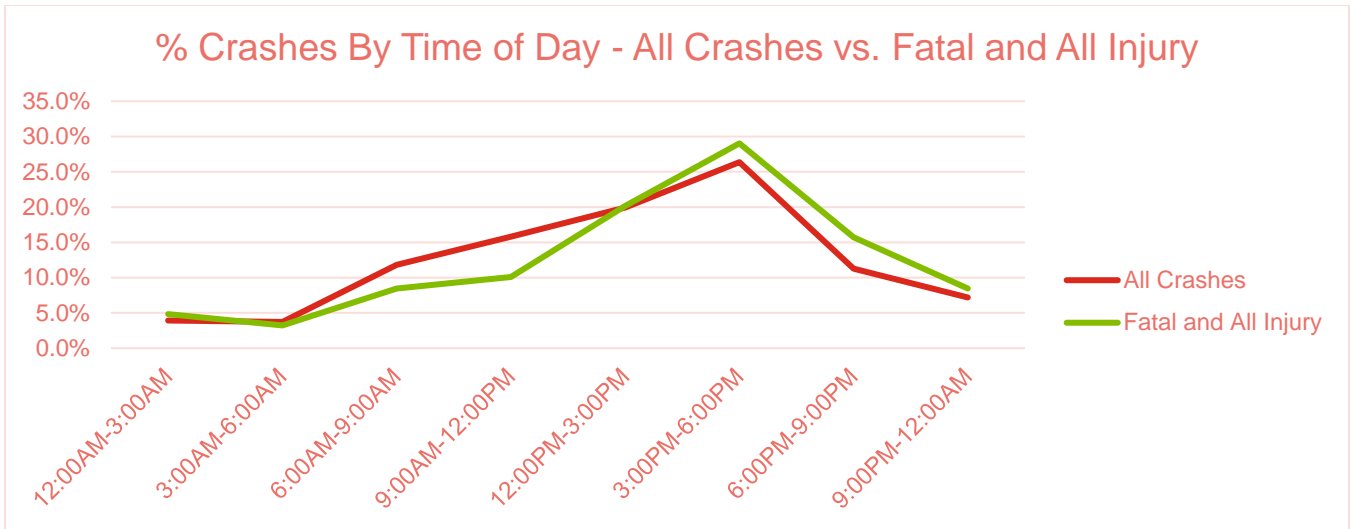


Figure 10: Percentage of Crashes by Time of Day (All Crashes vs. Fatal and Injury Crashes), 2014-2023

