CALIFORNIA SAFE ROADS©

Vulnerable Road Users (VRU) Safety Assessment

November 2023

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LIST OF ACRONYMS

ACS	American Community Survey
ADT	Average Daily Traffic
ADA	Americans with Disabilities Act
ATP	Active Transportation Plan
AB	Assembly Bill
BIL	Bipartisan Infrastructure Law
CBO	Community Based Organization
CCI	California Climate Investments
Caltrans	California Department of Transportation
CDC	Center for Disease Control
CHP	California Highway Patrol
CMF	Crash Modification Factor
CRS	California Road System
DP	Director Policy
EO	Executive Order
FARS	Fatality Analysis Reporting System
FC	Functional Classification
FHWA	Federal Highway Administration
GIS	Geographic Information System
HCCL	High Crash Concentration Location
HM	Highway Maintenance
HSIP	Highway Safety Improvement Program
HQTA	High Quality Transit Areas
IIJA	Infrastructure Investment and Jobs Act
LPI	Leading Pedestrian Intervals
LPP	Local Partnership Program
LRSM	Local Roadway Safety Manual
LRSP	Local Roadway Safety Plan
MPH	Miles Per Hour
MPO	Metropolitan Planning Organization
NAAC	Native American Advisory Committee
NHTSA	National Highway Traffic Safety Administration
OTS	Office of Traffic Safety
PEH	People Experiencing Homelessness
PSC	Proven Safety Countermeasure

RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RCN	Reconnecting Communities and Neighborhoods Program
RTPA	Regional Transportation Planning Agencies
SB	Senate Bill
SCCP	Solutions for Congested Corridors Program
SHOPP	State Highway Operation and Protection Program
SHS	State Highway System
SHSP	Strategic Highway Safety Plan
SMART	Strengthening Mobility and Revolutionizing Transportation
SSA	Safe System Approach
SSAR	Systemic Safety Analysis Report
SSARP	Systemic Safety Analysis Report Program
SS4A	Safe Streets for All
STBG	Surface Transportation Block Grant
STP	Sustainable Transportation Planning
SVI	Social Vulnerability Index
SWITRS	Statewide Integrated Traffic Records System
SafeTREC	Safe Transportation Research and Education Center
TOD	Transit Oriented Development
US	United States
USC	United States Code
USDOE	United States Department of Energy
USDOT	United States Department of Transportation
VMT	Vehicle Miles Traveled
VPD	Vehicles Per Day
VRU	Vulnerable Road Users

1. EXECUTIVE SUMMARY

The safety of Vulnerable Road Users (VRU)s continues to be a key priority of both the State of California (the State) and the Federal Highway Administration (FHWA). In recent years, the number of pedestrians and bicyclists that have been killed and seriously injured on roadways in California has steadily increased. This increase has prompted the U.S. Congress to mandate, through the Infrastructure Investment and Jobs Act (IIJA), that all states complete a VRU Safety Assessment as part of their Strategic Highway Safety Plan (SHSP) by November 15, 2023. The purpose of the VRU Safety Assessment is to use a data-driven process to compile locations and strategies to improve safety for VRUs on state and local roads. The ultimate goal of the VRU Safety Assessment is to achieve Caltrans' vision of zero fatalities and serious injuries by 2050, and similar national goals. This assessment identifies VRU safety improvement locations and provides a safety countermeasures selection matrix in alignment with the Safe System Approach (SSA) to help achieve the vision of eliminating roadway fatalities and serious injuries.

VRU Definition

FHWA defines a **VRU** as a:

- Pedestrian,
- Bicyclist or e-cyclist,
- Other conveyance such as scooter, or skateboard
- Highway worker on foot in a work zone

The FHWA definition does not include motorcycles.

California's initial VRU Safety Assessment utilizes the FHWA guidance and template to present an overview of VRU safety performance, a data analysis summary, a stakeholder consultation summary, and a program of locations and strategies. The VRU Safety Assessment utilizes a SSA, which emphasizes a comprehensive and holistic approach to eliminate fatal and serious injuries for all road users. The SSA recognizes that humans make mistakes and that a reactive and proactive approach emphasizing shared responsibility is necessary to prevent deaths and serious injuries on our roadway systems.

