Wasatch Front Regional Council

Comprehensive Safety Action Plan

WASATCH FRONT REGIONAL COUNCIL
Comprehensive Safety Action Plan

Technical Memorandum #1

Safety Analysis

September 2023

WASATCH FRONT REGIONAL COUNCIL COMPREHENSIVE SAFETY ACTION PLAN

TECHNICAL MEMORANDUM #1 – SAFETY ANALYSIS
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List of Acronyms

A	Serious Injury Crash
AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
BIL	Bipartisan Infrastructure Law
CCR	Critical Crash Rate
CSAP	Comprehensive Safety Action Plan
EPDO	Equivalent Property Damage Only
FHWA	Federal Highway Administration
GFA	Geographic Focus Area
GIS	Geographic Information System
HSIP	Highway Safety Improvement Program
HSM	Highway Safety Manual
K	Fatal Crash
PSI	Potential for Safety Improvement
SHSP	Strategic Highway Safety Plan
SS4A	Safe Streets and Roads for All
T	Total Fatal and Serious Injury Crashes
TWLTL	Two-Way Left-Turn Lane
UDOT	Utah Department of Transportation
USDOT	United States Department of Transportation
usRAP	United States Road Assessment Program
UTA	Utah Transit Authority
VMT	Vehicle Miles Traveled
WFRC	Wasatch Front Regional Council

1. Introduction

Wasatch Front Regional Council (WFRC) is preparing a regional Comprehensive Safety Action Plan (CSAP). The CSAP will present a holistic, well-defined strategy to reduce roadway fatalities and serious injuries in the Wasatch Front region.

The CSAP will analyze safety needs, identify high-risk locations and factors contributing to crashes, and prioritize strategies to address them.

The CSAP will meet eligibility requirements that allow local jurisdictions to apply for Implementation Grants from the United States Department of Transportation (USDOT) Safe Streets and Roads for All (SS4A) discretionary grant program.[1] The grant program was established by the Bipartisan Infrastructure Law (BIL) with $5 billion in appropriated funds, 2022-2026.

Technical Memorandum #1 provides an overview of the safety analysis methodology and results, leading to identification of a high-risk roadway network.

1.1. SS4A Grant Program Overview

The purpose of the SS4A discretionary grant program is to fund improvements and strategies to prevent roadway fatalities and serious injuries of all users of our highways, streets, and roadways: pedestrians, bicyclists, public transportation users, motorists, personal conveyance and micro-mobility users, and commercial vehicle operators.

The program provides funding to develop a comprehensive safety action plan (Action Plan) that identifies the most significant roadway safety concerns in a community, and implementation of projects and strategies to address roadway safety issues. SS4A requires that an eligible Action Plan be in place before jurisdictions may apply for funding to implement projects and strategies.

The SS4A programs provides Federal funds for two types of grants:

- **Planning and Demonstration Grants** to prepare an Action Plan. The goal of an Action Plan is to develop a holistic, well-defined strategy to prevent roadway fatalities and serious injuries in a locality, Tribe, or region.
- **Implementation Grants** to implement projects and strategies identified in an Action Plan to address a roadway safety problem. Projects and strategies may be infrastructure, behavioral, and/or operational activities. Applicants must have a qualifying Action Plan that meets the eligibility requirements to apply for Implementation Grants. In addition, applicant agencies must have ownership and/or maintenance responsibilities over a roadway network, safety responsibilities that affect roadways, or an agreement from the agency that has ownership and/or maintenance responsibilities for the roadway within the applicant's jurisdiction.

1.2. Safety Action Plan Components

SS4A requires an eligible Action Plan be in place before applying to implement projects and strategies. An eligible Action Plan is determined by the Self-Certification Eligibility Worksheet.[2] The Action Plan requirements are summarized in **Table 1.1**.

[1] https://www.transportation.gov/grants/SS4A
[2] https://www.transportation.gov/sites/dot.gov/files/2023-03/SS4A-Self-Certification-Eligibility-Worksheet-FY23.pdf

Table 1.1 – Action Plan Requirements

Action Plan Element		Required or Optional
The Safety Action Plan must include the three elements:		
1. **Safety Analysis:** Does the Action Plan include all the following?	Analysis of existing conditions and historical trends to baseline the level of crashes involving fatalities and serious injuries across a jurisdiction, locality, Tribe, or region;	Required Action Plan Elements
	Analysis of the location where there are crashes, the severity, as well as contributing factors and crash types;	
	Analysis of systemic and specific safety needs, as needed (e.g., high risk road features, specific safety needs of relevant road users);	
	A geospatial identification (geographic or locational data using maps) of higher risk locations.	
2. **Strategy and Project Selections**: does the plan identify a comprehensive set of projects and strategies to address the safety problems in the Action Plan, time ranges when projects and strategies will be deployed, and explain project prioritization criteria?		Required Action Plan Element
3. **Completion Date:** Was the plan finalized and/or last updated between 2018 and June 2023[3]?		Required Action Plan Element
The Safety Action Plan must include at least four of the following six optional requirements:		
4. Are both of the following true: **Leadership Commitment:** Did a high-ranking official and/or governing body in the jurisdiction publicly commit to an eventual goal of zero roadway fatalities and serious injuries? **Goal:** Did the commitment include either setting a target date to reach zero, OR setting one or more targets to achieve significant declines in roadway fatalities and serious injuries by a specific date?		Optional Action Plan Element Included in CSAP scope of work
5. **Planning Structure:** To develop the Action Plan, was a committee, task force, implementation group, or similar body established and charged with the plan's development, implementation, and monitoring?		Optional Action Plan Element Included in CSAP scope of work
6. **Engagement and Collaboration**: Did the Action Plan development include all the following activities? ▪ Engagement with the public and relevant stakeholders, including the private sector and community groups ▪ Incorporation of information received from the engagement and collaboration into the plan ▪ Coordination that included inter- and intra-governmental cooperation and collaboration, as appropriate		Optional Action Plan Element Included in CSAP scope of work

[3] Dates for 2024 applications are anticipated to be 2019 and 2024

Action Plan Element	Required or Optional
7. **Equity Considerations**: Did the Action Plan development include the following? ▪ Considerations of equity using inclusive and representative processes ▪ Identification of underserved communities through data ▪ Equity analysis, in collaboration with appropriate partners, focused on initial equity impact assessments of the proposed projects and strategies, and population characteristics	Optional Action Plan Element Included in CSAP scope of work
8. **Policy and Process Changes:** Are both of the following true? ▪ Plan development included an assessment of current policies, plans, guidelines, and/or standards to identify opportunities to improve how processes prioritize safety; and ▪ Plan discusses implementation through the adoption of revised or new policies, guidelines, and/or standards.	Optional Action Plan Element Included in CSAP scope of work
9. **Progress and Transparency**: Does the plan include the following? ▪ A description of how progress will be measured over time that includes, at a minimum, outcome data. ▪ The plan is posted publicly online.	Optional Action Plan Element Included in CSAP scope of work

1.3. Safe System Approach

CSAP recommendations will be based on a Safe System Approach. The Safe System Approach is adopted by the USDOT as the guiding paradigm to address roadway safety and mitigate the risk inherent in our complex transportation system.[4]

The Safe System Approach builds multiple layers of protection to prevent crashes from happening and minimize the harm should a crash occur. The Safe System Approach focuses on human mistakes and human vulnerability to design a system with redundancies in place to protect everyone. A Safe System Approach includes the principles as summarized in **Figure 1.1**.

Implementing a Safe System Approach requires moving away from traditional safety paradigms, as summarized in the following list and in **Table 1.2.**[5]

- The Safe System approach seeks to prevent death and serious injuries.
- In addition to trying to improve human behavior, the Safe System approach

Figure 1.1 – Safe System Approach

Source: USDOT, https://www.transportation.gov/NRSS/SafeSystem

[4] https://www.transportation.gov/NRSS/SafeSystem
[5] https://highways.dot.gov/safety/zero-deaths/safe-system-approach-presentation-0

designs for human mistakes and limitations.

- While the traditional safety approach focuses on controlling speeding, the Safe System approach includes speed and other strategies to reduce system kinetic energy.
- Rather than asserting that only individual roadway users are responsible, the Safe System approach aims to share responsibility among system users, managers, and others.
- Instead of reacting based on crash history, the Safe System approach proactively identifies and addresses risks.

Table 1.2 – Safe System Approach Paradigm

Traditional Approach to Safety	Safe System Approach Paradigm
Prevent crashes	Prevent death and serious injury
Improve human behavior	Design for human mistakes/limitations
Control speeding	Reduce system kinetic energy
Individuals are responsible	Share responsibility
React based on crash history	Proactively identify and address risks

1.4. Utah Strategic Highway Safety Plan

Utah's goal is to have zero traffic-related fatalities as documented in the Utah Strategic Highway Safety Plan (SHSP). A SHSP is a requirement of the Highway Safety Improvement Program (HSIP) (23 U.S.C. § 148) and is a statewide-coordinated safety plan that provides a comprehensive framework for reducing fatalities and serious injuries on all public roads.

The strategies identified within the SHSP are focused on efforts related to the five E's of safety:

- Engineering
- Education
- Emergency Medical Services
- Enforcement
- Everyone

The Utah SHSP identified eleven emphasis safety areas to focus on to reach the Zero Fatalities goal.

- Aggressive Driving
- Distracted Driving
- Impaired Driving
- Motorcycle Safety
- Pedestrian Safety
- Senior Safety
- Roadway Departure Crashes
- Intersection Safety
- Speed Management
- Teen Driving Safety
- Use of Safety Restraints

1.5. WFRC CSAP Project Overview

The WFRC CSAP will serve as the eligible Safety Action Plan to enable local jurisdictions to apply for the SS4A Implementation discretionary grant program. Development of the WFRC CSAP includes the following tasks as listed in **Table 1.3,** designed to meet Action Plan eligibility requirements**.**

Table 1.3 – WFRC CSAP Tasks

CSAP Task	Purpose
Task 1: Project Management	Weekly coordination with WFRC Project Management Team, to complete the project on-schedule.
Task 2: Planning Structure	Coordinate with the CSAP Steering Team. The Steering Team is composed of representatives of cities, counties, Utah Department of Transportation (UDOT), and Utah Transit Authority (UTA). The Steering Team meets monthly during project development. In addition, two rounds of stakeholder meetings will be conducted. Meetings are organized into Geographic Focus Areas. Meetings will be held within each Geographic Focus Area to review safety analysis results and to discuss projects, strategies, and project types.
Task 3: Leadership and Goal Setting	Regional leaders will be asked to consider adopting or approving a Safety Commitment Resolution. The Safety Commitment Resolution will be presented to regional stakeholders at a Regional Safety Workshop in Spring 2024 for consideration.
Task 4: Safety Analysis	Includes analysis of existing data and trends, identification of risk factors, and high-risk locations.
Task 5: Engagement and Collaboration	A project website has been established, available at wfrcsafetyplan.org. Community organization stakeholder meetings will be held in conjunction with the GFA meetings.
Task 6: Equity Considerations	The safety analysis incorporates equity into the selection of priority segments. The analysis identifies concentrations of disadvantaged or vulnerable populations. The equity analysis utilizes tools published by WFRC and by the Federal Highway Administration (FHWA).
Task 7: Policy and Process Changes	Existing policies, programs, and practices will be reviewed that may impact safety. Opportunities for change will be identified. Potential engineering, enforcement, or education policies or practices will be recommended.
Task 8: Strategy and Project Type	The CSAP will recommend and prioritize countermeasures, strategies, and project types to prevent fatalities and serious injuries.
Task 9: Final Report, Safety Resolution, and Safety Summit	A final report will summarize study findings and recommendations. The final report will be presented to stakeholders at a Regional Safety Workshop in Spring 2024.

1.6. Document Organization

This document is organized into the following sections:

- **Section 1** introduces the CSAP and provides background information.
- **Section 2** summarizes the WFRC study area.
- **Section 3** describes the safety data analysis method.
- **Section 4** describes the results of the regional-scale safety analysis.
- **Section 5** describes the results of the individual Geographic Focus Area safety analysis.
- Appendices

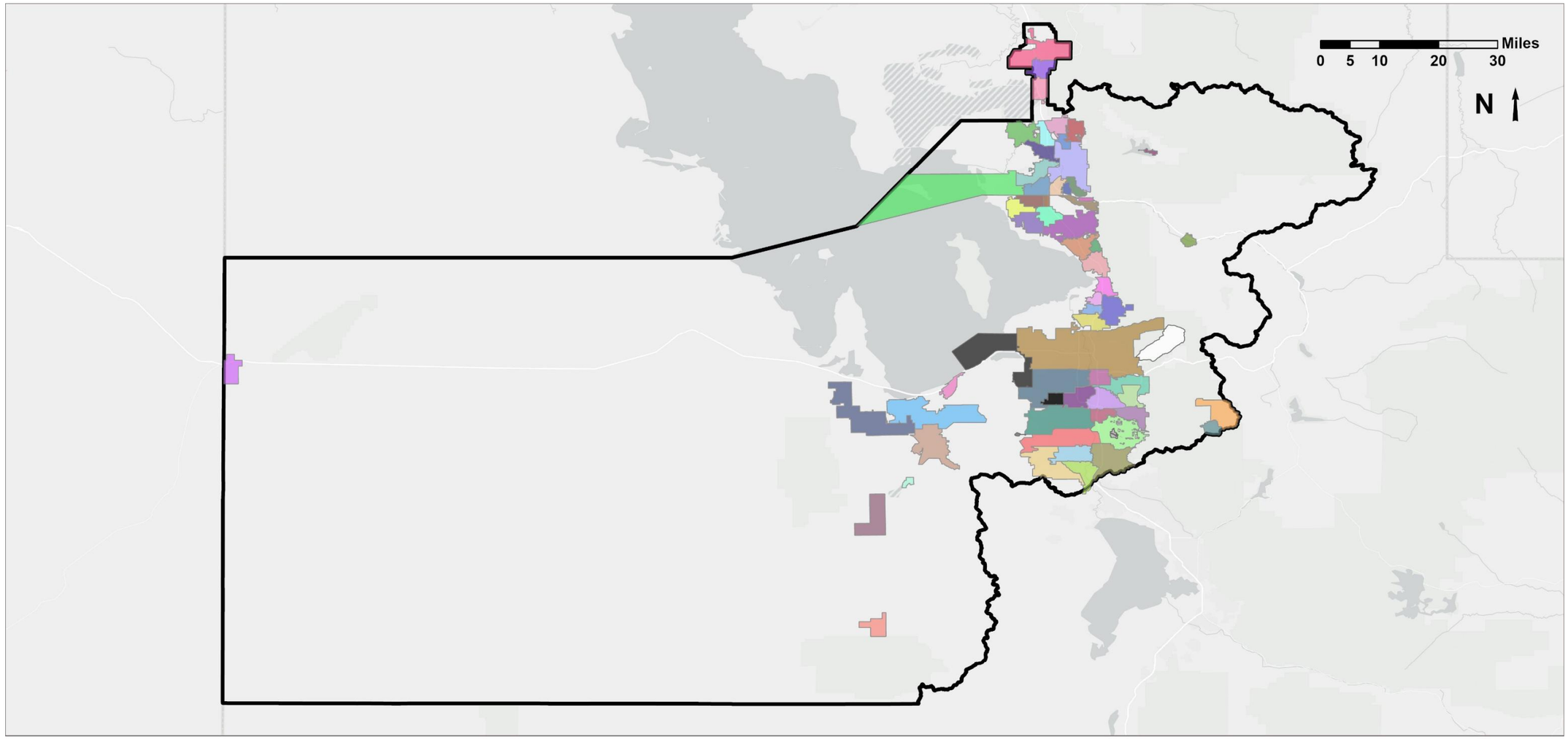
2. Study Area

The CSAP study area includes each jurisdiction within the WFRC area, as illustrated in **Figure 2.1**. To organize the large number of jurisdictions within the WFRC area into manageable analysis areas, jurisdictions are organized into Geographic Focus Areas (GFA). A map of the GFAs is included in **Figure 2.2**, and **Table 2.1** lists jurisdictions by GFA. The safety analyses presented in subsequent sections of this Technical Memorandum are presented by GFA, as well as a regional level analysis. Roadways within the study area are divided into the following three categories:

- State Routes: UDOT-maintained roads
- Federal Aid Routes: Local jurisdiction-maintained roads eligible for federal funding
- Local Streets: Local jurisdiction-maintained roads that are not Federal Aid routes.