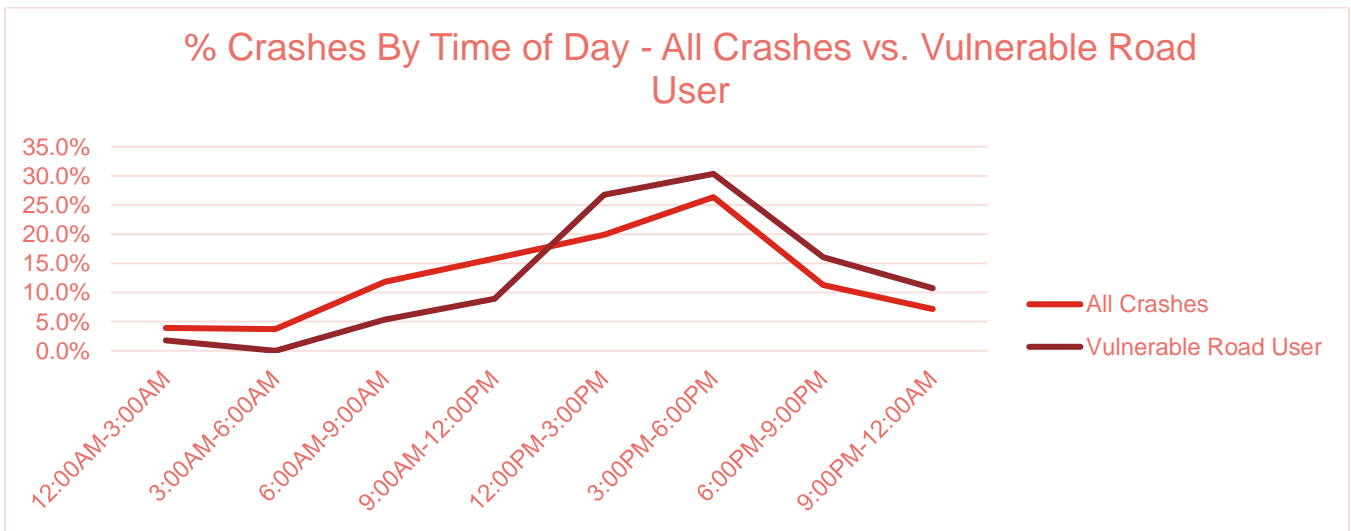


Figure 11: Percentage of Crashes by Time of Day (All Crashes vs. Vulnerable Road User Crashes), 2014-2023

CRASHES BY MODE

The table below shows crashes by mode of travel and severity level in Red Wing.

Overall, vehicle crashes occur the most frequently but have the lowest severity level. Still, there were 40 fatal and serious injury and 218 fatal and injury vehicle-only crashes in Red Wing, amounting to 1.3% and 7.2% of all vehicle-only crashes, respectively.

We also see that pedestrian- and bicyclist-involved crashes are more likely to be severe in the City. 15.5% of pedestrian-involved crashes resulted in a serious injury or fatality, whereas 9.1% of bike-related crashes resulted in a serious injury or fatality. Both of these fatal and serious injury crash rates are over 7 times more prevalent than vehicle-only crashes. These numbers increase to 51.1% and 63.6% for pedestrian-related and bike-related crashes, respectively, when including minor injuries, compared to 7.2% of vehicle-only crashes.

Severity	Total Number					Percent of Total				
	All Crashes	Vehicle-Only	Bike	Pedestrian	All vulnerable road user	All Crashes	Vehicle-Only	Bike	Pedestrian	All vulnerable road user
Fatal	8	7	0	1	1	0.3%	0.2%	0.0%	2.2%	1.8%
Serious Injury	40	33	1	6	7	1.3%	1.1%	9.1%	13.3%	12.5%
Minor Injury	200	178	6	16	22	6.5%	5.9%	54.5%	35.6%	39.3%
Possible Injury	304	283	3	18	21	9.8%	9.3%	27.3%	40.0%	37.5%
Property Damage Only	2539	2534	1	4	5	82.1%	83.5%	9.1%	8.9%	8.9%
Total	3091	3035	11	45	56					

Table 1: Fatal and Injury Crashes by Mode and Severity, 2014-2023

CRASH CAUSATION

CRASH TYPES

Figure 12 shows the total number of all crashes (including non-injury crashes), and Figure 13 shows the total number of fatal and serious injury and fatal and injury crashes by type. Figure 14 shows the percentage of all crashes, fatal and serious injury crashes, and fatal and injury crashes showing which types of crashes are overrepresented in fatal and injury and fatal and serious injury crashes compared to all crashes.

The top three types of crashes for all crashes (including non-injury crashes) are other/unknown, rear end, and single vehicle run off road crashes. The top three types for fatal and serious injury crashes are angle, single vehicle run off road, and pedestrian crashes. The top three types for fatal and injury crashes are angle, single vehicle run off road, and rear end.

By percentage, pedestrian, bike, head on, and angle crashes are significantly overrepresented in fatal and serious injury and fatal and injury crashes when compared to all crashes, and left turn, angle, and single vehicle run off road crashes are also overrepresented compared to all crashes. Rear end, sideswipe crashes (opposing and same direction), and other/unknown crashes are underrepresented in fatal and serious injury and fatal and injury crashes compared to all crashes.

Please note that other/unknown crashes contain a wide variety of different crash types that are not otherwise categorized. Parking maneuver crashes are generally included in this category as are hit and run crashes that were not witnessed by other people but caused enough damage to exceed the reportable crash damage threshold.