This assessment, upon approval by the California State Transportation Agency (CalSTA) will be included in the SHSP.

The following sections summarize key information and findings of the VRU Safety Assessment.

1.1. Overview of VRU Safety Performance

California SHSP Crash Data Dashboard, with data from 2011 to 2021, was utilized to analyze safety trends and performance. The source data for the dashboard comes from California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) and includes highway and local roadway data. The Fatality Analysis Reporting System (FARS) was utilized to study national trends and California specific data, as needed.

Key findings of this data

- The number of VRU fatal and serious injury crashes in California and the United States have increased at nearly the same rate
- VRU fatal and serious injury crashes occur most often on weekdays, with Friday being the day most crashes occur
- Most pedestrian fatalities and serious injuries that involve alcohol occur at night to a greater extent than other alcohol related crash types
- October is the month with the highest number of VRU fatal and serious injury crashes, and crashes were more likely to occur in months where daylight hours were shorter (October-March)
- Almost 80% of VRU crashes occur on one of three functional roadway classifications:
  - One third of VRU crashes occur on Other Principal Arterial roads
  - One quarter occur on Minor Arterial roads
  - One fifth occur on Local roads
- Racial minorities are more likely to be involved in a fatal or serious injury crash as pedestrians, while White road users are more likely to be involved in a fatal or serious injury crash as bicyclists
- People in underserved communities are more likely to be involved in VRU fatal and serious injury crashes
- Male VRUs are more likely to be involved in fatal or serious injury crashes

1.2. Summary of Quantitative Analysis

The VRU Safety Assessment uses a data-driven process to identify specific communities referred to in this study as VRU Safety Improvement Areas. These areas were identified through a statewide analysis of 10 years' worth of SWITRS crash data to identify density of fatal and serious injury VRU crashes. The following data sources contributed to the selection of the VRU Safety Improvement Areas. **Section 3.1** describes these data sources in more detail.

Demographic Data

Crash Data

Equity Data

Roadway Data

Pedestrian and Bicycle Activity Data

The VRU Safety Assessment is a planning level document. Additional effort will be necessary to further develop context-sensitive projects and strategies as part of the transportation planning process. The VRU Safety Countermeasures Selection Matrix identified in this document builds upon the data-driven analysis as well as existing state and local efforts. The Caltrans Pedestrian and Bicyclist Safety Improvement Monitoring Programs and Local Road Safety Plans (LRSP)s, developed in these safety improvement areas, are also used as part of the program of locations and strategies to improve VRU safety.

Below is the list of VRU Safety Improvement Areas.

VRU Safety Improvement Areas

Northern California

- Fresno
- Sacramento County
- Stockton
- Visalia
- Watsonville
- Yuba City

Southern California

- Bakersfield
- Compton
- Los Angeles
- Riverside
- San Bernardino
- South Gate
- Victorville

1.3. Summary of Consultation

The stakeholder engagement process for the VRU Safety Assessment involved partners representing local and regional government agencies, advocacy groups, underserved communities, and nonprofit organizations in California. Statewide stakeholder groups contacted included but were not limited to:

- SHSP Pedestrian Challenge Area team
- SHSP Bicycle Challenge Area team
- SHSP Steering Committee
- SHSP Equity-Related Data Working Group
- California Walk and Bike Technical Advisory Committee
- Active Transportation Program (ATP) Technical Advisory Committee
- Highway Safety Improvement (HSIP) Program Implementation Plan Metropolitan Planning Organization (MPO) outreach group

Caltrans initiated the consultation process by hosting an online workshop and providing an overview of the VRU Safety Assessment and emphasizing the collaborative approach to seek stakeholder feedback. Two additional online workshops were held to further facilitate understanding and provide an opportunity to engage with the statewide group of stakeholders. These served as platforms to present comprehensive information about the VRU Safety Assessment, including the project timeline, analysis methodology, and VRU crash trends. Caltrans held two additional meetings with communities representing VRU Safety Improvement Areas. These

focused meetings allowed the Caltrans project team to delve deeper into specific community needs for VRU safety improvements and to gather feedback on proposed strategies.