Table 2.1 – Jurisdictions by GFA

Geographic Focus Area	Jurisdictions
South Box Elder/North Weber County	Brigham City
	Box Elder County
	Perry
	Willard
	Farr West
	Harrisville
	North Ogden
	Pleasant View
West Weber County	Marriott-Slaterville
	Weber County
	Hooper
	Plain City
	Roy
	West Haven
East Weber County/Morgan County	Morgan
	Morgan County
	Huntsville
Central Weber County	Weber County
	Ogden
	Riverdale
	South Ogden
	Uintah
	Washington Terrace
North Davis County	Davis County
	Clearfield
	Clinton
	Layton
	South Weber
	Sunset
	Syracuse
	West Point
South Davis County	Davis County
	Bountiful
	Centerville
	Farmington
	Fruit Heights
	Kaysville
South Davis County (continued)	North Salt Lake
	West Bountiful
	Woods Cross
Salt Lake City	Salt Lake City
East Salt Lake Valley	Sandy
	Cottonwood Heights
	Salt Lake County
	Alta
	Brighton
	Holladay
	Millcreek
	White City
	Emigration
West Salt Lake Valley	West Jordan
	Salt Lake County
	Copperton
	Kearns
	Magna
	Midvale
	Murray
	South Salt Lake
	Taylorsville
	West Valley City
South Salt Lake Valley	Herriman
	Bluffdale
	Draper
	Riverton
	South Jordan
Tooele County	Tooele County
	Erda
	Grantsville
	Lake Point
	Rush Valley
	Stockton
	Tooele
	Vernon
	Wendover



Legend

WFRC Boundary	Cottonwood Heights	Holladay	Morgan	Riverton	Stockton	West Bountiful	Kearns
Alta	Draper	Hooper	Murray	Roy	Sunset	West Haven	Magna
Bluffdale	Erda	Huntsville	North Ogden	Rush Valley	Syracuse	West Jordan	White City
Bountiful	Farmington	Kaysville	North Salt Lake	Salt Lake City	Taylorsville	West Point	
Brigham City	Farr West	Lake Point	Ogden	Sandy	Tooele	West Valley City	
Brighton	Fruit Heights	Layton	Perry	South Jordan	Uintah	Willard	
Centerville	Grantsville	Marriott-Slaterville	Plain City	South Ogden	Vernon	Woods Cross	
Clearfield	Harrisville	Midvale	Pleasant View	South Salt Lake	Washington Terrace	Copperton	
Clinton	Herriman	Millcreek	Riverdale	South Weber	Wendover	Emigration Canyon	

Figure 2.1 – WFRC Study Area by Jurisdiction

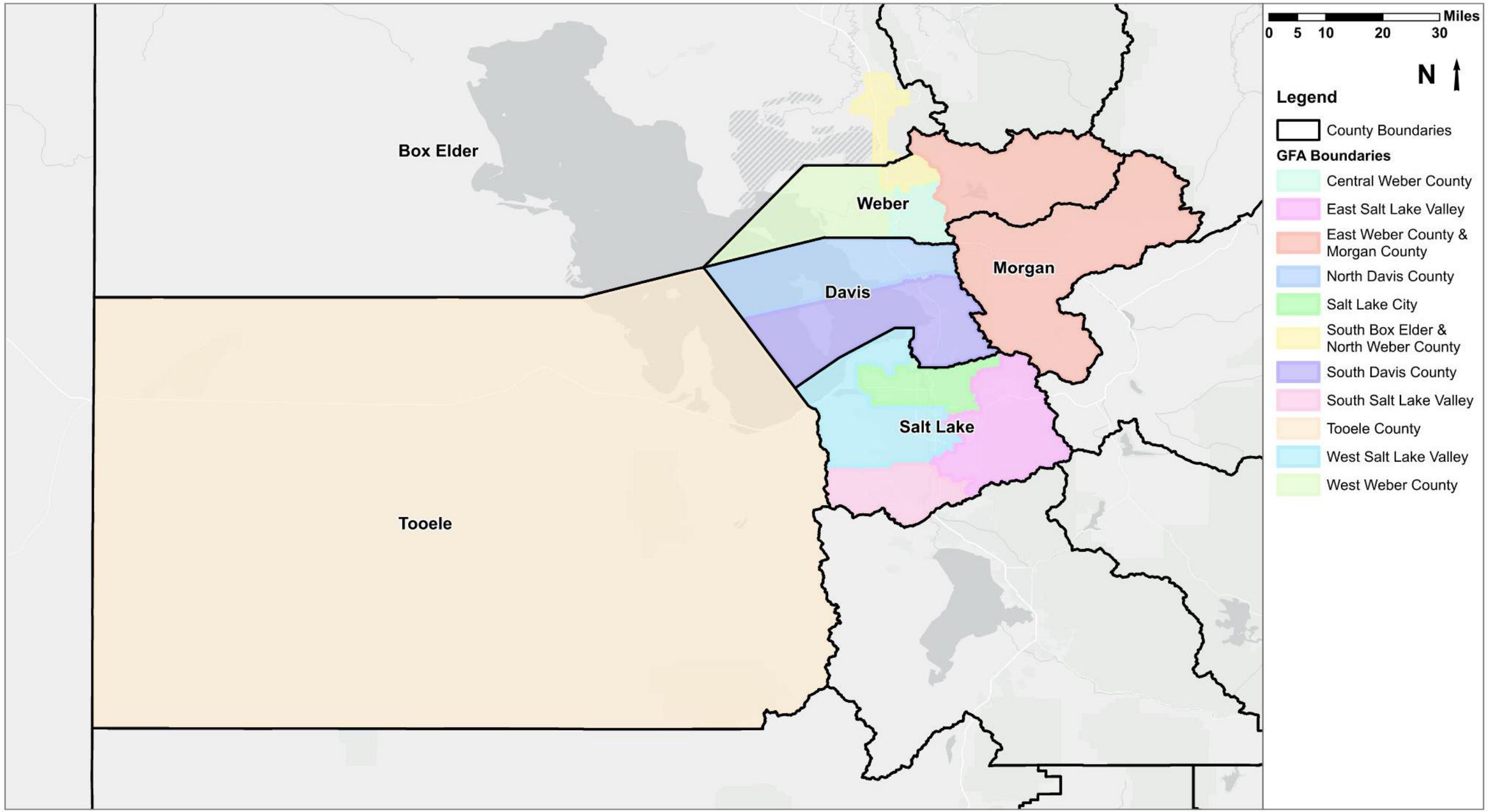


Figure 2.2 – WFRC Study Area by GFA

3. Safety Analysis Methodology

Five safety analysis methodologies are applied. The first four methodologies listed below lead to the identification of a Composite High-Risk Roadway network. The safety analysis methodologies are:

- SHSP Emphasis Area Analysis
- Historical Crash Analysis
- Crash and Network Screening Analysis
- Roadway Characteristic Risk Analysis
  - Crash Profile Risk Assessment
  - usRAP Risk Factors Analysis
  - Local Street Risk Assessment
- Composite High-Risk Roadway Network Identification

An overview of the methodology is shown in **Figure 3.3.** Each analysis is explained in the following sections.

3.1. SHSP Emphasis Area Analysis

The SHSP emphasis area analysis compares the number of fatal and serious injuries for each of the eleven Utah SHSP emphasis safety areas. A ranking is assigned to each emphasis area for the state, WFRC planning area, and GFA based on the frequency fatal and serious injuries for that emphasis area. This analysis helps to determine priority emphasis areas for each GFA, based on whether the ranked frequency of fatal and serious injury crashes within the GFA is significantly different than the statewide or WFRC rankings. Note that while bicyclist-involved crashes are not one of the eleven Utah SHSP emphasis areas, bicyclist-involved fatal and serious injuries were included in this analysis.

Utah SHSP Emphasis Areas

- Aggressive Driving
- Distracted Driving
- Impaired Driving
- Motorcycle Safety
- Pedestrian Safety
- Roadway Departure Crashes
- Intersection Safety
- Speed Management
- Teen Driving Safety
- Use of Safety Restraints
- Senior Safety

3.2. Historical Crash Analysis

A historical crash data analysis was conducted for the most recent complete five-year period, 2018 through 2022 for crashes that occurred on roadways in the WFRC study area. The crash data was analyzed for the WFRC study area as a whole and for each individual GFA. Historical crash analysis results are summarized for the following areas:

- Overall Crashes by Severity and Roadway Ownership
- Crashes by Year
- Crashes by Location and Density
- Crashes by Crash Type
- Vulnerable User Crashes
- Crashes by Manner of Collision
- Intersection Crashes
- Crashes by Functional Class
- Crash Tree Diagrams
  - Crash Type (Top 3 crash types)

Definitions:

Crash type: Represents a query of multiple data fields. Each crash is only assigned one crash type. Examples include rear-end collisions, side-swipe, run-off-road, head-on, right-angle, left-turn, etc.

Manner of Collision: Represents the manner in which two vehicles initially came together. This may overlap with the crash type categorization.

- Manner of Collision (Top 3 manner of collision categories)
- Active Transportation

The analysis summarizes fatal and serious injury crashes, fatal crashes by roadway ownership, and serious injury crashes by roadway ownership, as applicable.

3.3. Crash and Network Screening Analysis

The Highway Safety Manual (HSM) was developed by the American Association of State Highway and Transportation Officials (AASHTO) and provides guidance for incorporating quantitative safety analysis into project planning and development processes. With an emphasis on analytical methods to quantify safety, the HSM helps practitioners understand the safety effects of decisions in planning, design, operations, and maintenance efforts.

The HSM 1st Edition, 2010, consists of three volumes and a supplement and contains the following:

- Part A – Introduction, Human Factors, and Fundamentals (Volume 1)
- Part B – Roadway Safety Management Process (Volume 1)
- Part C – Predictive Method (Volume 2 and Supplement)
- Part D – Crash Modification Factors (Volume 3)

The Roadway Safety Management Process (Part B) outlines the recommended process for agencies to monitor and reduce crash frequency and severity on existing roadway networks. The basic structure of the Roadway Safety Management Process is illustrated in **Figure 3.1**.

The process is intended to be iterative so that agencies can use it continuously to improve overall safety on their existing roadway network. By implementing projects through data-informed processes, agencies can maximize the effectiveness of available funding sources.

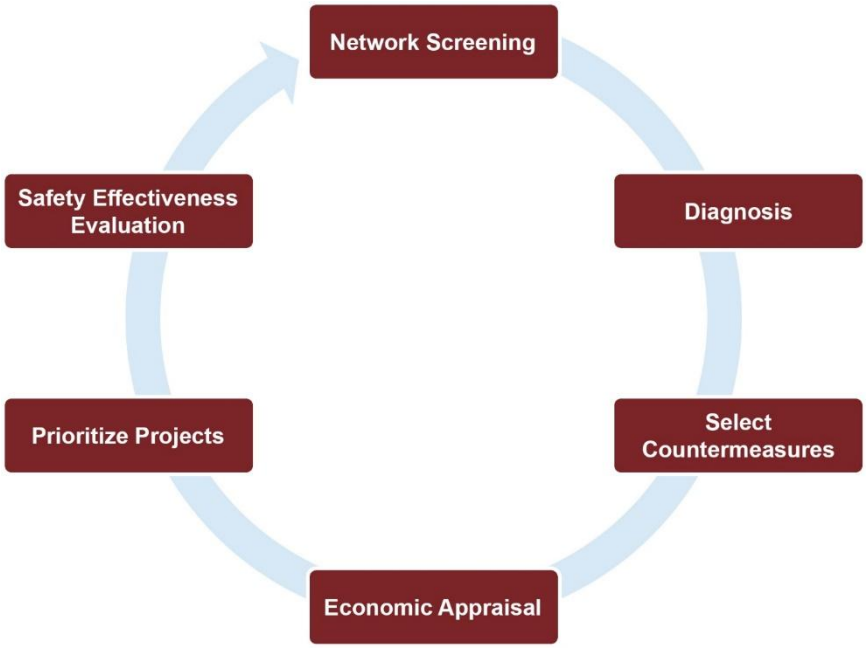


Figure 3.1 – Roadway Safety Management Process

Network screening is the first step of the Roadway Safety Management Process. HSM Chapter 4 introduces network screening processes, defined as the process for reviewing a transportation network to identify and rank sites from most likely to least likely to realize a reduction in crash frequency with the implementation of a particular countermeasure(s). The location of sites identified as most likely to realize

a reduction in crash frequency should be studied in more detail to identify crash patterns, contributing factors, and appropriate countermeasures.

The HSM identifies five steps in this process:

- Establish Focus: Identify the purpose or intended outcome of the network screening analysis.
- Identify Network and Establish Reference Populations: Specify the types of sites or facilities being screened (i.e., segments, intersections, geometrics) and identify groupings of similar sites or facilities.
- Select Performance Measures: Performance measures are selected as a function of the screening focus and the data and analytical tools available.
- Select Screening Method: Three principal screening methods are described (ranking, sliding window, peak searching).
- Screen and Evaluate Results: Conduct the screening analysis and evaluate the results.

The crash and network screening analysis methodologies applied in the CSAP are based on Part B Chapter 4 of the HSM. Intersections and roadway segments were analyzed using the following crash metrics:

- Number of Crashes
- Critical Crash Rate (CCR) – HSM Chapter 4
- Probability of Specific Crash Types Exceeding Threshold Proportion – HSM Chapter 4
- Equivalent Property Damage Only (EPDO) – HSM Chapter 4

The initial step of the crash analysis established sub-populations of roadway segments and intersections with similar characteristics (e.g., major arterial, minor arterial, collector) Each GFA was analyzed independent of one another. Next, intersections were grouped by their control type (Signalized and Unsignalized) and segments by their roadway category (Other Principal Arterial, Minor Arterial, Major Collector, Minor Collector, and Local) within the three roadway ownership groupings of State Route, Federal Aid Route, and Local Street. Individual crash rates were calculated for each sub-population. The sub-population level crash rates were used to assess whether a specific location has more or fewer crashes than expected. This is known as the Critical Crash Rate (CCR) analysis. These sub-populations were also used to determine typical crash patterns to help identify locations where unusual numbers of specific crash types are occurring. This is known as the Probability of Specific Crash Types Exceeding Threshold Proportion Analysis.

3.3.1. Critical Crash Rate (CCR) Analysis

Reviewing the number of crashes at a location is a good way to understand the cost to society incurred at a location but does not provide a complete indication of the level of risk for those who use that intersection or roadway segment.

The CCR method provides a statistical review of locations to determine where risk is higher than that experienced by other similar locations. It is also the first step in analyzing for patterns that may suggest systemic issues that can be addressed at that location, and proactively at others to prevent new safety challenges from emerging.

The CCR compares the observed crash rate to the expected crash rate at a particular location based on the facility type and volume using a GFA-specific calculated average crash rate for the specific type of intersection or roadway segment being analyzed. Based on traffic volumes and a weighted GFA-specific crash rate for each facility type, a CCR threshold is established at the 95% confidence level to determine locations with higher crash rates that are unlikely to be random. The threshold is calculated for each location based on its traffic volume and the crash profile of similar facilities, consistent with equations specified in HSM Chapter 4.

A CCR differential is determined for each intersection and roadway segment within the GFA by calculating the difference of the expected CCR to the location-specific CCR. A positive CCR differential indicates a location with higher-than-expected crashes rates or a location with a potential for safety improvement. The results of this analysis are summarized by identifying the 10 highest CCR differentials for each of the following population groups:

- Intersections
  - Signalized
  - Unsignalized
- Segments
  - State Routes
  - Federal Aid Routes
  - Local Streets

Key findings are summarized in Chapter 5. Detailed results for each GFA are summarized in the Appendices. A separate Appendix is prepared for each GFA.

3.3.2. Probability of Specific Crash Types Exceeding Threshold Proportion

When analyzing crash data systematically, it is important to identify areas where certain types of crashes are occurring with greater frequency. The HSM describes a method to identify locations where the probability of a specific crash type exceeds the threshold population. This method prioritizes locations based on the probability that the true proportion (long-term predicted proportion) of a type of crash or injury level will exceed the threshold proportion. The threshold proportion is based on the proportion of a specific crash type/severity to all crashes within the dataset. This analysis identifies locations where certain crash types are overrepresented and therefore subject to be isolated for further analysis. For each GFA the following crash types were analyzed for the 10 locations identified from the CCR analysis:

- Crash Severity – Fatal, Suspected Serious Injury, Suspected Minor Injury, Possible Injury, and Property Damage Only
- Manner of Collision – Angle, Front to Rear, Head On, Single Vehicle, Parked Vehicle, Rear to Rear, Rear to Side, Sideswipe, and Other/Unknown
- Vulnerable Road Users – Pedestrian, Bicycle, and Motorcycle

3.3.3. Equivalent Property Damage Only (EPDO)

The EPDO method assigns weighting factors to crashes based on a crash severity level to develop a property-damage-only score. In this analysis, the injury crash costs were calculated for each location (based on 2023 UDOT crash costs). This value is divided by the cost for a property-damage-only crash, to calculate the equivalent number of property-damage-only crashes at each site. This value allows all locations to be compared based on injury crash costs. The EPDO analysis was performed for the ten locations identified in the CCR analysis.

3.4. Roadway Characteristic Risk Analysis

A roadway characteristic risk analysis was performed to identify risk factors that would lead to fatal and serious injury crashes occurring on roadway segments within each GFA, using the following three sub-analyses:

- Crash Profile Risk Assessment
- usRAP Risk Factors Analysis
- Local Street Risk Assessment

3.4.1. Crash Profile Risk Assessment

The Crash Profile Risk Assessment reviewed fatal and serious injury crashes reported in the WFRC study area to identify attributes that correspond to a higher frequency of fatal and serious injury crashes. A point value was assigned to each characteristic or attribute based on the frequency per the review. A risk factor score was calculated for each state and federal aid route.

Table 3.1 outlines the Crash Profile Risk factor scoring framework. The roadway characteristic data used in this assessment is extracted from UDOT's usRAP dataset. UDOT collected usRAP data for state and federal aid routes. Local roads were not included in this analysis because sufficient data regarding their attributes is not available. A separate methodology was prepared for local roads and is presented in Section 3.4.3. This analysis identifies roadway segments where improvements can be made to reduce potential for crashes.

Table 3.1 – Crash Profile Risk Assessment Ranking

Risk Factor	Characteristic	Area Type (Urban/Rural)	Measurement & Points	Max Points	Explanation
Traffic Volume	Average Annual Daily Traffic (AADT)	Both	0: <1,000 2: 1,000-4,000 4: 4,001-10,000 6: 10,001-20,000 8: 20,001+	8	A review of regional crash data shows that: Roadways with more than 20,000 ADT experience approximately 44% of all crashes. Roadways with ADT of 10,000 to 20,000 experience approximately 25% of all fatal and serious injury crashes.
Speed	Speed Limit	Both	0: ≤ 20 Miles Per Hour (MPH) 2: 25 MPH 4: 30 MPH 6: 35 – 40 MPH 4: 45 MPH 3: ≥ 50 MPH	5	A review of regional crash data shows that: 51.4% of fatal and serious injury crashes occurred on roadways with a posted speed limit of 35 MPH or 40 MPH. 28.7% of fatal and serious injury crashes occurred on roadways with speed limits 45 MPH and above. 19.9% of fatal and serious injury crashes occurred on roadways with a posted speed limit of 30 MPH or less.
Roadway Type	Cross Section (Urban)	Urban	0: 2 Lane Divided/Median 0: 8+ Lanes 0: One-Way 2: 6 Lane w/ TWLTL 2: 6 Lane Undivided 3: 2 Lane w/TWLTL 3: 4 Lane Divided/Median 3: 6 Lane Divided 4: 4 Lane Undivided 4: 4 Lane w/TWLTL 6: 2 Lane Undivided	6	A review of regional crash data shows that: 28.0% of fatal and serious injury crashes in urban areas occur on two-lane undivided roadways. 17.3% of fatal and serious injury crashes in urban areas occur on four-lane undivided roadways. 16.2% of fatal and serious injury crashes in urban areas occur on four-lane roadways with TWLTL.