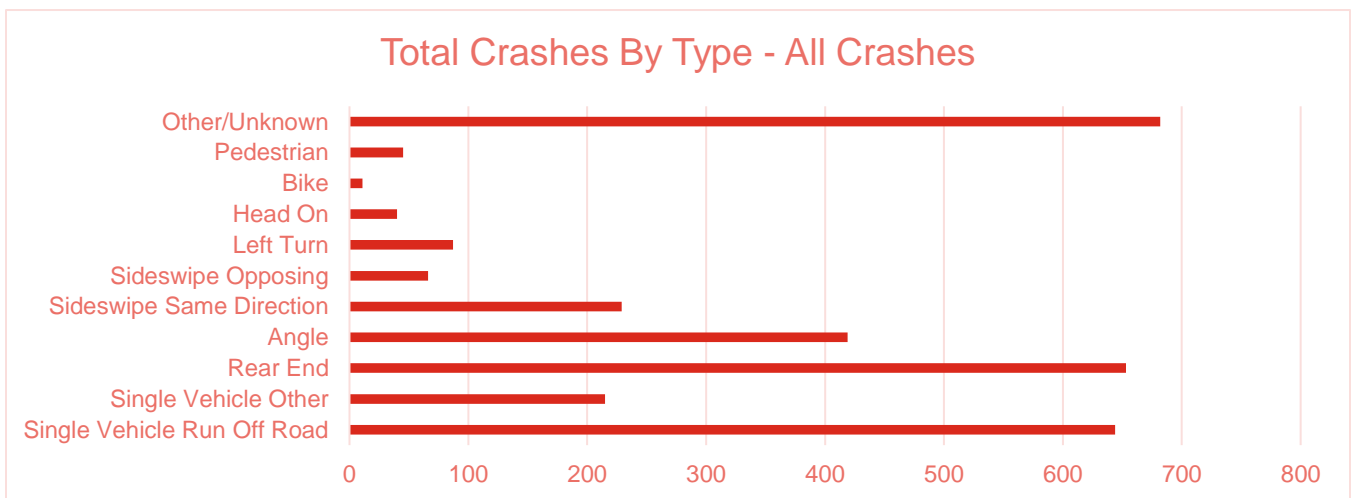


Figure 12: Total Amount of All Crashes (includes non-injury crashes) by Collision Type, 2014-2023

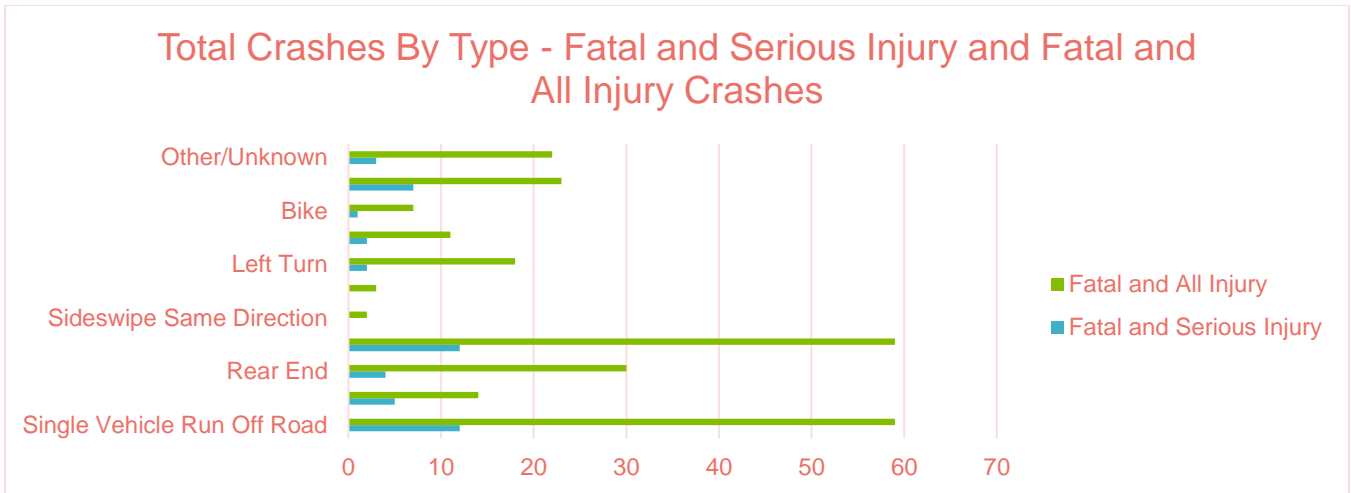


Figure 13: Total Amount of Fatal and Serious Injury and Fatal and Injury Crashes by Collision Type, 2014-2023