Key findings gleaned from partner consultation

Most representatives of the VRU Safety Improvement Areas believe that funding is needed for infrastructure improvements, outreach, and more accessible public education campaigns to reduce fatal and serious injury crashes for vulnerable road users. Multiple stakeholders brought up vehicle speed and lack of separated facilities as key concerns.

1.4. Program of Locations and Strategies

The specific safety improvement locations identified in this document build upon existing state and local efforts. The Caltrans Pedestrian and Bicyclist Safety Improvement Monitoring Programs for the State Highway System (SHS), Local Road Safety Plan (LRSPs) developed in safety improvement areas, and strategies to improve VRU safety are all part of the effort to reduce fatal and serious injury crashes in these communities. In addition to identifying the safety improvement locations, several key strategies for improving VRU safety are included on the following page.

Policy, Planning, and Guidance Strategies

- ☑ **Continue Outreach with Stakeholders.** Provide a forum through the SHSP for engagement with local and regional agencies to have meaningful dialogue with a give and take of information addressing VRU safety.
- ☑ **Continue Implementing the Caltrans Director's Policy on Road Safety.** Caltrans is committed to achieving the goal of eliminating fatalities and serious injuries on roads by 2050 through the Director's Policy on Road Safety (DP-36), which aligns with the National Roadway Safety Strategy. The DP-36 also commits the department to eliminating race-, age-, mode- and ability-based disparities in road safety outcomes for all road users

- ☑ **Continue Implementing Caltrans' Complete Streets Policy.** Caltrans' Complete Streets Policy commits Caltrans to ensuring all transportation projects funded or overseen by Caltrans provide comfortable, convenient, and connected complete streets facilities for people walking, biking, and taking transit unless an exception is documented and approved
- ☑ **Implementing the VRU Safety Countermeasures Selection Matrix.** This assessment includes a VRU Safety Countermeasures Selection Matrix based on SSA principles that targets speed management and separating users in time and space and utilizes best practices and current FHWA research resources. The purpose of the Selection Matrix is to narrow down options for implementing different types of VRU safety improvements in projects

Investment Strategies

- ☑ **Continued investment in the Caltrans Active Transportation Program.** The Caltrans Active Transportation Program (ATP) aims to increase the proportion of trips accomplished by walking, biking, and increasing safety mobility for non-motorized road users. Continued investment in this program helps implement planning efforts and infrastructure elements that improve VRU safety on state and local roads
- ☑ **Increase HSIP funding.** Caltrans is committed to exceed the IIJA VRU Special Rule obligation requirement by planning to direct 30% of the IIJA HSIP funds towards VRU safety by 2025
- ☑ **Expand the Highway Maintenance Safety Program Pilot.** In 2021, Caltrans launched the Highway Maintenance Safety Program Pilot (Pilot) program to quickly deliver proactive, low-cost safety countermeasures within one to two years from planning to implementation. The Pilot has improved pedestrian safety at 1,500 locations, and has been extended for another five years to implement VRU safety improvements at an additional 2500 locations
- ☑ **Increased investment for Complete Streets funding in the State Highway Operation and Protection Program.** Caltrans is also making significant investments for Complete Streets projects in the State Highway Operation and Protection Program (SHOPP) by adding and maintaining features that make roadways more accommodating and safer for pedestrians and bicyclists

1.5. Alignment with a Safe System Approach

The VRU Safety Assessment utilizes a SSA framework to inform policy and practice decisions that ensure VRU safety. The SSA utilizes a comprehensive and holistic approach to eliminate fatal and serious injuries for all road users. It recognizes humans make mistakes, humans are vulnerable, and that a reactive and proactive approach emphasizing shared responsibility is necessary to prevent deaths and serious injuries, especially those of VRUs, on our roadways.