Risk Factor	Characteristic	Area Type (Urban/Rural)	Measurement & Points	Max Points	Explanation
					29.1% of fatal and serious injury crashes in urban areas occur on two-lane roadways with TWLTL (9.6%), four-lane divided roadways (9.9%), and six-lane divided roadways (9.6%).
Roadway Type	Cross Section (Rural)	Rural	0: 2 Lane Divided/Median 0: 4 Lane Divided/Median 0: 6+ Lanes 0: One-Way 1: 4 Lane Undivided 2: 2 Lane w/TWLTL 3: 4 Lane w/TWLTL 4: 2 Lane Undivided	4	A review of regional crash data shows that: 48.7% of fatal and serious injury crashes in rural areas occurred on two-lane undivided roadways. 21.7% of fatal and serious injury crashes in rural areas occurred on four-lane roadways with TWLTL. 18.9% of fatal and serious injury crashes in rural areas occurred on two-lane roadways with TWLTL.
Lighting Condition	Presence of Lighting	Both	0: Lighting 2: No Lighting	2	FHWA estimates that lighting can reduce crashes by up to 28% (for night-time injury crashes).
Access Density	Presence of Commercial Access	Both	0: No Commercial Access 2: Commercial Access (Rural) 3: Commercial Access (Urban)	2 (Rural) 3 (Urban)	40.3% of fatal and serious injury crashes occurred on segments with at least one commercial access.
Centerline Condition	Presence of Centerline Rumble Strip	Rural	0: Rumble Strip 2: No Rumble Strip	2	FHWA estimates that centerline longitudinal rumble strips can reduce head-on fatal and serious injury crashes by 44%-64%
Shoulder Condition	Presence of Shoulder Rumble Strip	Rural	0: Rumble Strip 2: No Rumble Strip	2	FHWA estimates that shoulder rumble strips can reduce single vehicle, run-off-road fatal and serious injury crashes on two lane rural roads by 13%-51%
Shoulder Condition	Presence of Paved Shoulder	Rural	1: ≥3.3' Paved Shoulder 2: <3.3' Paved Shoulder 3: No Paved Shoulder	3	50.3% of fatal and serious injury crashes occurred on segments with non-paved shoulders, while these same segments carried 37.8% of Vehicle Miles Traveled.
Roadside Hazard	Presence of Fixed Object	Urban	0: No Roadway Fixed Object 0: Distance to Fixed Object (≥ 16.4') 1: Distance to Fixed Object (3.3'-< 16.4')	2	HSM crash prediction models for urban roadways segments indicate a reduction in total crashes with greater offsets to fixed objects

Risk Factor	Characteristic	Area Type (Urban/Rural)	Measurement & Points	Max Points	Explanation
			2: Distance to Fixed Object (< 3.3')		
Roadside Hazard	Clearzone Width	Rural	0: Clearzone Width (≥ 32.8') 0.5: Clearzone Width (16.4' - < 32.8') 0.5: Clearzone Width (3.3'-< 16.4') 1: Clearzone Width (< 3.3')	1	Highway Safety Manual Crash Modification Factors indicate that greater clear zone widths reduce run off road and single vehicle fatal and injury crashes on rural roadways.
Geometrics	Curve	Rural	0: No Curve or Gentle Curve 0: Moderate Curve 1: Sharp or Very Sharp Curve	1	4.3% of fatal and serious injury crashes in the WFRC study area occurred on roadways with sharp or very sharp curves.
Pedestrian Condition	Presence of Sidewalk	Urban	0: Sidewalk 2: No Sidewalk	2	27.8% of bicycle and pedestrian fatal and serious injury crashes in the WFRC study area occurred on roadways without a sidewalk. FHWA estimates that sidewalks can reduce crashes involving pedestrians walking along the roadway by 65% - 89%.
Bicyclist Condition	Presence of Bicycle Facility	Urban	0: Bike Lane or Facility 2: No Bike Lane or Facility	2	87.4% of bicycle and pedestrian fatal and serious injury crashes occurred on segments without a designated bike lane.

3.4.2. usRAP Risk Factors Analysis

The United States Road Assessment Program (usRAP) is a proactive tool for analyzing the safety of a roadway. usRAP is recommended to be supplemented by other crash data and safety assessments. Roadway data is coded in 100-meter segments, and software (known as ViDA) outputs star ratings on a 1-5 scale for the roadway segment for vehicles, pedestrians, and bicycles.

Star ratings are assigned to each segment of the roadway network. Star ratings consider road infrastructure attributes known to impact the likelihood of a crash and its severity. The roadway's star rating is based on the presence or absence of these design and traffic control features. Stars are awarded depending on the level of safety that is "built-in" to the roadway. Five-star roadways have the most safety-related design and traffic control features. One-star roadways have the fewest safety-related design and traffic operational features. In practice, 5-star rated roads are rare. The safest roads are usually in the 3 star and above range. The best candidates for safety improvements usually fall in the 2 star and below range.

Separate star ratings are assigned for vehicle occupants, bicyclists, and pedestrians. The star ratings consider factors related to both crash likelihood and crash protection. Star ratings are influenced by traffic speeds on the roadway but are not influenced by traffic volumes. Previous research has demonstrated that the vehicle-occupant star ratings for roads are strongly related to fatal and serious injury crash frequencies.

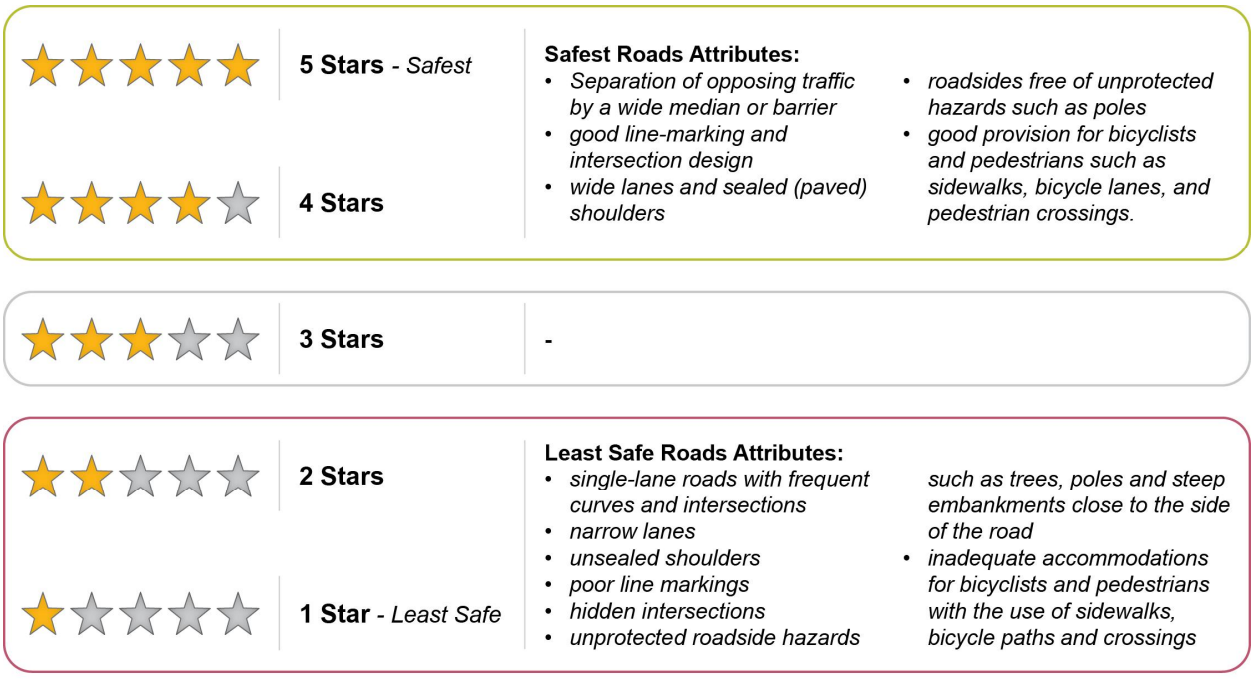
Roads with 4 and 5 stars have attributes appropriate for prevailing traffic speeds, which might include:

- Separation of opposing traffic by a wide median or barrier
- Good line-marking
- Sealed (paved) shoulders
- Roadsides free of unprotected hazards such as poles
- Dedicated facilities for bicyclists and pedestrians such as sidewalks, bicycle lanes, and pedestrian crossings.

Roads with 1 and 2 stars do not have attributes that are appropriate for the prevailing traffic speeds. Attributes of an unsafe road may include:

- Single-lane roads with frequent curves and intersections
- Unpaved shoulders
- Poor line markings
- Hidden intersections
- Unprotected roadside hazards such as trees, poles and steep embankments close to the side of the road
- Inadequate accommodations for bicyclists and pedestrians
- Lack of median barriers

Figure 3.2 provides a summary of the usRAP star rating system.



Information from usRAP Summary Memorandum

Figure 3.2 – usRAP Star Rating Summary

A Star Rating Score (SRS) is calculated for 100-meter segments for vehicles, pedestrians, and bicyclists. However, for the purposes of producing a usable map and output, 100 meters is too detailed for a regional analysis. Hence, Star Ratings are "smoothed" (or averaged) over longer lengths to produce meaningful results.

UDOT collected usRAP data for state and federal aid routes. The usRAP risk assessment was not performed on local streets within the GFAs as the data is not available. Chapter 5 summarizes the results. Segments with a 1–2-star rating within each GFA are summarized within each GFA Appendix.

3.4.3. Local Street Risk Assessment

A Local Street Risk Assessment was performed on all non-federal aid routes (generally local residential streets) within the WFRC study area. This assessment integrated available collision data and other location factors into a scoring system appropriate for local roads, given that usRAP data was not available for local roads. These location factors accounted for conditions such as active transportation activity, proximity to land uses that tend to attract people walking and bicycling, equity focus areas, and speed-related data from Wejo, a big-data (Vehicle Location-Based Services data) vendor.

This scoring system highlights sections of the roadway network based on the prevalence of the characteristics in **Table 3.2**.

Table 3.2 – Local Street Risk Factors

Risk Factor Category	Risk Factor	Available Score
Crash Severity	Presence of Fatal or Serious Injury Crash (KA)	26
Crash Severity	Presence of Minor Injury Crash	2
Crash Severity	Presence of Possible Injury Crash	1
Active Transportation Crash	Presence of Active Transportation Crash	5
Location Risk	Within an Equity Focus Area	5
Location Risk	Within 1000’ of a School	5
Location Risk	Within 250’ of a Transit Stop	5
Location Risk	Presence of a Bicycle or Pedestrian Activity Center	5
High Speed	Segments with an 85th Percentile Speed Greater than 40 MPH	10
Aggressive Driving	Top 10% of Segments with Observed Hard Braking or Hard Acceleration Events	5

The scoring process overlaid these datasets in GIS to rank locations that had the highest occurrence of the combined characteristics. This process identified local streets that have both the highest rate of actual collisions along with land use and locational characteristics that indicate a high level of vulnerable users. The scoring process acknowledges that some factors are more important than others. Local street segments where fatalities and serious injuries have occurred received additional weight in the scoring process, allowing the analysis to further highlight locations of multiple fatalities or serious injuries.

After the scoring process was completed, roadway segment scores were stratified to identify the 5% of local streets in the WFRC study area with the highest scores (a high score indicates a high risk). The highest-scoring local streets became the high-risk network for local streets, classified into Tier 1 (highest 20 corridor scores in each GFA) and Tier 2 (highest 5% of scores in the overall WFRC region). The Tier 1 and Tier 2 high-risk network for local streets are shown by GFA within each GFA Appendix.

3.5. Composite High-Risk Roadway Network Identification

Each of the safety analysis methodologies completed identified segments that can be improved to reduce fatalities and serious injuries.

To identify an overall high-risk roadway network and provide focused information for jurisdictional decisions regarding prioritization of safety improvements, an analysis was performed to identify overlapping segments from each of the analysis methodologies.

A composite score, from zero to five, was determined using the approach in **Table 3.3**. The High-Risk Roadway Network is a composite of analysis methodologies that resulted in identification of a segment (e.g. SHSP Emphasis Area Comparison did not identify specific segments). Also note that High-Risk Roadway Network is limited to State Highways and Federal Aid Routes. Local streets (non Federal Aid routes) are identiied separately. The network does not include intersections identified in the safety Crash and Network Screening Analysis. Intesrections should be considered separately.

The top 10% of roadway segments for the entire WFRC area are included in the Composite High-Risk Network. These segments have a composite risk value of four or higher.

The Composite High-Risk Roadway Network highlights segments identified by multiple analyses, and serves to futher focus additional investigaion and analysis efforts.

Table 3.3 – Composite High-Risk Roadway Network

Analysis	Approach	Value
SHSP Emphasis Area Comparison	Not utilized, does not inform the Composite High-Risk Roadway Network	-
Historical Crash Analysis	5-Year Crash Totals ≥ 3 Crashes	1
Crash and Network Screening Analysis	Positive Local CCR Differential	1
Crash Profile Risk Assessment	Risk Score ≥ 20	1
usRAP Risk Assessment - Vehicle	Vehicle Star Rating = 1-2 Stars	1
usRAP Risk Assessment – Pedestrian	Pedestrian Star Rating = 1-2 Stars	0.5
usRAP Risk Assessment - Bicycle	Bicycle Star Rating = 1-2 Stars	0.5
	Total Possible Composite Risk Score	**5**

3.6. CSAP Safety Analysis Overview

Figure 3.3 is an overview of the safety analysis performed for the CSAP. This figure highlights how each safety analysis identifies a set of segments/intersections. Potenital safety improvement projects can be identified from each of the individiual analyses. The Composite High-Risk Roadway Network provides focused information for jurisdictional decisions regarding prioritization of safety improvements.

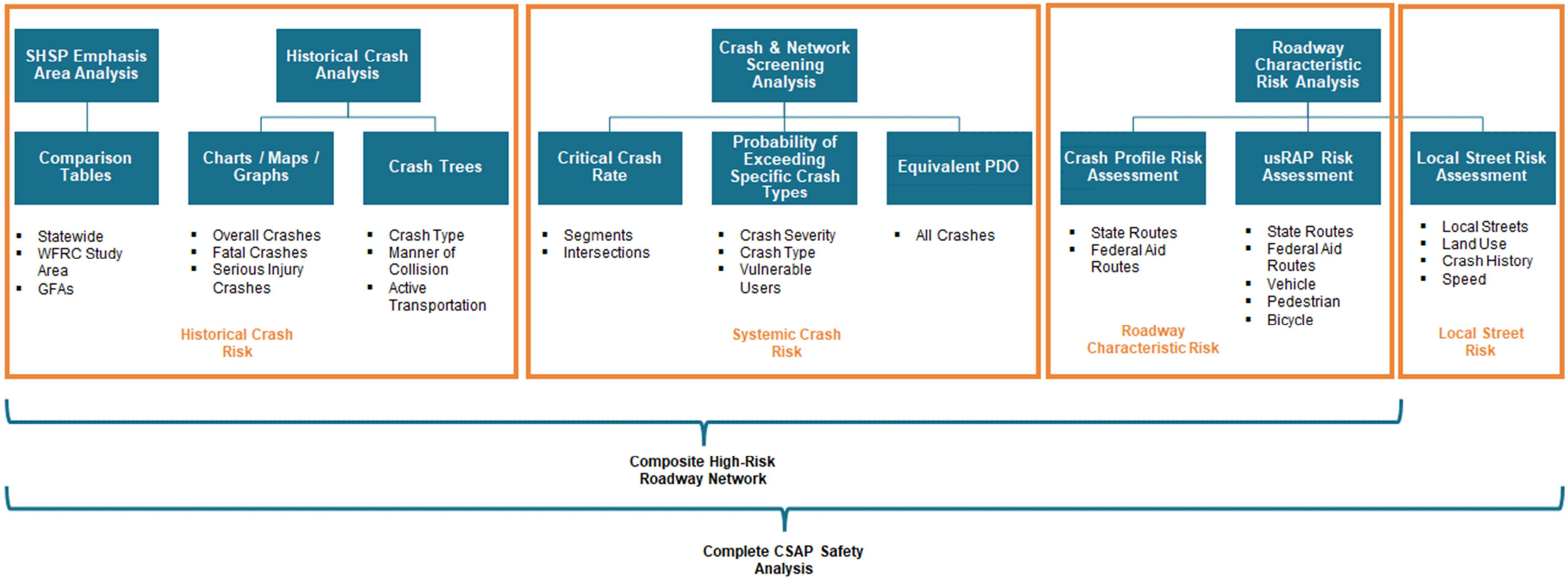


Figure 3.3 – CSAP Safety Analysis Overview

4. WFRC Study Area Analysis Results

A regional-level analysis was performed for the entire WFRC study area to provide a baseline to which individual GFAs are compared. This included the SHSP emphasis area analysis and the historical crash analysis. Data is reported for crashes that occurred within the WFRC study area, January 1, 2018 – December 31, 2022.

4.1. SHSP Emphasis Area Analysis

The SHSP emphasis area analysis compares the ranking of the eleven* Utah SHSP emphasis areas by percent of total fatalities and serious injuries for the WFRC study area to the rankings for statewide totals. Note that a single crash may be assigned multiple categories (e.g. Teen Driver and Roadway Departure). The results of the SHSP emphasis area analysis are displayed in **Table 4.1** including the five highest-ranked emphasis areas**.** The five highest-ranked emphasis areas for the WFRC study area are listed below:

- Intersections
- Roadway Departure
- Speed-Related
- Teen Driver
- No Safety Restraints

Table 4.1 – SHSP Emphasis Area Comparison Analysis

Category	Utah SHSP Safety Emphasis Area*	Statewide Totals			WFRC Totals		
		Fatal and Serious Injury	% of Total	Rank	Fatal and Serious Injury	Rank	Change in Rank
Driver	Teen Driver	1,640	18%	**4**	751	4	1
	Older Driver	1,508	16%	6	700	6	0
	Speed-Related	2,133	23%	**3**	936	3	0
	Aggressive Driving	555	6%	11	297	10	0
	Distracted Driving	718	8%	10	286	11	1
	Impaired Driving	1,184	13%	8	623	8	-2
	No Safety Restraints	1,542	17%	**5**	599	9	-3
Roadway	Intersections	3,567	39%	**1**	2,163	1	0
	Roadway Departure	2,931	32%	**2**	1,014	2	-3
Special Users	Motorcycle	1,457	16%	7	750	5	5
	Pedestrian	912	10%	9	636	7	2
	Bicycle*	280	3%	12	167	12	0

**Bicyclists are not one of the eleven Utah SHSP emphasis areas but was included as part of the CSAP safety analysis. Note that more than one emphasis area may be associated with a single crash.*

4.2. Historical Crash Analysis

A historical crash data analysis was conducted for the most recent complete 5-year period from 2018 to 2022 for crashes that occurred within the WFRC study area. This historical crash analysis is primarily focused on fatal and serious injury crashes.