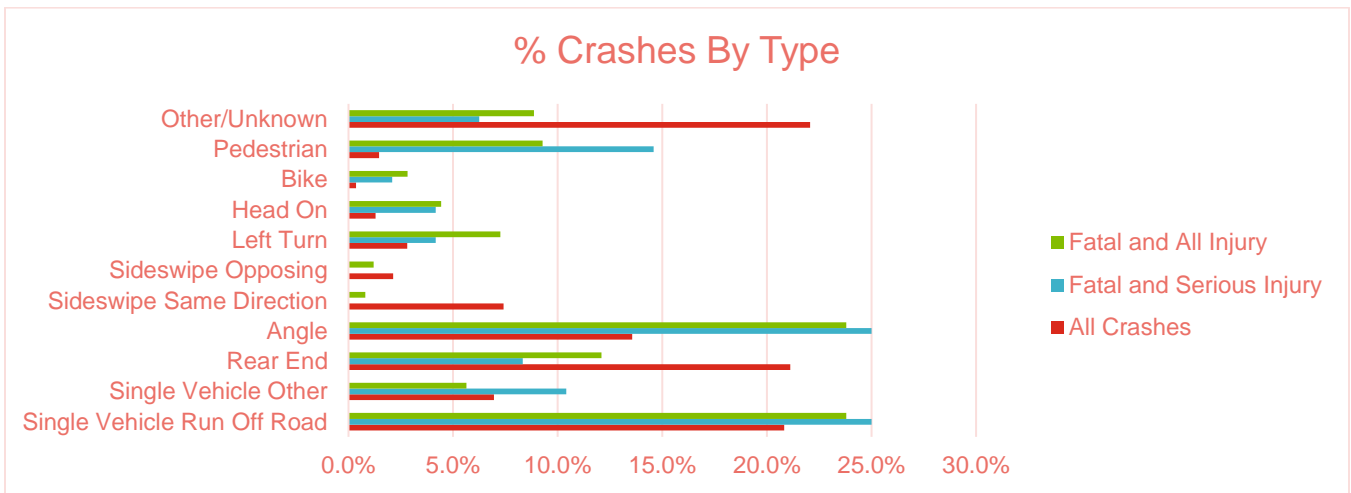


Figure 14: Percentage of Fatal and Injury, Fatal Serious Injury, and All Crashes by Collision Type, 2014-2023

ENVIRONMENTAL CHARACTERISTICS

WEATHER CONDITIONS

The majority of all crashes, fatal and injury crashes, fatal and serious injury crashes, and vulnerable road user crashes in Red Wing occurred when the weather was clear or cloudy, not during winter weather or rain (Figure 15). Fatal and serious injury, fatal and injury, and vulnerable road user crashes occurred more frequently in clear and cloudy conditions compared to all crashes (including non-injury crashes). While the cause of this trend is somewhat unclear, some theories include:

- Drivers are generally more cautious and driving more slowly during rainy and snowy weather
- People walking and biking do so less often during rainy or snowy weather compared to clear and cloudy weather