The SSA is integrated throughout this assessment. The historical trends and data analysis are focused only on VRU fatalities and serious injury data in alignment with state and national goals to eliminate roadway deaths and serious injuries. Consultation efforts for this assessment implement the SSA principle that responsibility is shared. Caltrans engaged with local and regional government agencies, advocacy organizations, and non-profit organizations to gain local knowledge on contributing factors to improve VRU safety. Aligning with California SHSP's five Es of traffic safety (education, enforcement, engineering, emergency response, and emerging technologies), the project team consulted with the California Office of Traffic Safety (OTS) for discussions on education, California Highway Patrol (CHP) for enforcement discussions, and various local governments for engineering (infrastructure) improvements. The program of locations and strategies includes Caltrans' Pedestrian and Bicyclist Safety Improvement Monitoring Program, which utilizes both proactive and reactive approaches to identify and address VRU safety improvements in alignment with the SSA. The VRU Safety Countermeasures Selection Matrix also identifies whether each proposed strategy separates users in time or space, another important aspect of implementing the SSA.

2. OVERVIEW OF VRU SAFETY PERFORMANCE

This chapter presents California's VRU safety performance through the following data trends analysis:

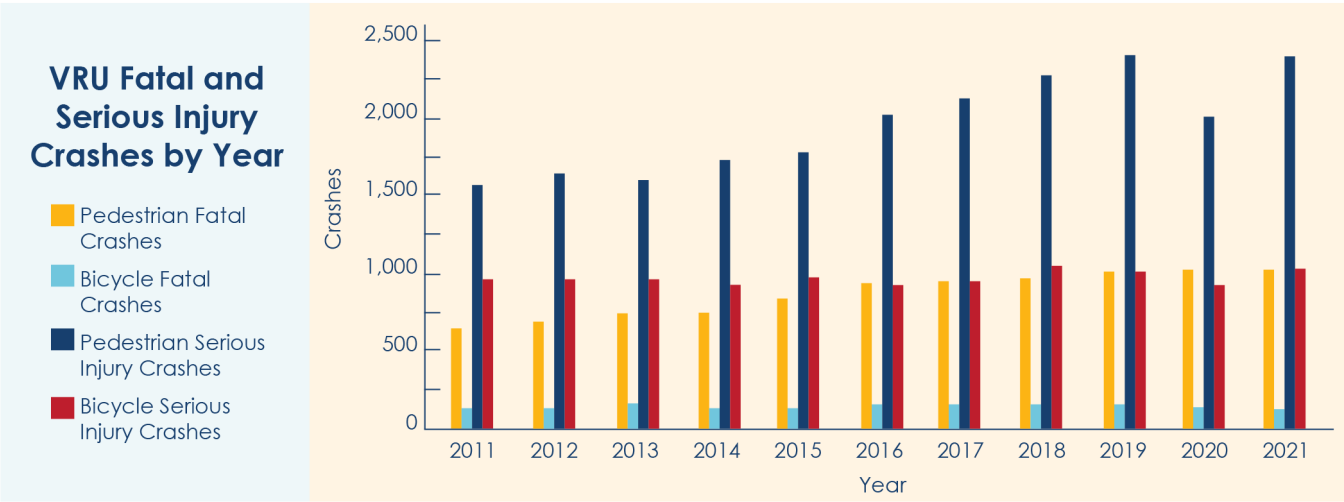
- **Historical Safety Trends**
- **Safety Trends by User Type**
- **VRU Safety Performance vs. Overall Safety Performance**
- **Nonmotorized Safety Performance Target Progress**

The assessment used 2011-2021 data from the California SHSP's Crash Data Dashboard to analyze safety trends and performance. This 11-year data analysis period includes the year 2020, which was atypical for safety performance due to the COVID-19 pandemic. The source data for the dashboard comes from CHP's Statewide Integrated Traffic Records System (SWITRS) data system and includes local roadway data. The National Highway Traffic Safety Administration (NHTSA) data system - Fatality Analysis Reporting System (FARS) was utilized to study national trends, as well as California specific data as needed. In addition, Caltrans' pedestrian and bicyclist network screening programs were utilized to study crash locations on the SHS. Furthermore, data was used from a University of California, Berkeley report, "Strategies for Reducing Pedestrian and Bicycle Injury at the Corridor Level."