4.2.1. Overall Crashes

Table 4.2 provides an overview of overall crashes by severity and roadway ownership within the WFRC study area for the five-year period (2018-2022). A review of the data shows:

- Nearly three times as many fatal crashes occurred on State Routes as compared to Federal Aid Routes. State Routes typically carry higher traffic volumes and vehicles travel at higher speeds as compared to Federal Aid routes and Local Streets.
- The total number of crashes that occurred on State Routes is twice that of those that occurred on Federal Aid routes, and five times that of Local Streets.
- 0.3% of all crashes result in a fatality in the WFRC study area.

Table 4.2 – Overall Crash by Severity by Roadway Ownership (2018-2022)

Route Type	State Route		Federal Aid Route		Local Street		Other		Overall Total	
Crash Severity	Crashes		Crashes		Crashes		Crashes		Crashes	
	#	%	#	%	#	%	#	%	#	%
Fatal	432	0.4%	148	0.3%	39	0.2%	0	0.0%	**619**	**0.3%**
Suspected Serious Injury	1,862	2%	1,056	2%	329	2%	0	0.0%	**3,247**	**2%**
Suspected Minor Injury	10,868	10%	6,316	12%	1,794	8%	13	1.6%	**18,991**	**11%**
Possible Injury	20,295	19%	9,978	19%	2,512	12%	9	1.1%	**32,794**	**18%**
No Injury / Property Damage Only	73,101	69%	34,159	66%	16,597	78%	812	97.4%	**124,669**	**69%**
Route Total	**106,558**	**100%**	**51,657**	**100%**	**21,271**	**100%**	**834**	**100%**	**180,320**	**100%**

4.2.2. Fatal and Serious Crashes by GFA

Figure 4.1 through **Figure 4.2** provide an overview of fatal and serious injury crashes by GFA for the WFRC study area for the five-year period (2018-2022). A review of the data shows:

- West Salt Lake GFA experienced more than twice the number of crashes as compared to other GFAs.
- Salt Lake City GFA and East Salt Lake GFA both experiences more than 400 fatal and serious injury crashes over the 5-year period.
- Adjusted for Vehicle Miles Traveled (VMT), Tooele County GFA had the highest rate of fatal and serious injury crashes.
- Crashes in rural GFAs, East Weber County/Morgan County GFA and Tooele County GFA, tended to be more serve as compared to urbanized GFAs such as South Davis County.

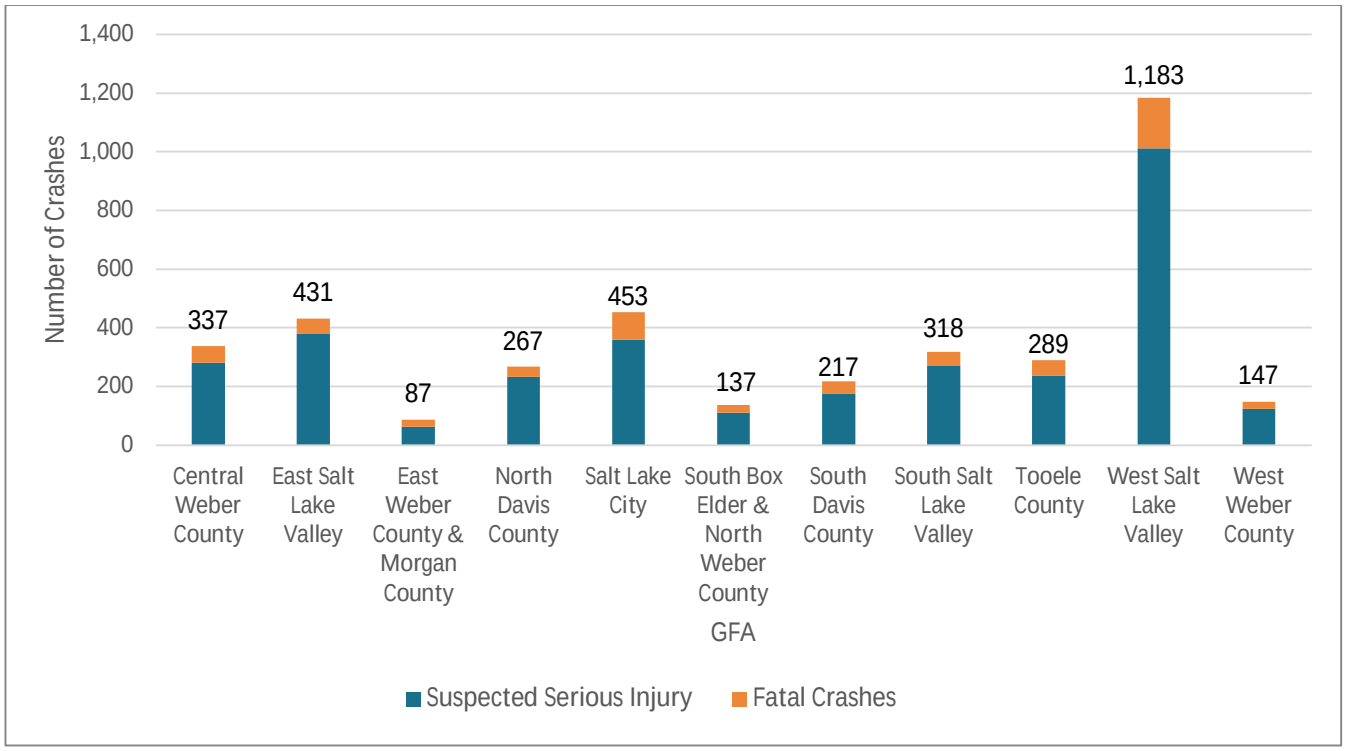


Figure 4.1 – Total Number of Fatal and Serious Injury Crashes by GFA, 2018-2022

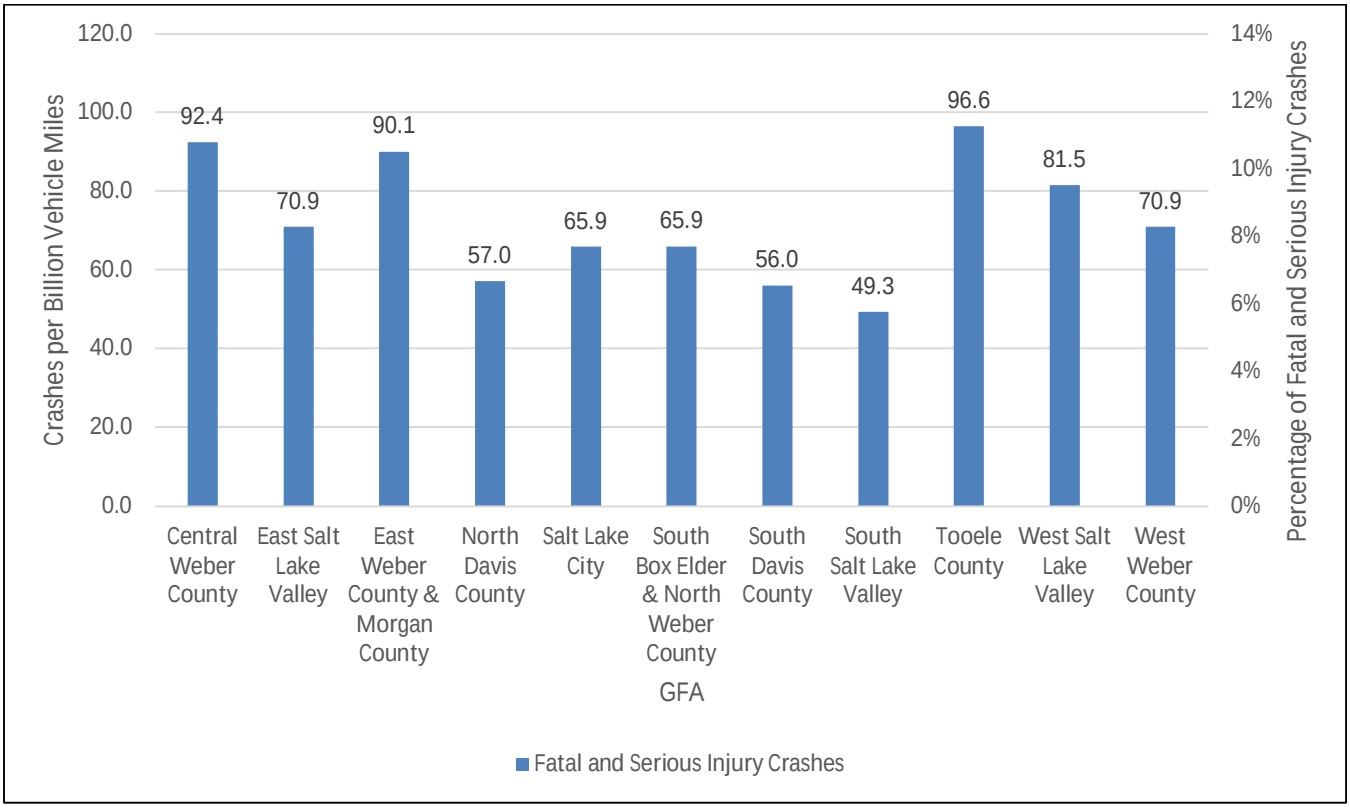


Figure 4.2 –Fatal and Serious Injury Crashes by VMT & GFA, 2018-2022

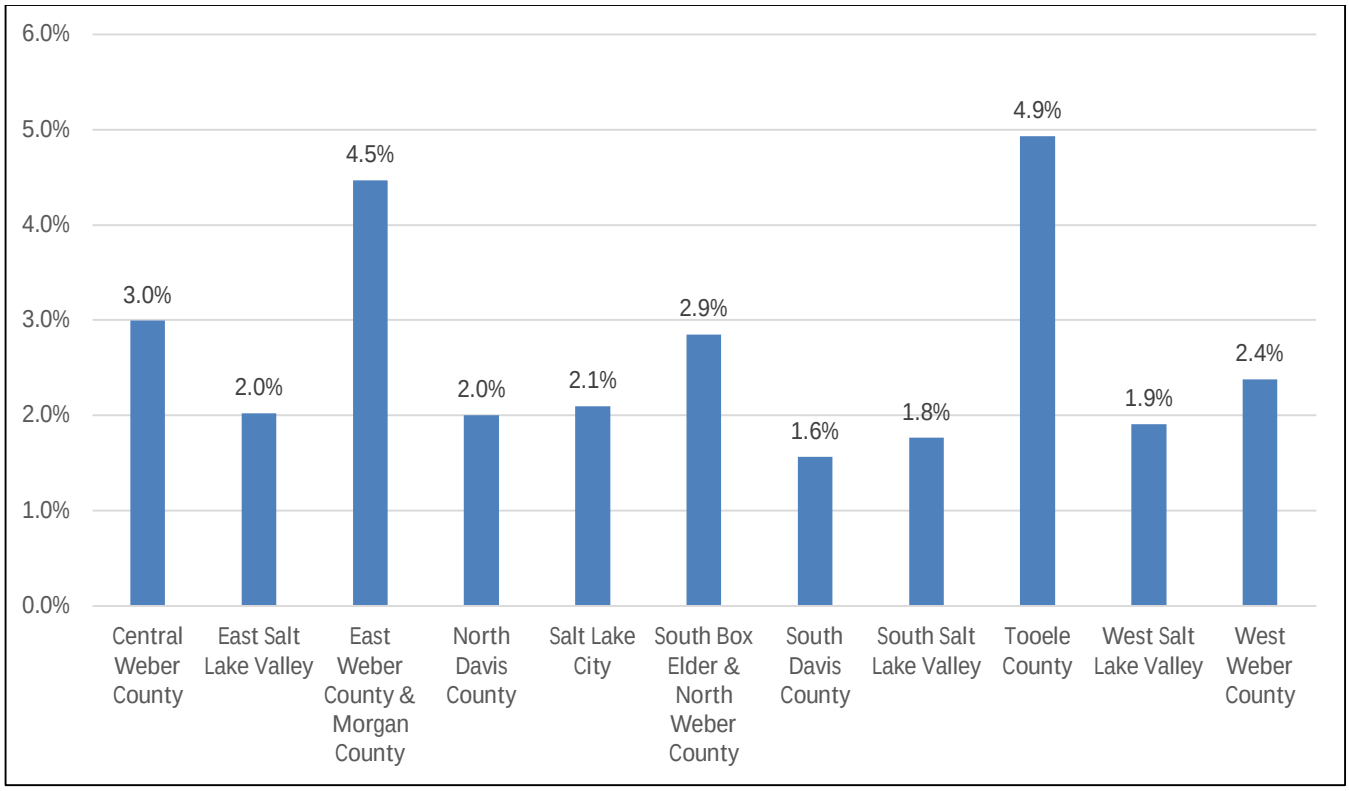


Figure 4.3 – Percent of Fatal and Serious Injury Crashes from Total Crashes by GFA, 2018-2022

4.2.3. Fatal and Serious Injury Crashes by Year

Figure 4.4 through **Figure 4.6** summarize fatal and serious injury crashes by year (2018-2022) and roadway ownership for the WFRC study area. A review of the shows:

- Fatal crashes are at a five-year high in 2022.
- In both frequency and adjusted for Vehicle Miles Traveled, State Routes show the highest frequency of fatal and serious injury crashes.
- The number of fatal and serious injury crashes on Local Streets has decreased each year, between 2018 and 2023.

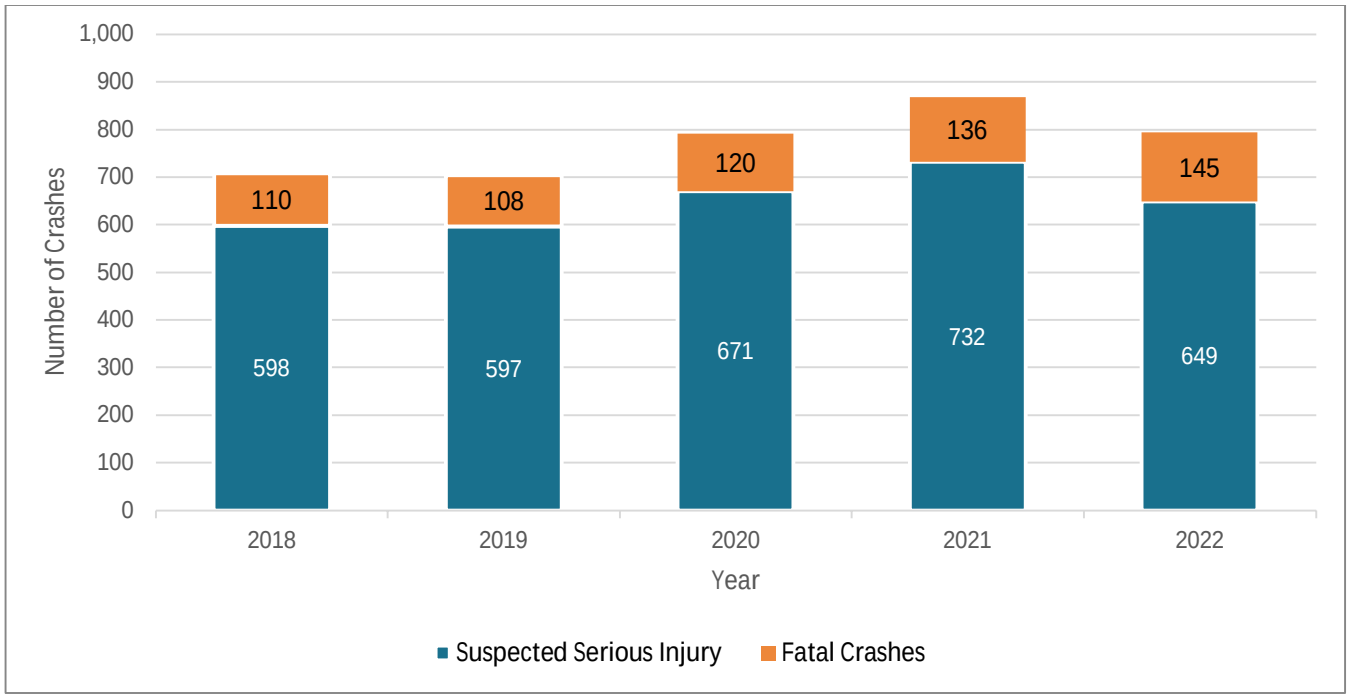


Figure 4.4 – Fatal and Serious Injury Crashes by Year, 2018-2022

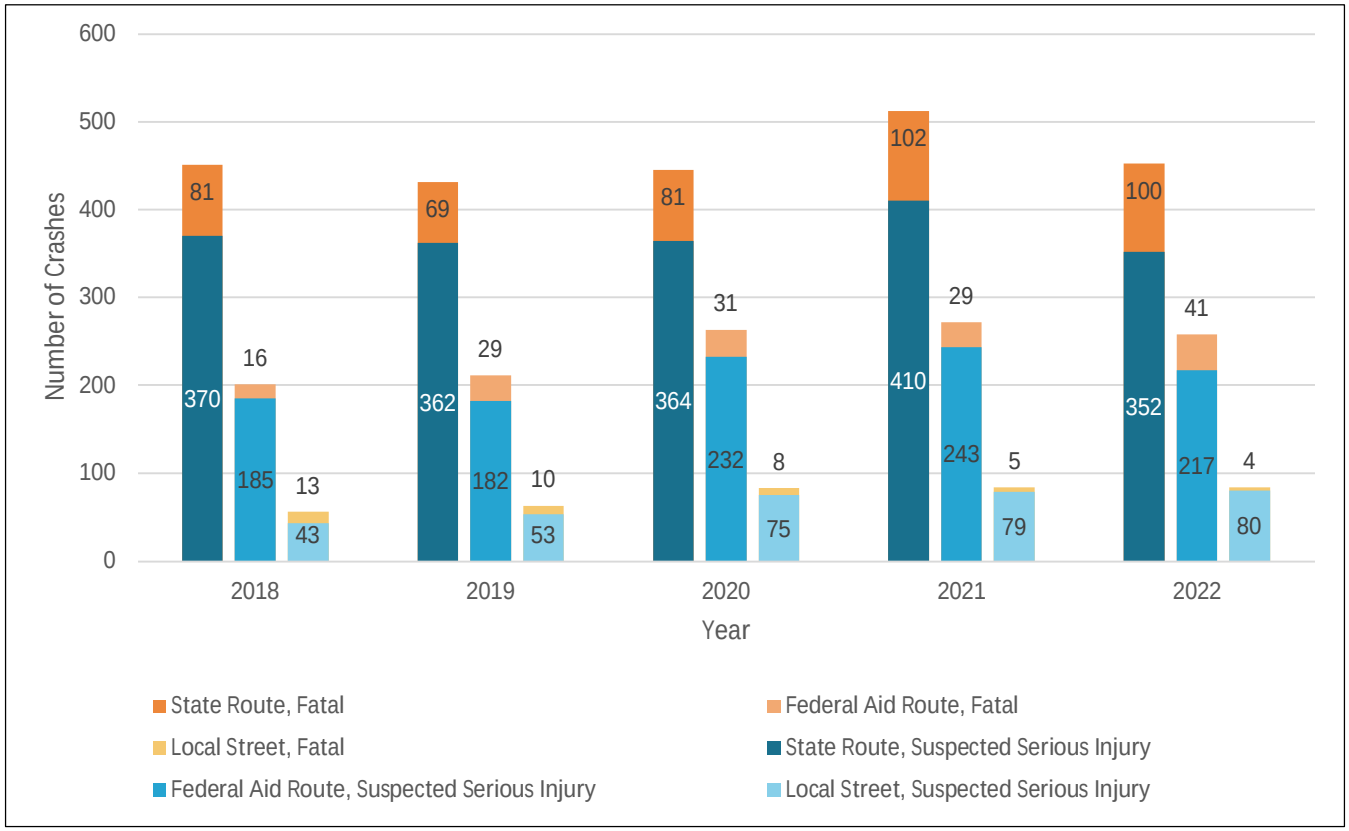


Figure 4.5 – Annual Fatal and Serious Injury Crashes by Roadway Ownership, 2018-2022