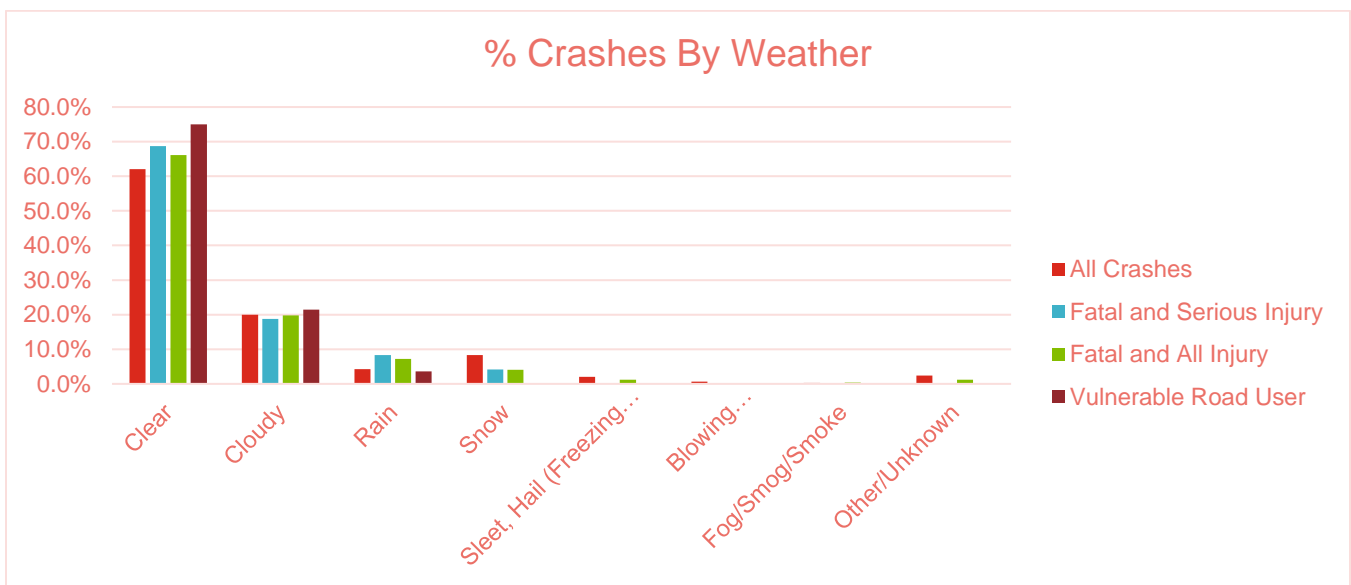


Figure 15: Percentage of All Crashes, Fatal and Serious Injury, Fatal and Injury, and Vulnerable Road User Crashes by Weather Condition, 2014-2023

LIGHTING CONDITIONS

The majority of fatal and injury and fatal and serious injury crashes in Red Wing occurred during daylight conditions. Comparing all crashes (including non-injury crashes) to fatal and injury, fatal and serious injury, and vulnerable road user crashes, a greater amount of fatal and injury, fatal and serious injury, and vulnerable road user crashes occur in dark, lighted conditions. This could indicate that existing lighting is not illuminating enough of the roadways and intersections to provide adequate visibility outside of daylight hours. Figure 16 shows all crashes compared to fatal and serious injury, fatal and injury, and vulnerable road user crashes for each lighting condition.