2.1. Historical Safety Trends

As shown in **Figure 1**, pedestrian involved crashes show an overall increasing trend while bicyclist involved crashes remained more constant over the analysis period. Pedestrian fatal and serious injury crashes rose steadily between 2011 and 2021, with a slight decrease in 2020 during the peak of the COVID-19 pandemic.

Figure 1: VRU Fatal and Serious Injury Crashes by Year (Source: SWITRS 2011-2020)



2.2. Safety Trends by User Type

As shown in **Figure 2**, the year-to-year percentage of VRU involved crashes compared with total crashes is typically between 23% and 27%, with a decrease from 2014. While the downward trend is encouraging, the data does show that nearly one in four fatal or serious injury VRU crashes involve pedestrians and bicyclists, which emphasizes the need to focus on VRU safety.

Figure 2: Percentage of VRU fatal and serious injury crashes as part of all fatal and serious injury crashes (Source: SWITRS 2011-2020)

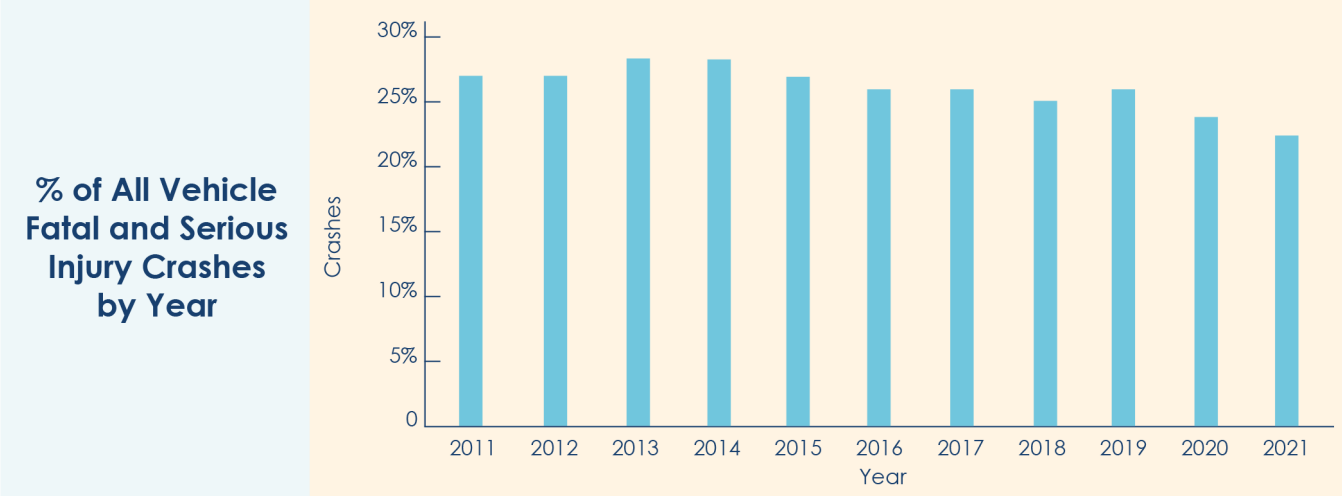
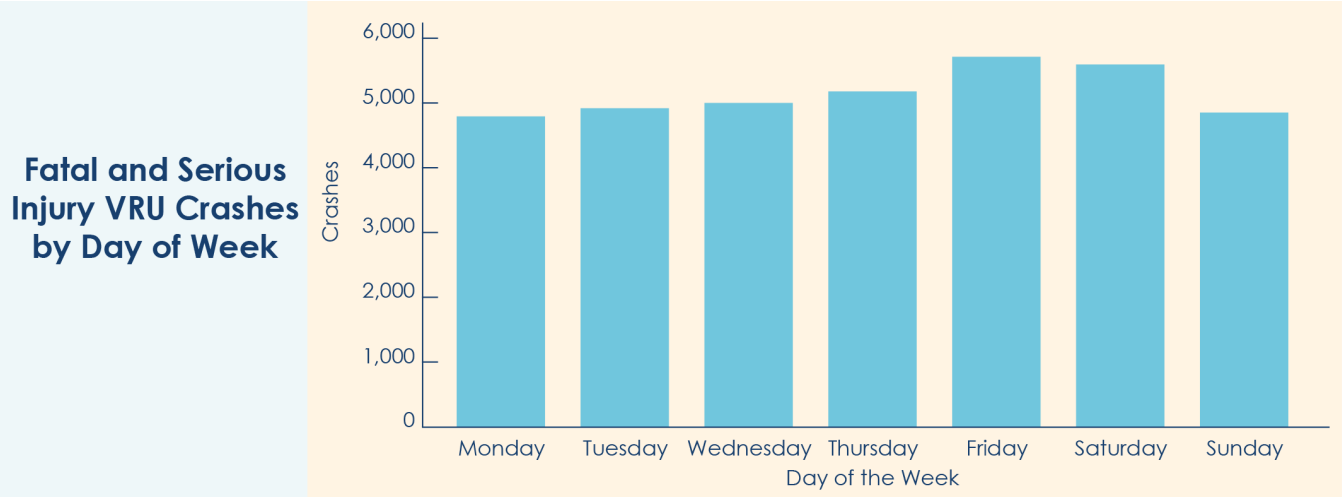