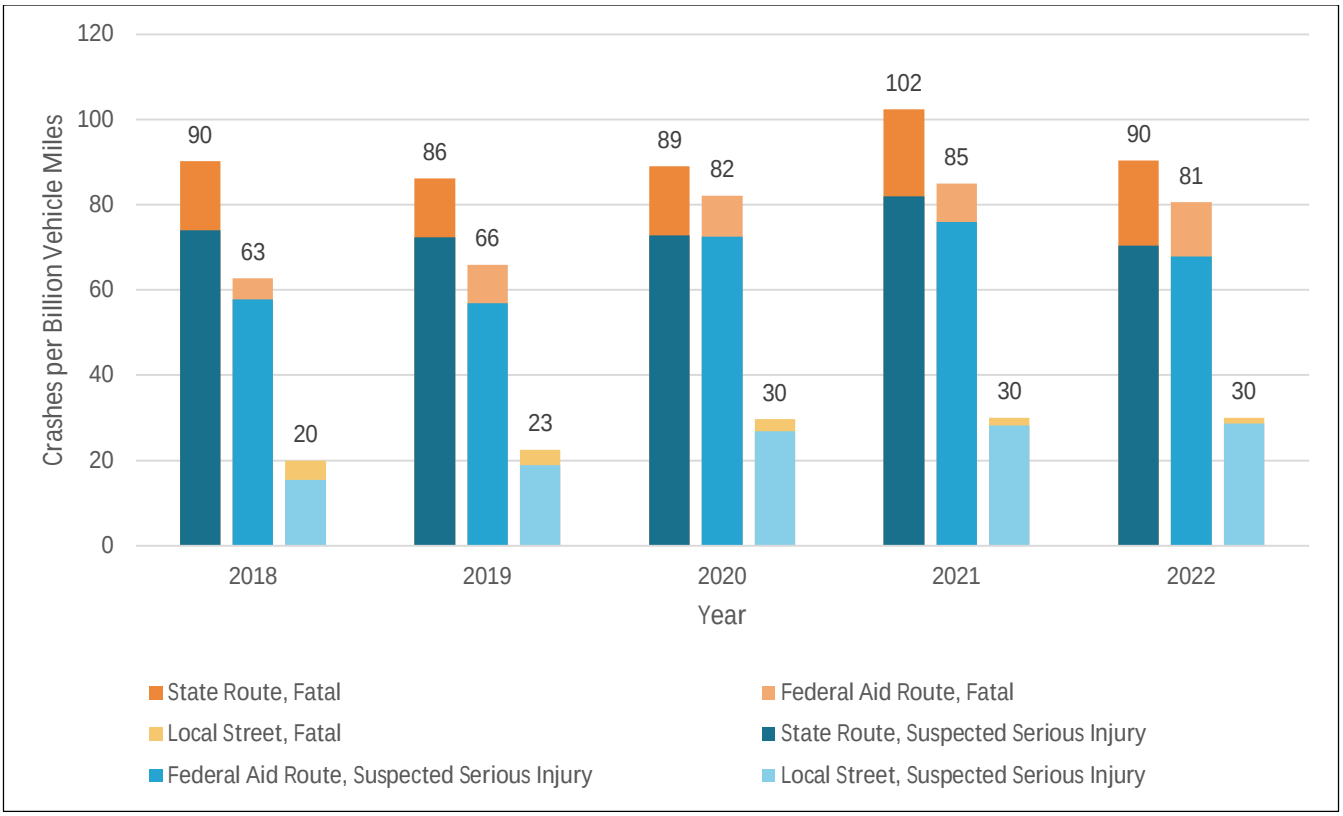


Figure 4.6 – Annual Fatal and Serious Injury Crashes by Roadway Ownership & VMT, 2018-2022

4.2.4. Fatal and Serious Injury Crashes by Crash Type

Figure 4.7 through **Figure 4.9** provide an overview of fatal and serious injury crashes by crash type and roadway ownership for the WFRC study area for the five-year period (2018-2022).

A review of the data shows:

- The three most common crash types are Left-Turn at Intersection, Roadway Departure, and Active Transportation. All three of these crash types are most prevalent on State Routes.
- When adjusted by vehicles miles traveled, Federal Aid routes experience a higher frequency of Left-Turn at Intersection and Active Transportation crashes.

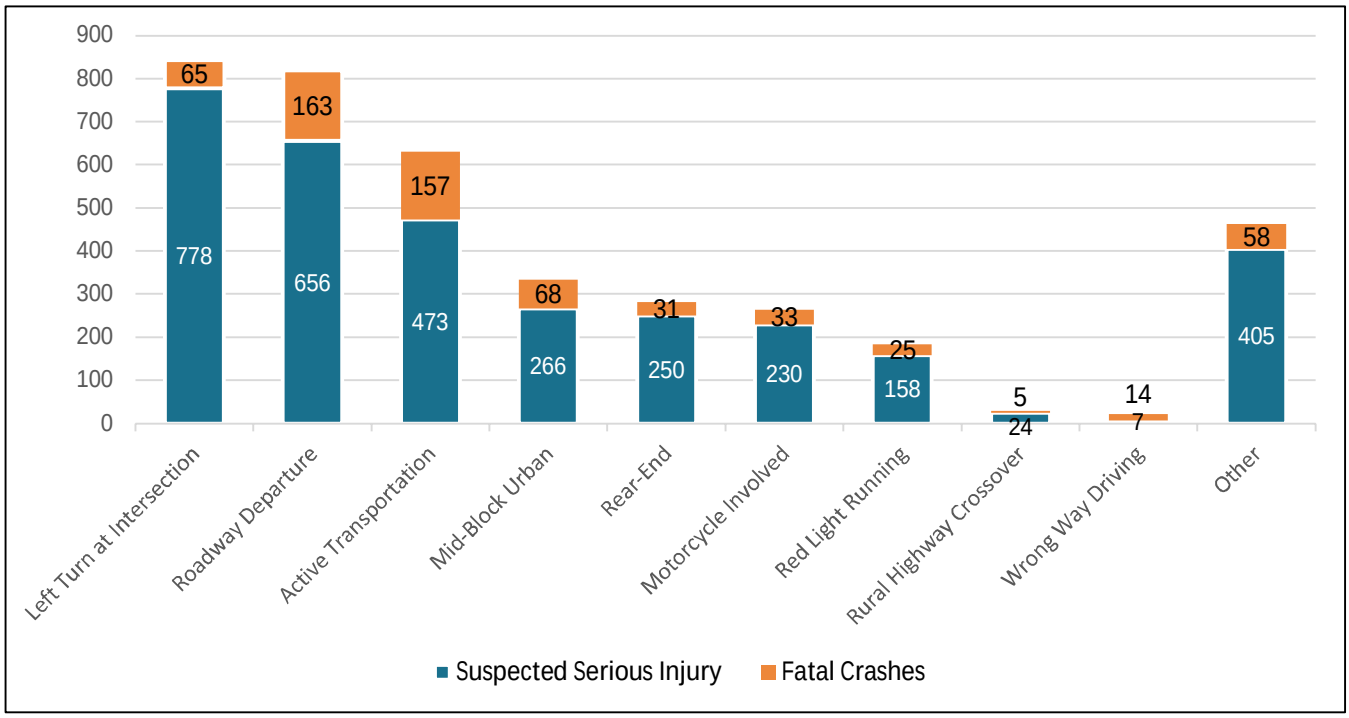


Figure 4.7 – Fatal and Serious Injury Crashes by Crash Type, 2018-2022

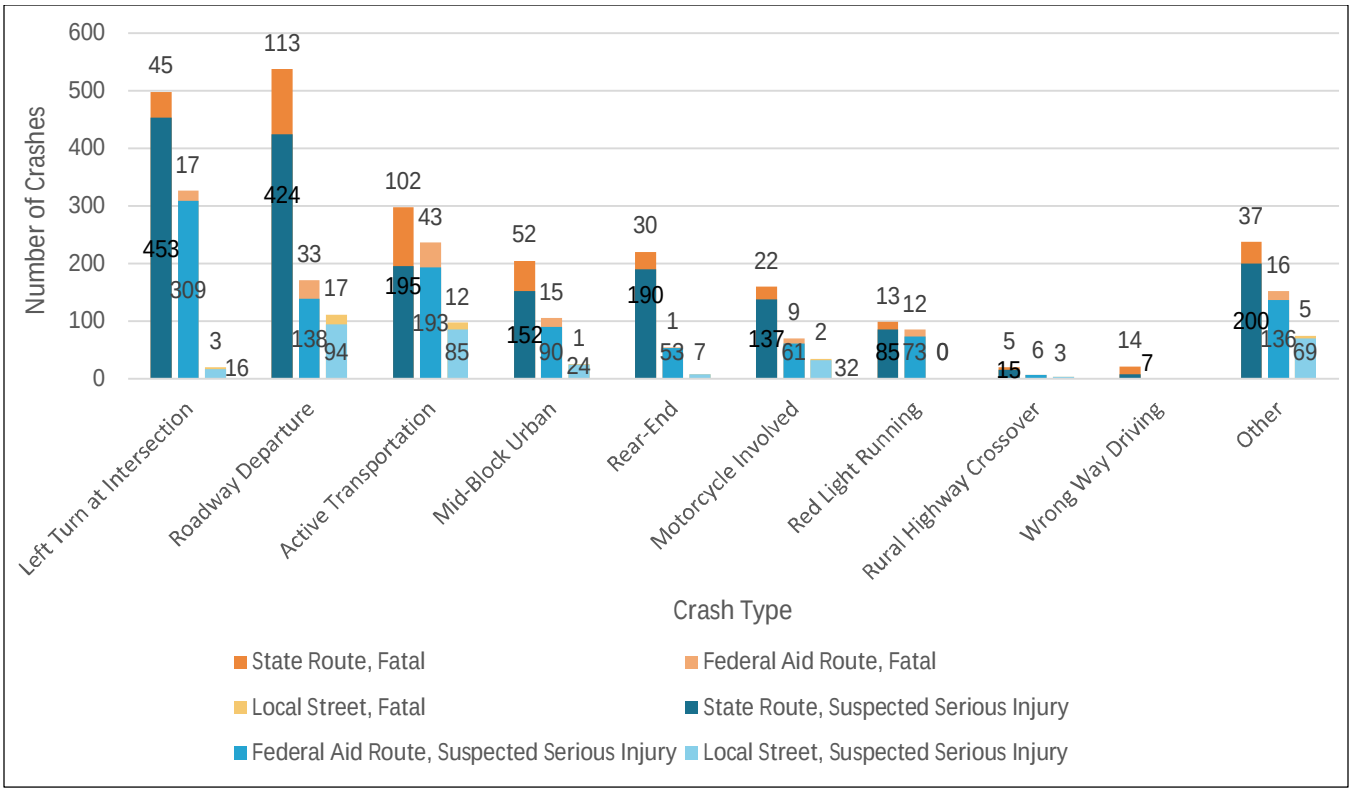


Figure 4.8 – Fatal and Serious Injury Crashes by Crash Type & Roadway Ownership, 2018-2022

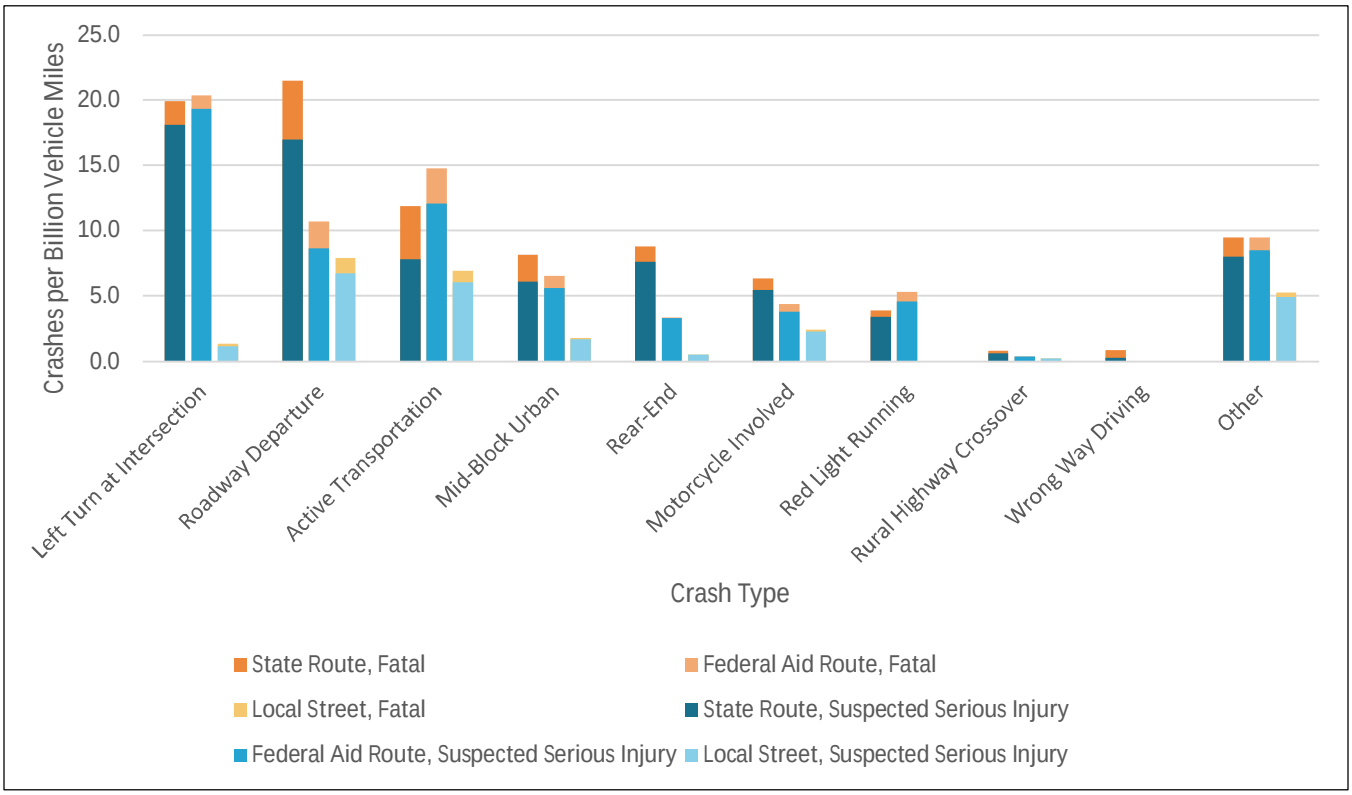


Figure 4.9 – Fatal and Serious Injury Crashes by Crash Type, Roadway Ownership & VMT, 2018-2022

4.2.5. Fatal and Serious Injury Vulnerable User Crashes

Figure 4.10 through **Figure 4.12** provide an overview of fatal and serious injury crashes by vulnerable road user and roadway ownership for the WFRC study area for the five-year period (2018-2022).

A review of the data shows:

- Fatal and crashes involving pedestrians exceed that of motorcycles and bicyclists combined.
- There are over three times as many pedestrian fatal and serious injury crashes as compared to bicycle fatal and serious injury crashes.
- State Routes experienced the highest frequency of both pedestrian and bicycle fatal crashes.
- Federal Aid routes experienced the highest frequency of bicycle serious injury crashes.
- When adjusted for Vehicle Miles Traveled, Federal Aid routes had the highest rate of pedestrian and bicycle fatal and serious injury crashes.