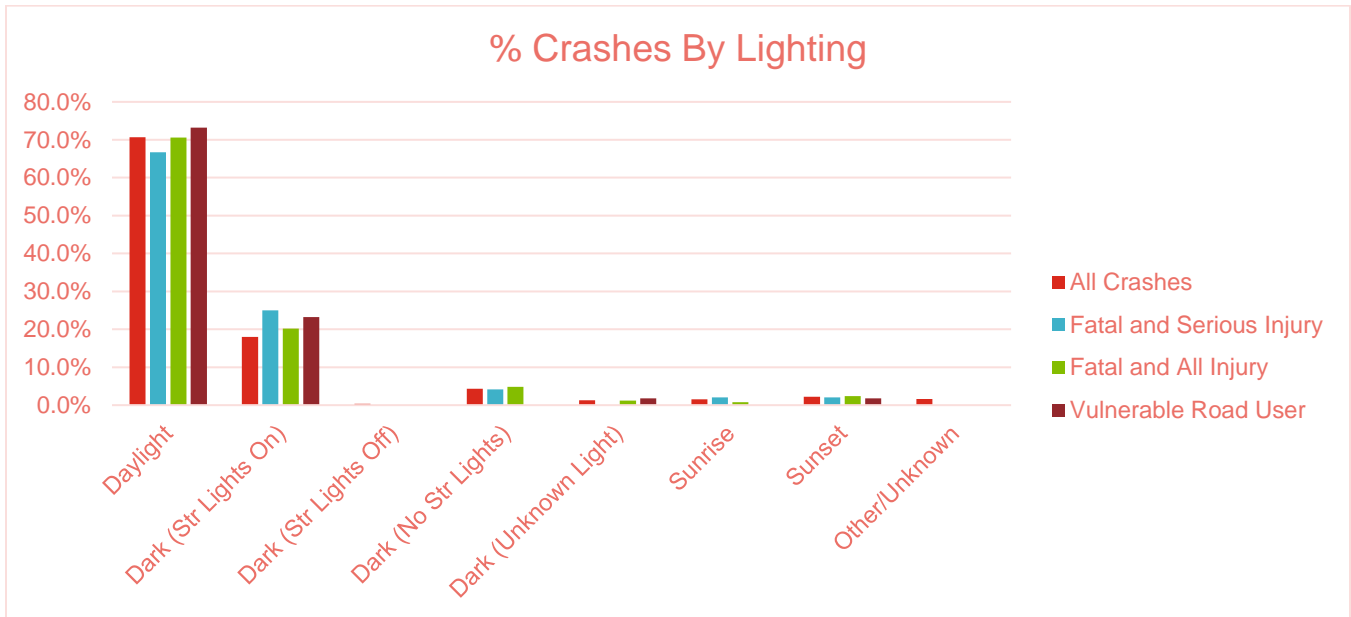


Figure 16: Percentage of All Crashes, Fatal and Serious Injury, Fatal and Injury, and Vulnerable Road User Crashes by Lighting Condition, 2014-2023

PAVEMENT SURFACE CONDITIONS

The majority of all crashes, fatal and injury crashes, fatal and serious injury crashes, and vulnerable road user crashes in Red Wing occurred when the weather was dry or wet, not during snowy or icy conditions (Figure 17). Fatal and serious injury, fatal and injury, and vulnerable road user crashes occurred more frequently in dry and wet conditions compared to all crashes (including non-injury crashes) and less often during snowy and icy pavement conditions. While the cause of this trend is somewhat unclear, some theories include:

- Drivers are generally more cautious and driving more slowly with snowy and icy pavement
- People walking and biking do so less often when pavement is snowy or icy compared to dry or wet pavement

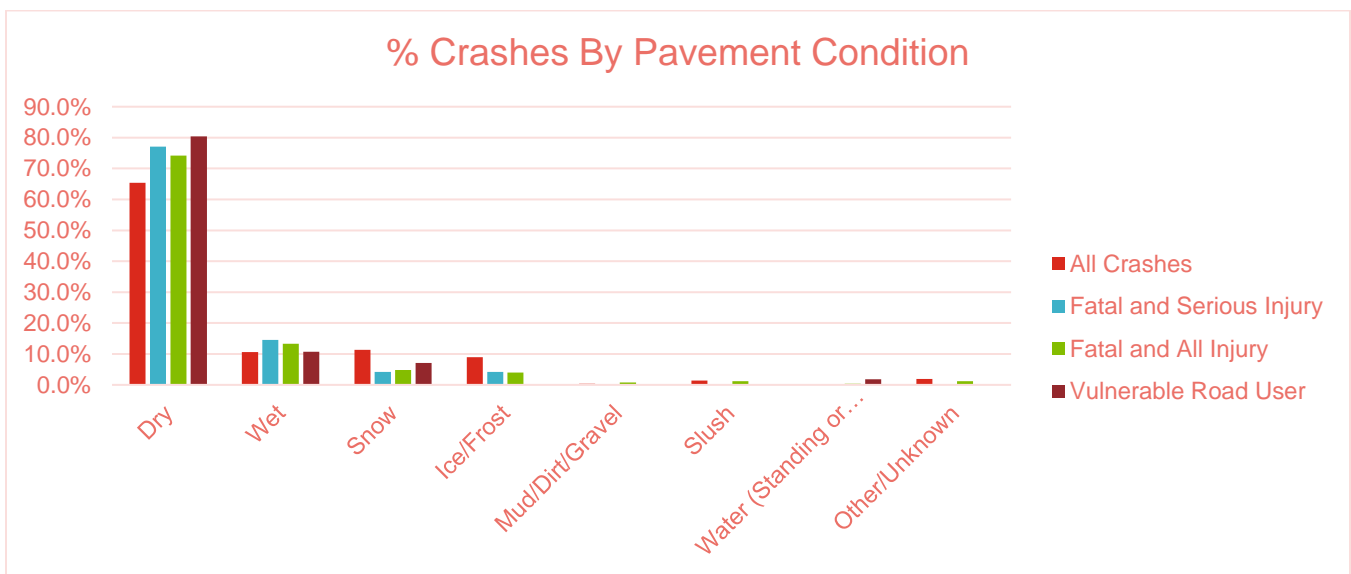


Figure 17: Percentage of All Crashes, Fatal and Serious Injury, Fatal and Injury, and Vulnerable Road User Crashes by Pavement Surface Condition, 2014-2023