Figure 3 presents additional analysis that examined pedestrian and bicycle crashes by day of week and pedestrian and bicycle crash concentration compared to population concentration. The data shows that the most common day of week for bicycle crashes was Friday, closely followed by Saturday.

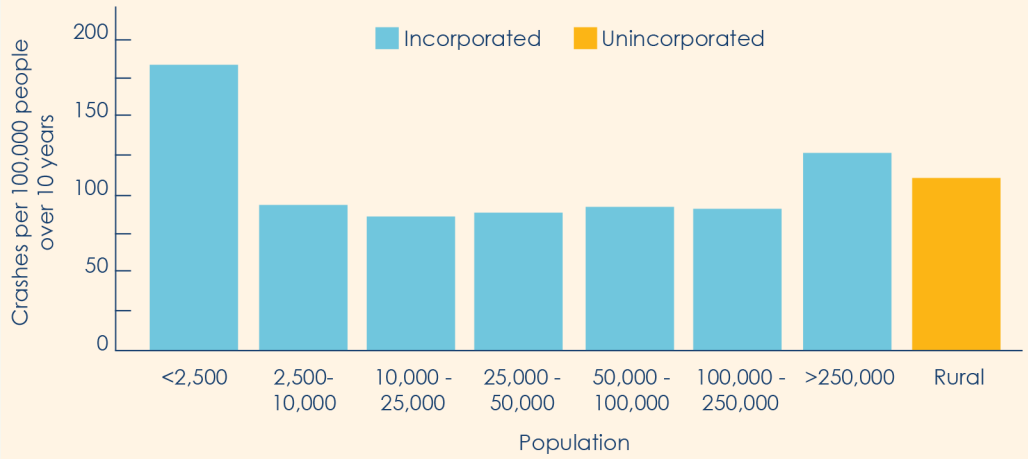
Figure 3: Fatal and Serious Injury VRU Crashes by Day of Week (Source: SWITRS 2011-2020)



The highest fatal and serious injury vulnerable road user crash rates were in the largest cities and unincorporated county areas (**see Figure 4**).

Figure 4: Vulnerable Road User Fatal and Serious Injury Crashes by Size of Jurisdiction (Source: SWITRS 2011-2020)