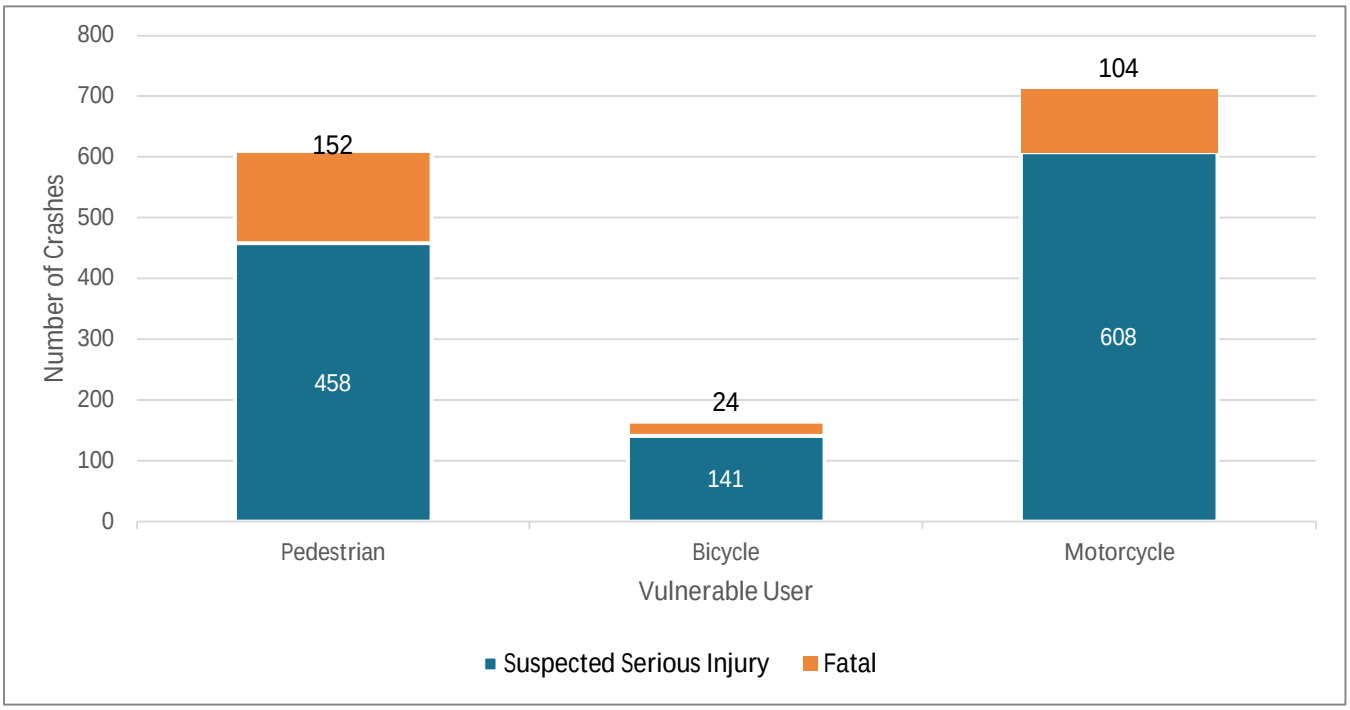


Figure 4.10 – Fatal and Serious Injury Crashes by Vulnerable User, 2018-2022

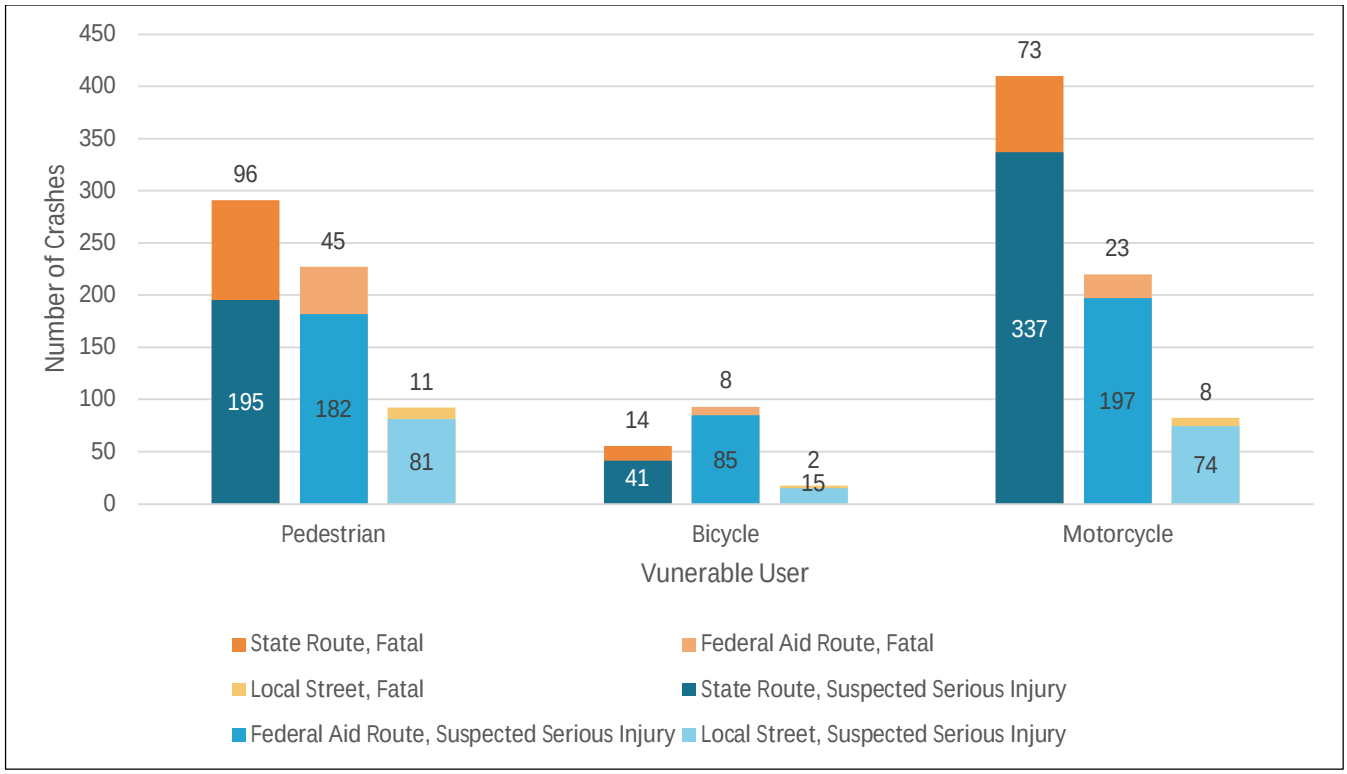


Figure 4.11 – Fatal and Serious Injury Crashes by Vulnerable User & Roadway Ownership, 2018-2022

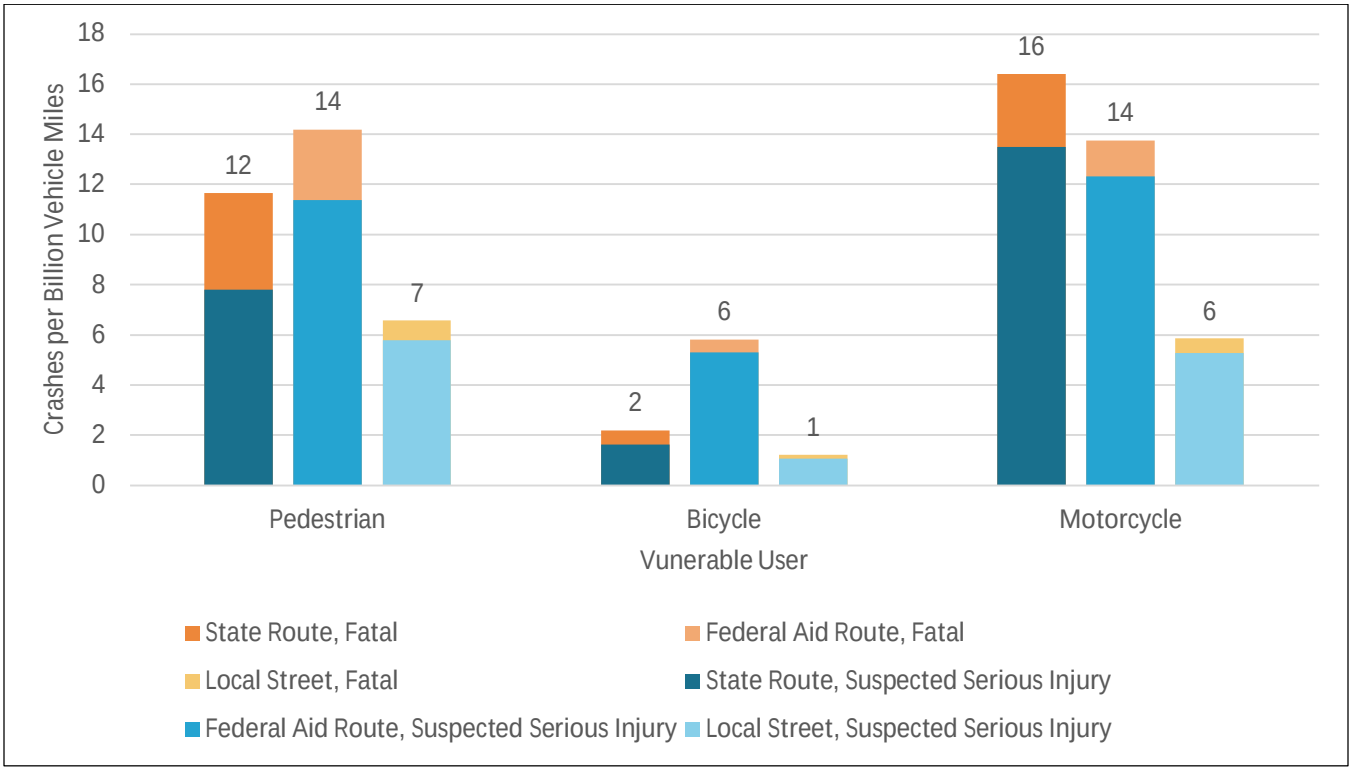


Figure 4.12 – Fatal and Serious Injury Crashes by Vulnerable User, Roadway Ownership & VMT, 2018-2022

4.2.6. Fatal and Serious Injury Crashes by Manner of Collision

Figure 4.13 through **Figure 4.15** provide an overview of fatal and serious injury crashes by manner of collision and roadway ownership for the WFRC study area for the five-year period (2018-2022).

A review of the data shows:

- Of crashes involving two vehicles (excludes single-vehicle crashes), the most frequent manner of collision is angle crashes. These typically occur at intersections, and often vehicles making a left turn.
- Front to Rear manner of collision represented the next most frequent manner of collision.
- When adjusted for Vehicle Miles Traveled, Federal Aid Routes and State Routes have a similar rate of angle crashes.

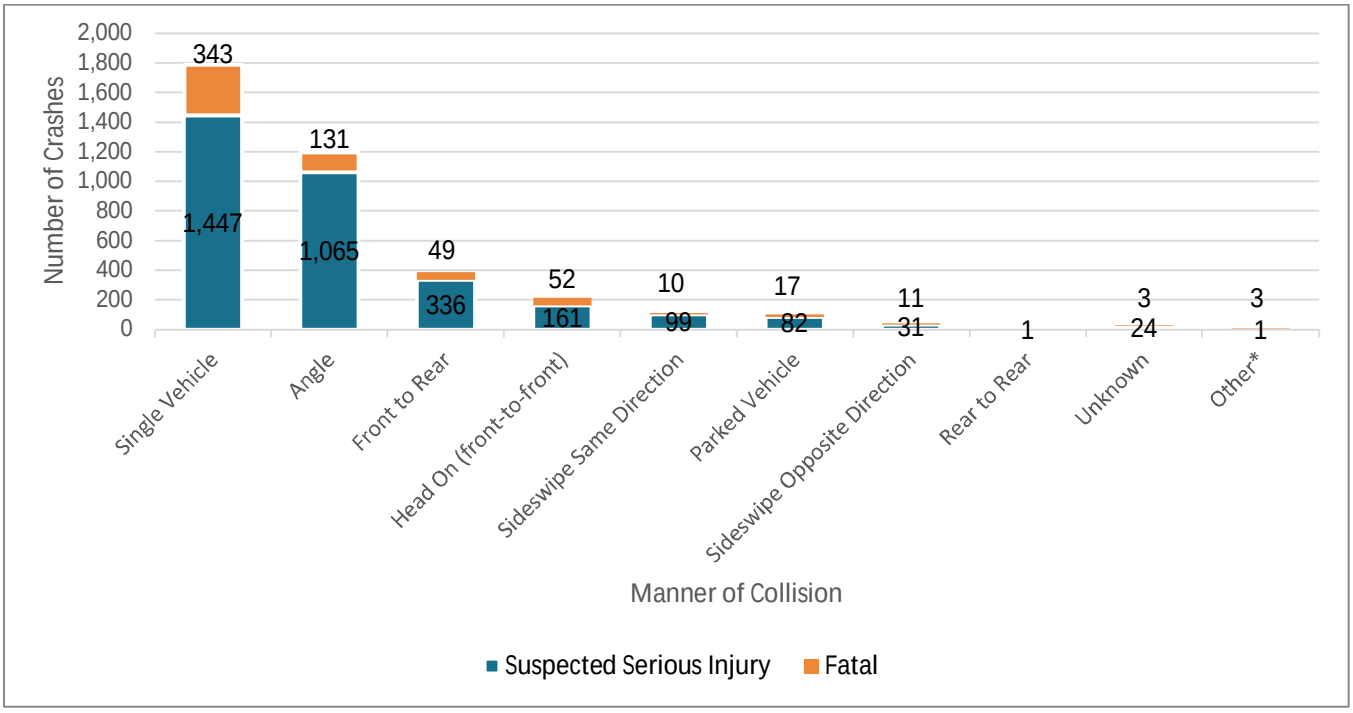


Figure 4.13 – Fatal and Serious Injury Crashes by Manner of Collision, 2018-2022

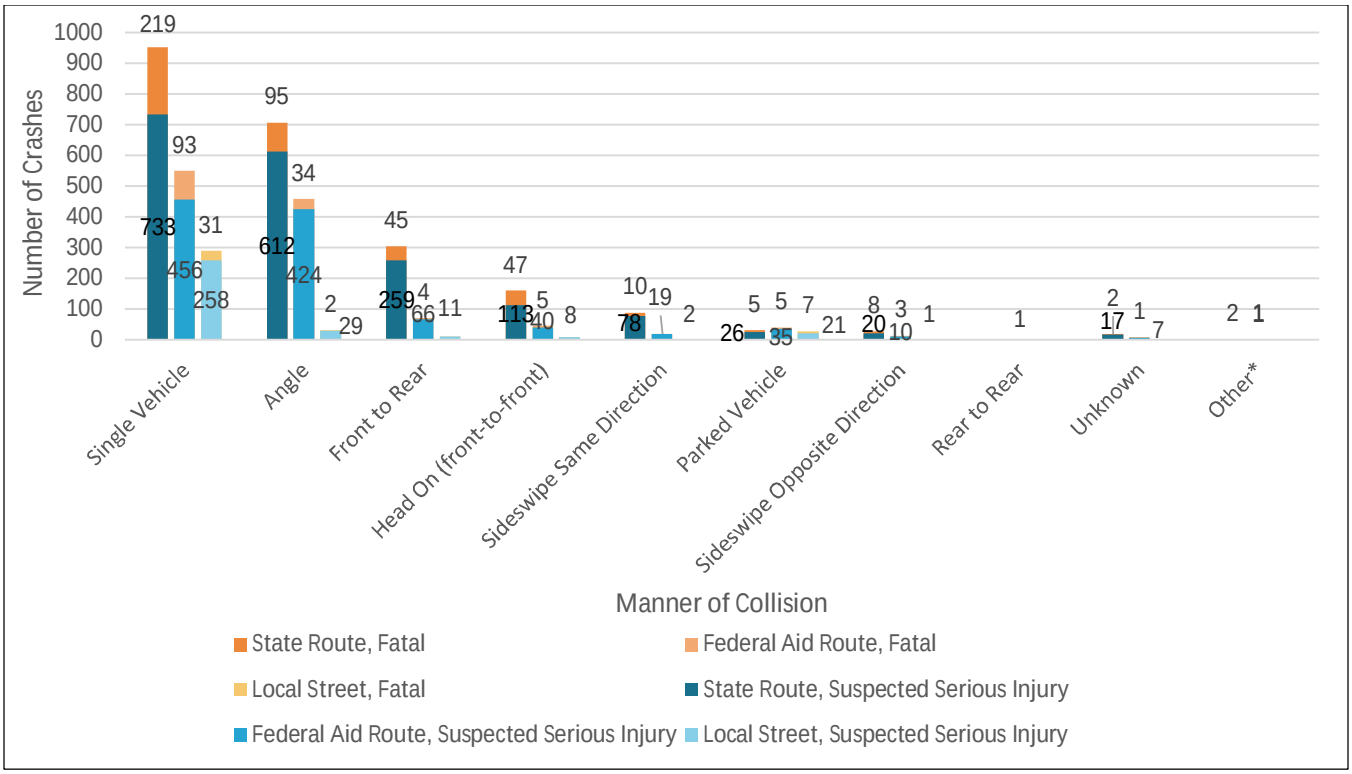


Figure 4.14 – Fatal and Serious Injury Crashes by Manner of Collision & Roadway Ownership, 2018-2022

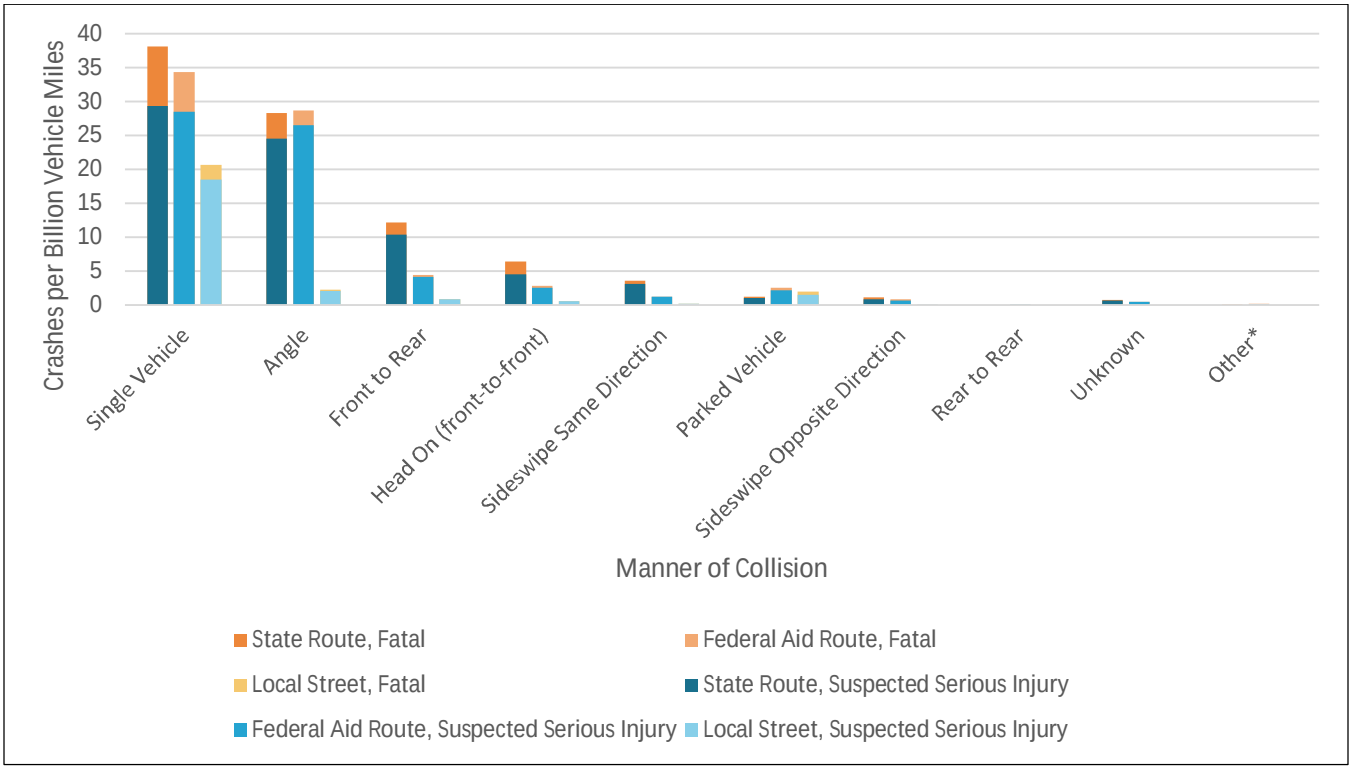


Figure 4.15 – Fatal and Serious Injury Crashes by Manner of Collision, Roadway Ownership & VMT, 2018-2022

4.2.7. Fatal and Serious Injury Intersection Crashes

Figure 4.16 through **Figure 4.18** provide an overview of fatal and serious injury crashes by intersection and roadway ownership for the WFRC study area for the five-year period (2018-2022).