VRU Fatal and Serious Injury Crashes by Size of Jurisdiction



2.3. VRU Safety Performance vs. Overall Safety Performance

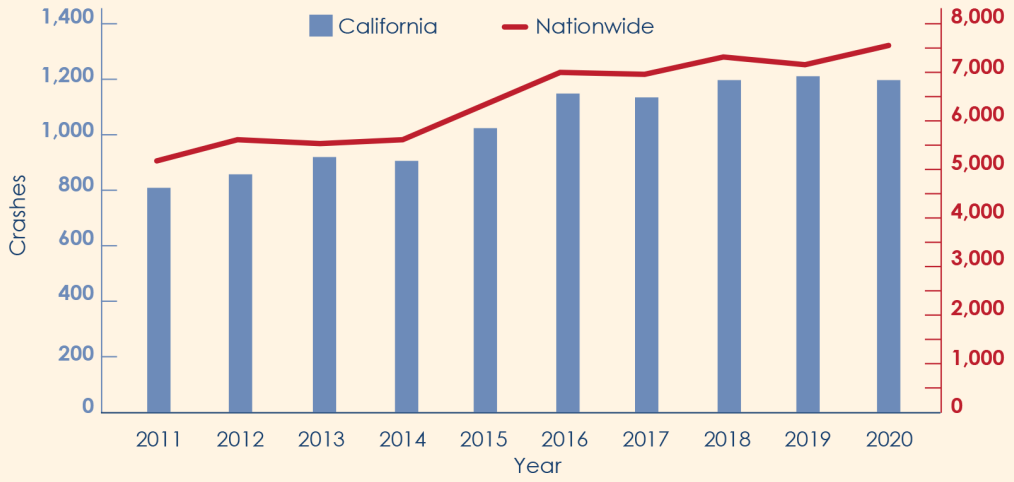
In California, fatal and serious injury crashes have increased annually from 2011 to 2019. VRU crashes are usually between 23% and 27% of the total crashes. Preliminary data from 2022 and 2023 suggest that the proportion of VRU crashes are now trending upward. Similar to the overall serious injury and fatal crash patterns, the majority (72%) of VRU fatalities and serious injuries occur mid-block (halfway through a city block) where traffic speeds are higher, and drivers may not be expecting to encounter pedestrians or bicyclists. However, because VRUs are more easily injured or killed, most intersection area crashes involving VRUs also result in greater levels of injury or death. Reducing conflicts at intersections therefore continues to be a priority in VRU safety.

Of all fatal and serious injury crashes involving vulnerable road users, 82% occurred on locally owned roadways between 2011 and 2020. This highlights the importance of a statewide focus on all public roads, including locally owned roadways where most VRU fatalities and serious injuries have been occurring. Nearly 36% of all fatal and serious crashes involving vulnerable road users on all California public roads are intersection crashes. Taking action to improve VRU safety is a critical component of Caltrans' mission to provide safe and reliable transportation network to all road users.

NHTSA's FARS data system provides a nationwide census on yearly motor vehicle traffic crash data to the Congress and the public. In 2010, NHTSA adopted a more detailed record system to more effectively develop countermeasures for VRU crashes. This has allowed the project team to compare VRU fatal crash data from the nation to California's SWITRS database, as shown in **Figure 5** below. During the analysis period of 2011 to 2020, California has had similar increase of fatal VRU crashes when compared to the nation as a whole.

Figure 5: Nationwide vs California Fatal VRU Crashes (Source: SWITRS 2011-2020, NHTSA FARS)

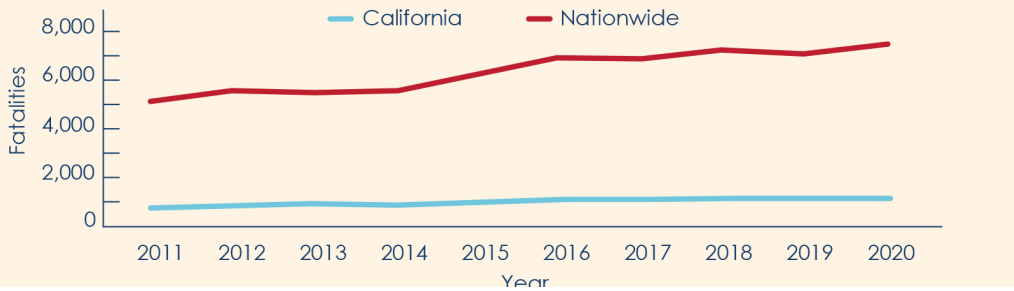
Nationwide vs. California Fatal VRU Crashes



Over this same period, California's overall share of VRU fatalities has slightly increased as shown in **Figure 6**.