A review of the data shows:

- Non-intersection-related fatal crashes are almost twice as many intersection-related fatal crashes.
- State Routes have twice as many non-intersection-related fatal crashes as compared to intersection related fatal crashes.
- Federal Aid Routes have larger number of intersection related crashes, while Local Roads (non-Federal Aid) have a large number of non-intersection related crashes.

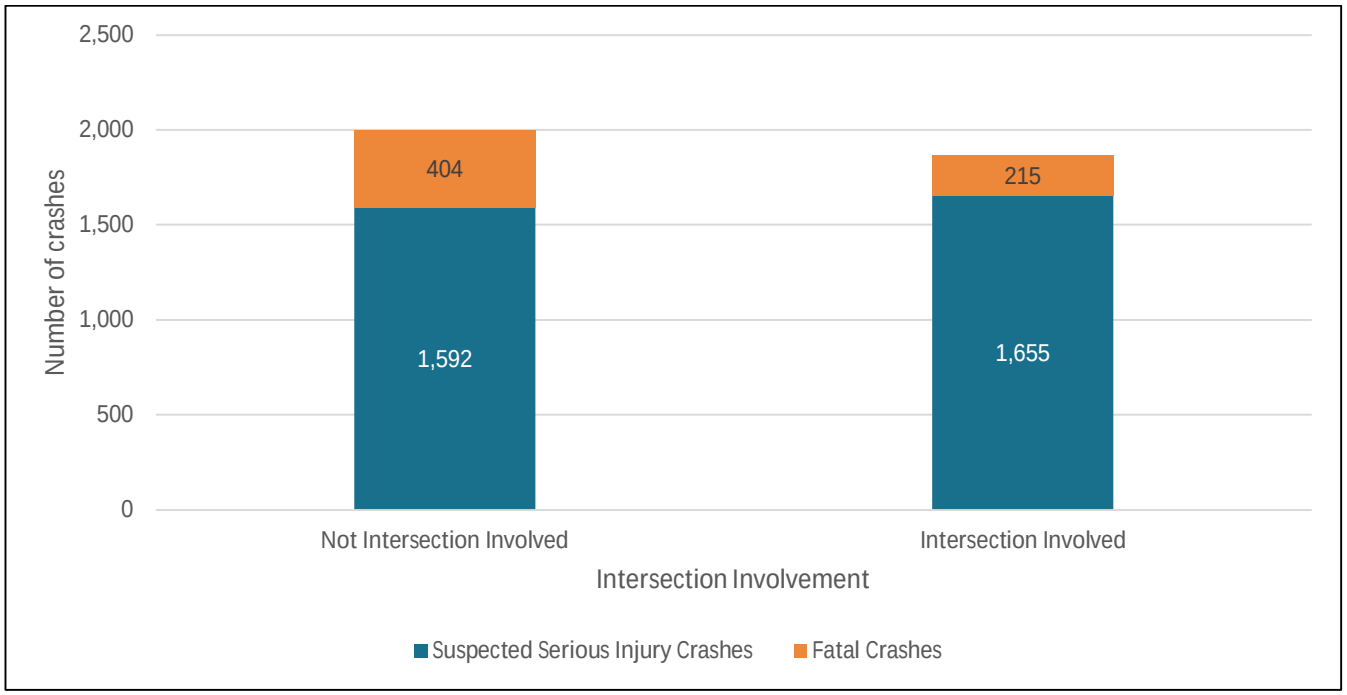


Figure 4.16 – Fatal and Serious Injury Crashes by Intersection, 2018-2022

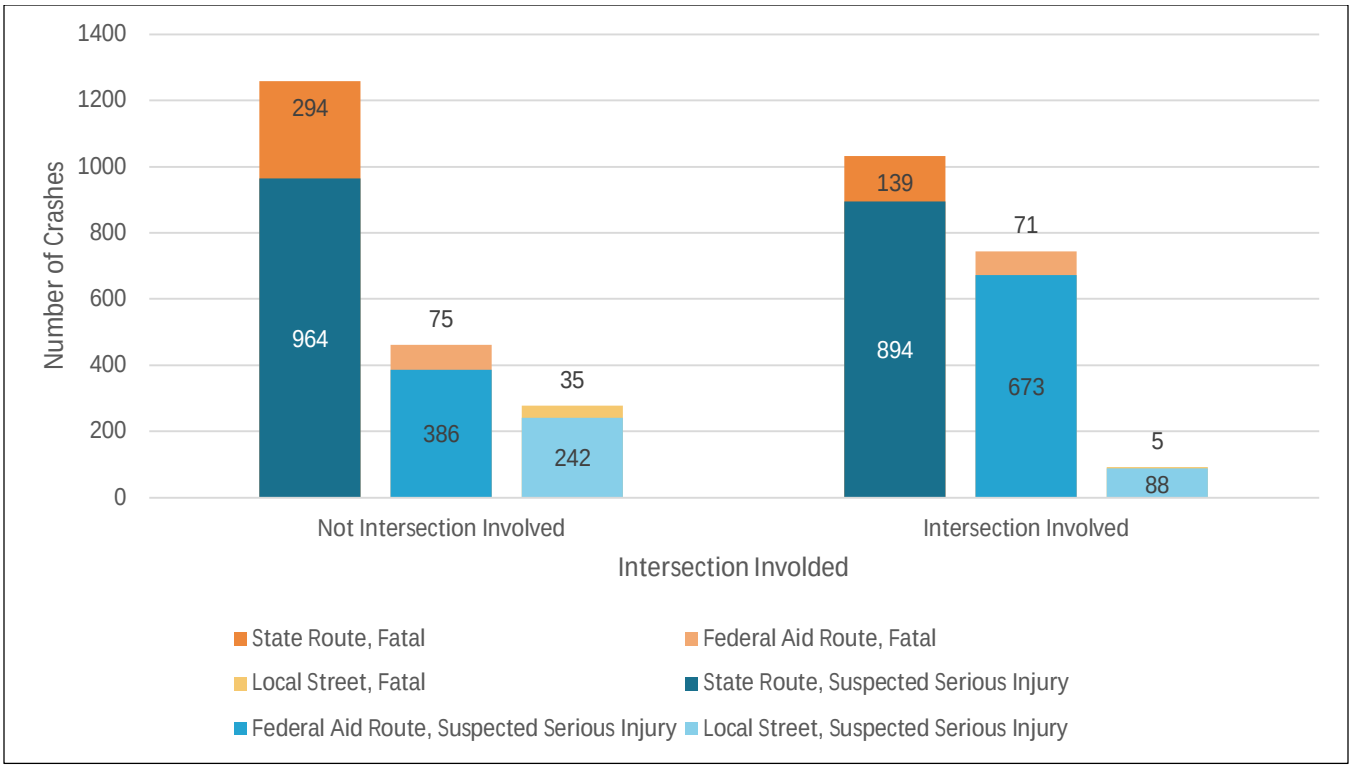


Figure 4.17 – Fatal and Serious Injury Crashes by Intersection & Roadway Ownership, 2018-2022

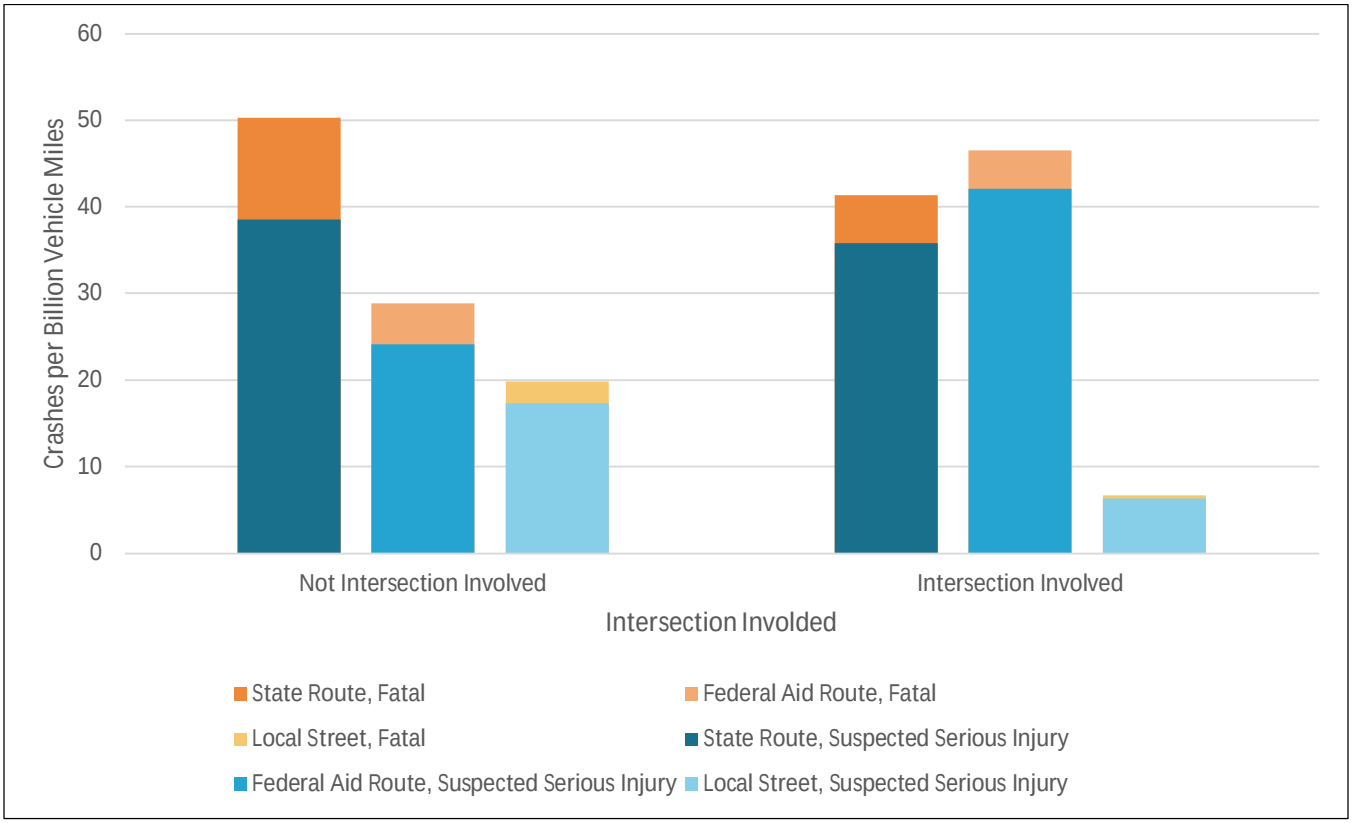


Figure 4.18 – Fatal and Serious Injury Crashes by Intersection, Roadway Ownership & VMT, 2018-2022

4.2.8. Fatal and Serious Injury Crashes by Functional Class

Figure 4.19 through **Figure 4.21** provide an overview of fatal and serious injury crashes by functional class and roadway ownership for the WFRC study area for the five-year period (2018-2022).

A review of the data shows:

- The highest frequency of fatal and serious injury crashes occurs on Principal Arterials. Principal Arterials carry the highest volume of traffic in the region.
- In both total frequency and adjusted for Vehicle Miles Traveled, Principal Arterials, Minor Arterials, and Collectors each experience more crashes than Interstates.

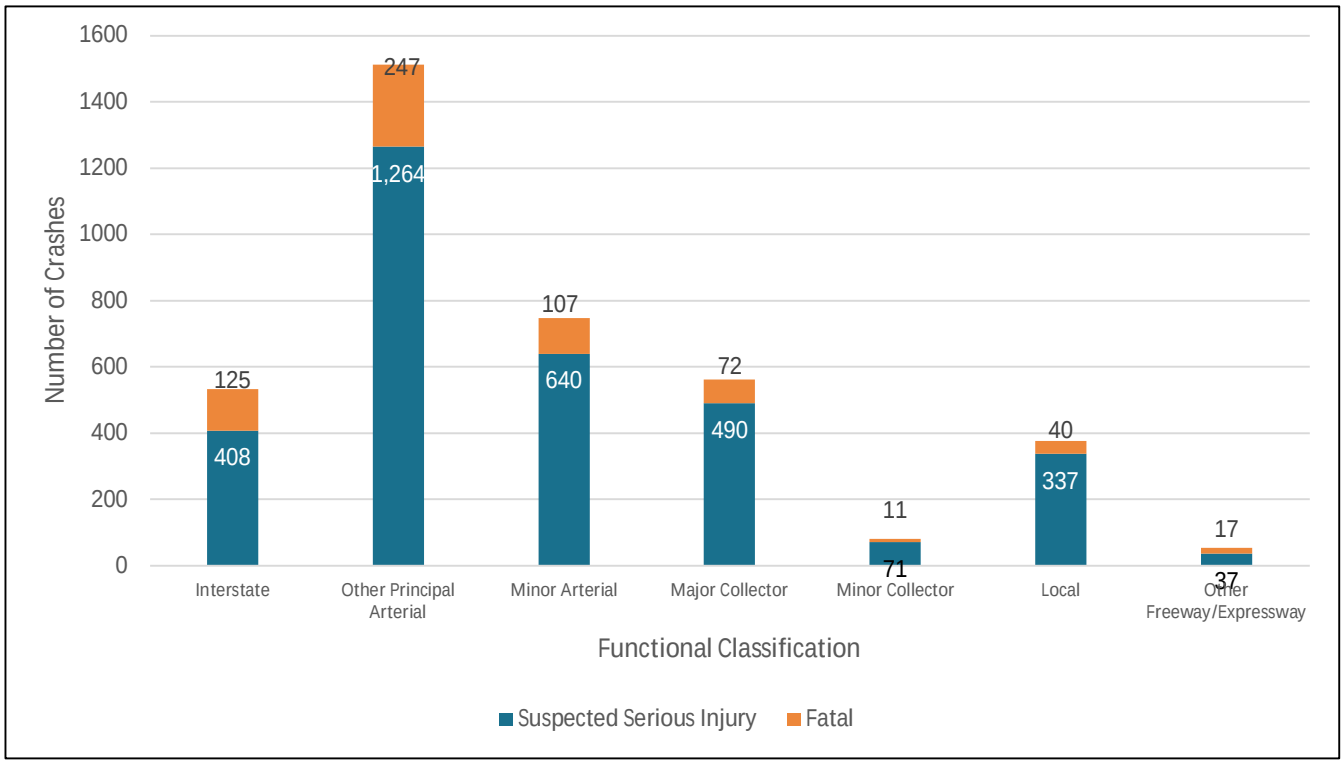


Figure 4.19 – Fatal and Serious Injury Crashes by Functional Class, 2018-2022

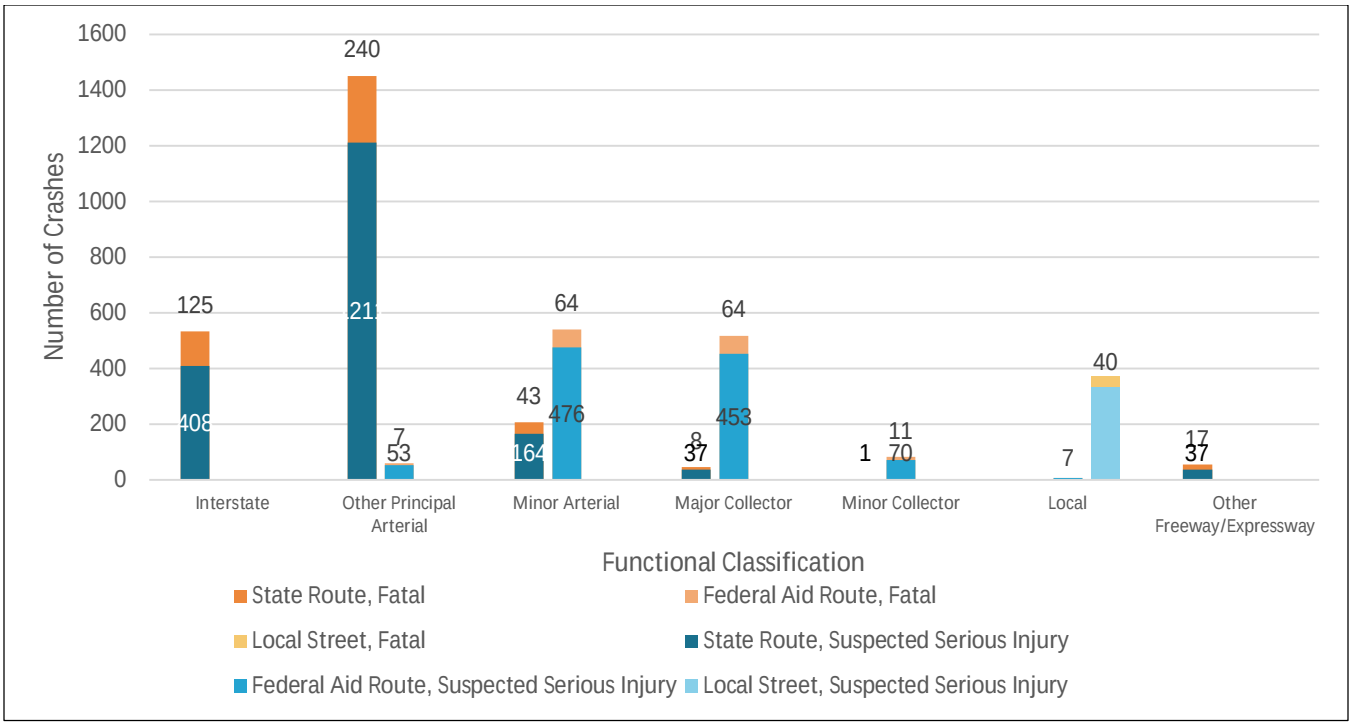


Figure 4.20 – Fatal and Serious Injury Crashes by Functional Class & Roadway Ownership, 2018-2022

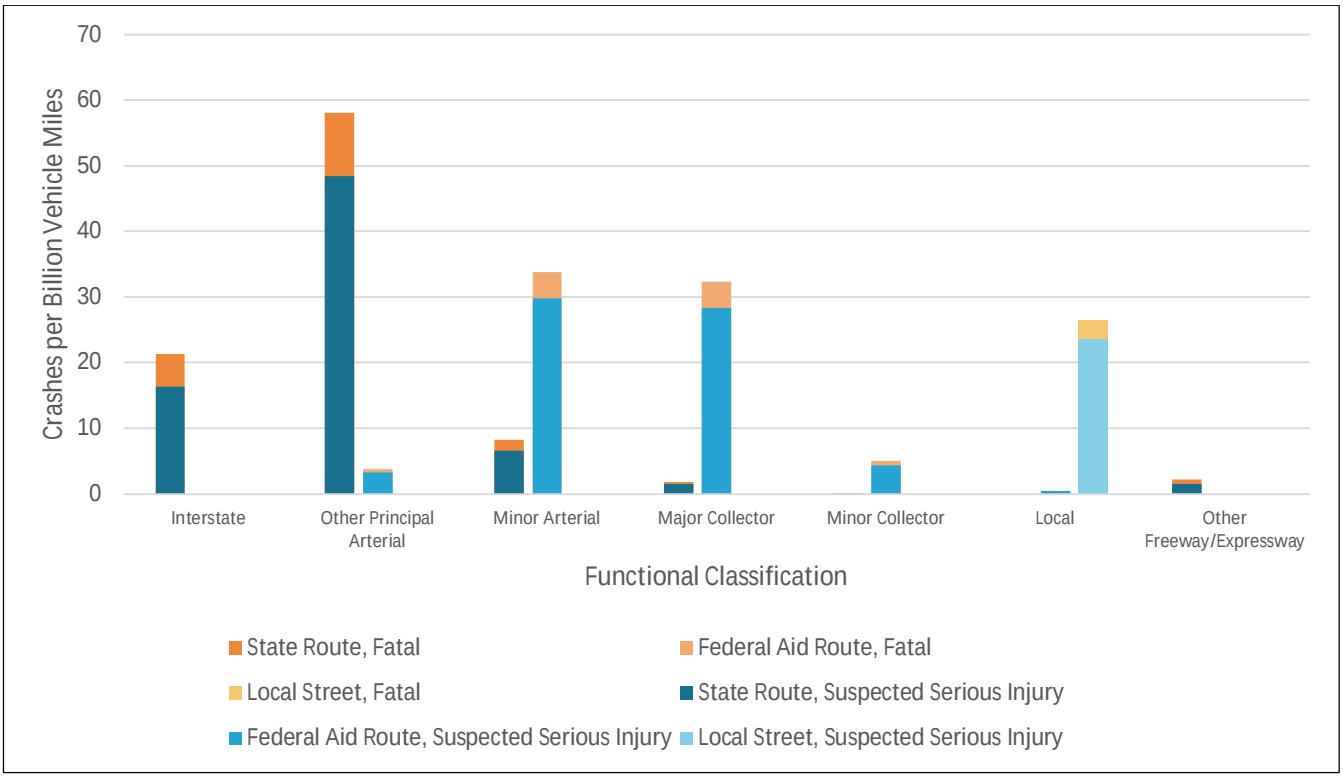


Figure 4.21 – Fatal and Serious Injury Crashes by Functional Class, Roadway Ownership & VMT, 2018-2022

4.2.1. Fatal and Serious Injury Crash Tree Diagrams

Fatal and serious injury crash tree diagrams were generated for the WFRC study area. These crash tree diagrams, for the five-year period (2018-2022), are presented in **Figure 4.22** through **Figure 4.24**.

The crash trees are limited to the three categories with highest frequency crash type and manner of collision.

A review of the data shows:

State Routes:

- Nearly 60% (59.3%) of fatal crashes in the WFRC area occurred on State Routes.
- More than half (52.7%) of fatal crashes in the WFRC area occurred on State Routes in urban areas.
- Less than 7% (6.7%) of fatal crashes in the WFRC area occurred on State Routes in rural areas.
- Nearly 13% (12.6%) of fatal crashes were types as Left Turn at Intersection, representing the most frequency crash type.
- Most frequently occurring crash types are:
  - Roadway Departure
  - Active Transportation
  - Mid-Block
  - Motorcycle Involved

Federal Aid Routes:

- Nearly 1/3 (31.2%) of crashes occurred on Federal Aid Routes.
- Approximately 1/3 (29.9%) of fatal crashes in the WFRC area occurred on Federal Aid Routes in urban areas.
- Most frequency occurring crash types are:
  - Left-turn at intersection
  - Roadway Departure
  - Active Transportation
  - Mid-Block
  - Rural Highway Cross-over

Local Streets:

- Less than 10% (9.5%) of fatal crashes in the WFRC area occurred on Local Streets.
- Most frequency occurring crash types are:
  - Active Transportation
  - Roadway Departure
  - Left-Turn at Intersection
  - Rural Highway Cross-over

Each crash tree diagram displays the total fatal and serious injury crashes (T), fatal crashes (K), and serious injury crashes (A).

CRASH TYPE

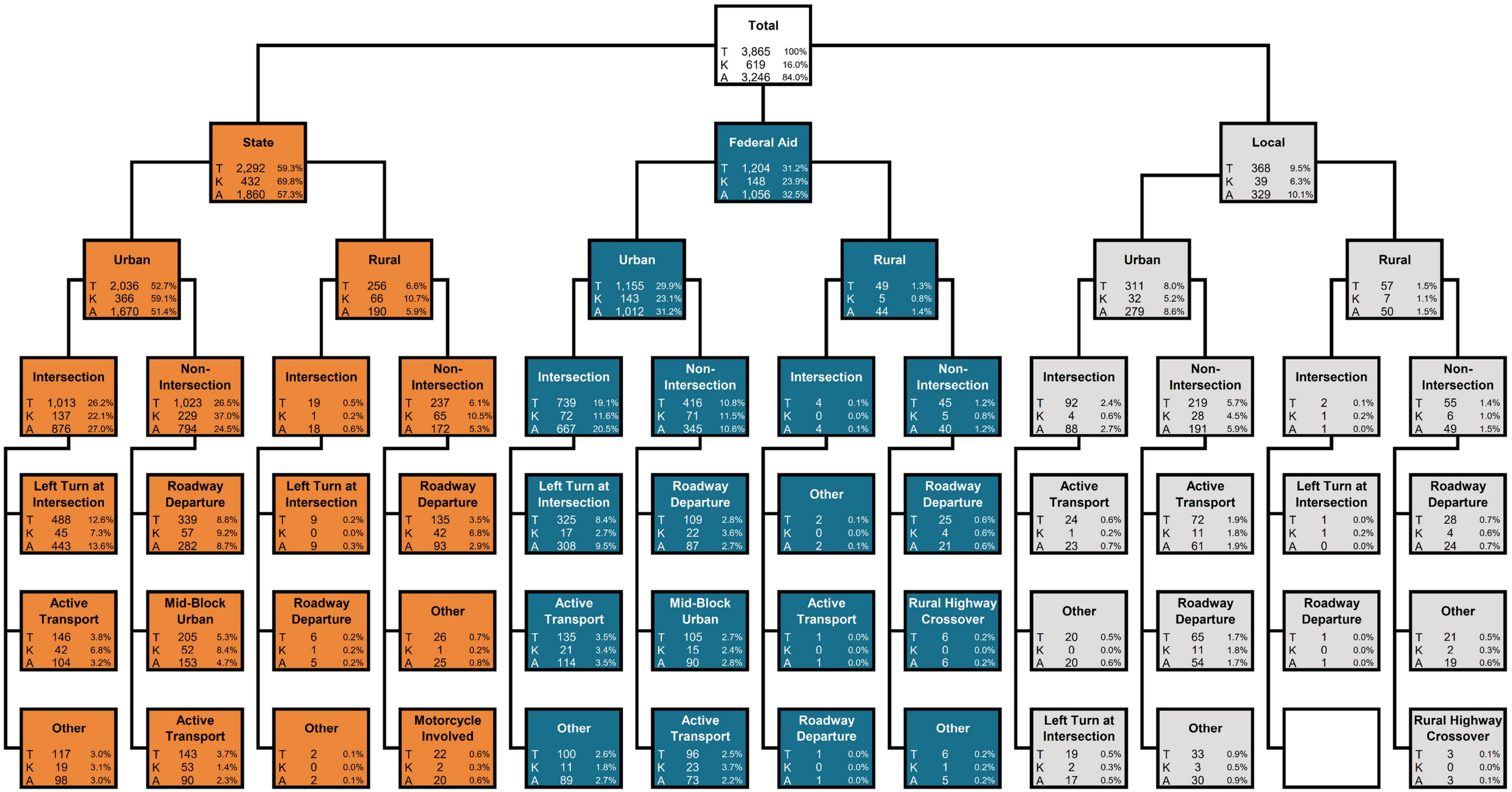


Figure 4.22 – Fatal and Serious Injury Crash Tree Diagram, 2018-2022 (Crash Type)

MANNER OF COLLISION

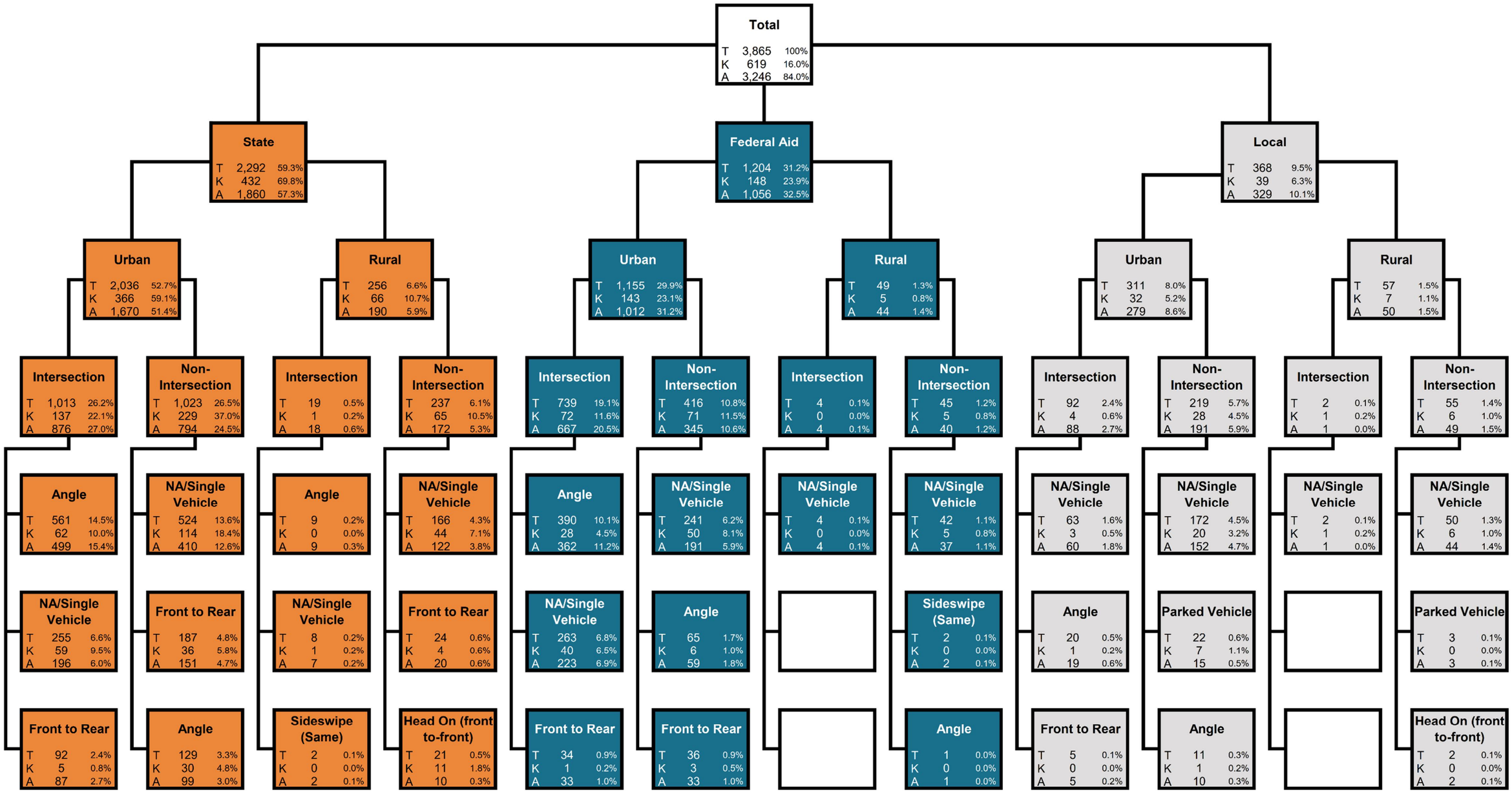


Figure 4.23 – Fatal and Serious Injury Crash Tree Diagram, 2018-2022 (Manner of Collision)

ACTIVE TRANSPORTATION

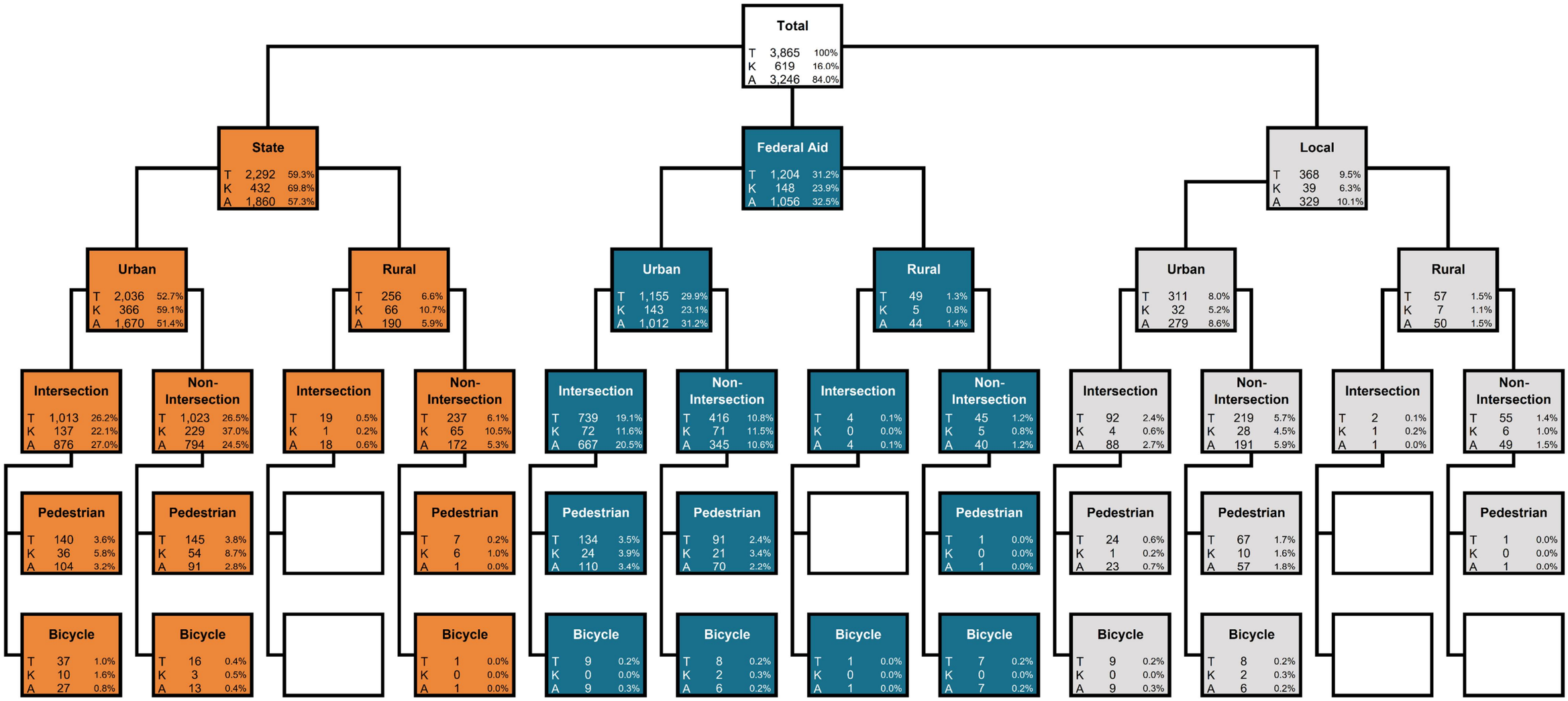


Figure 4.24 – Fatal and Serious Injury Crash Tree Diagram, 2018-2022 (Active Transportation)

5. Geographic Focus Area Analysis Results

A complete summary of results based on the safety analysis methodologies described in this report for each GFA are compiled in **Appendix A**. **Table 5.1** identifies the Appendix number by GFA.

Table 5.1 – Geographic Focus Area Appendix List

Geographic Focus Area	Appendix #
South Box Elder & North Weber Counties	A1
West Weber County	A2
Central Weber County	A3
East Weber & Morgan County	A4
North Davis County	A5
South Davis County	A6
West Salt Lake Valley	A7
Salt Lake City	A8
East Salt Lake Valley	A9
South Salt Lake Valley	A10
Tooele County	A11

Appendix A

GEOGRAPHIC FOCUS AREA SAFETY ANALYSIS RESULTS UNDER SEPARATE COVER