Figure 6: Proportion of Nationwide VRU Fatalities in California (Source: SWITRS 2011-2020, NHTSA FARS)

Proportion of Nationwide VRU Fatalies in California



2.4. Nonmotorized Safety Performance Target Progress

2.4.1. Safety Performance Targets

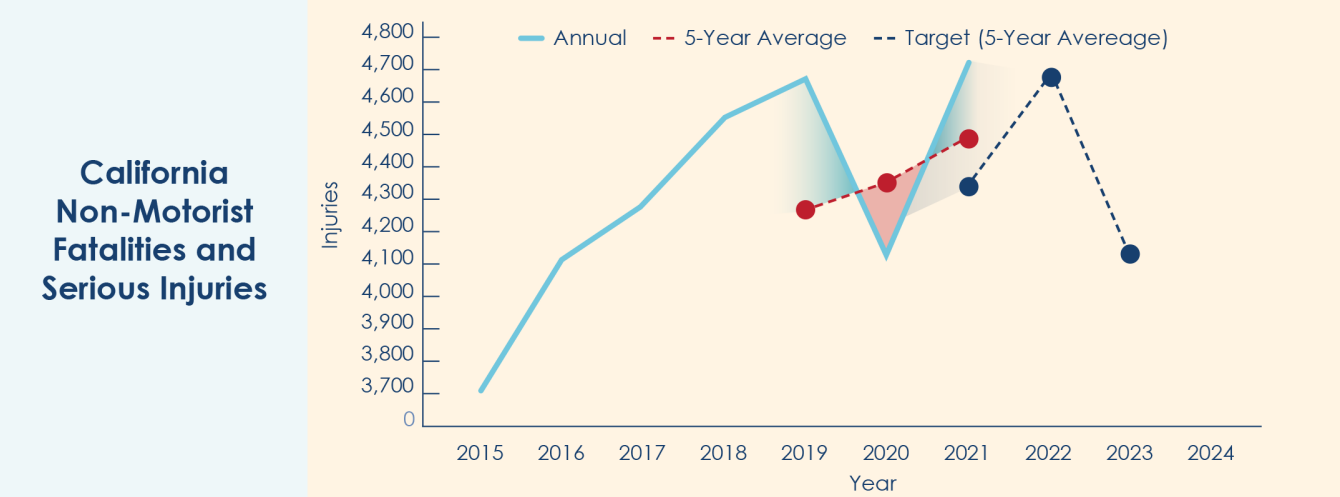
Caltrans has set safety performance management targets for nonmotorized users since 2015. This data currently sets targets for 2021, 2022, and 2023 based on data from 2015 to 2021. The outlined annual targets as reported to the FHWA are as follows in **Table 1**.

Table 1: Caltrans Safety Performance Targets

Fatal and Serious Injuries	2015	2016	2017	2018	2019	2020	2021	2022	2023
Annual	3,795	4,140	4,294	4,569	4,694	4,187	4,714	--	--
5-Year Average	--	--	--	--	4,298.4	4,376.8	4,491.6	--	--
Target (5-Year Average)	--	--	--	--	--	--	4,340.8	4,684.4	4,131.7

Crash data from 2015-2020 was used to project a trend for 2021-2023, which shows a decrease of 0.3% each year for non-motorist fatalities and serious injuries. In addition, the relative percentage change from 2018-2019 and 2019-2020 were averaged to determine the annual decreasing trend of 2.40% for the number of non-motorized serious injuries. **Figure 7** below indicates that crashes were higher than what was predicted for 2021.

Figure 7: California Non-Motorist Fatalities and Serious Injuries (Source: FHWA State Highway Safety Report 2021, California)



3. SUMMARY OF QUANTITATIVE ANALYSIS

This chapter provides a comprehensive overview of the methodology used to analyze crash data, using roadway characteristics and demographics and the establishing correlations to indicate potential contributing factors. The quantitative analysis uses important demographic factors to provide an equitable understanding of the challenges and impacts faced by different groups and communities.

3.1. Methodology

SHS and local roadway data were studied separately based on roadway functional classifications. The SHS was evaluated based on Caltrans' existing Pedestrian and Bicyclist Safety Improvement Monitoring Program and the related University of California, Berkeley report, "Strategies for Reducing Pedestrian and Bicyclist Injury at the Corridor Level." The monitoring program screens the SHS network to identify and evaluate VRU-involved crash locations, and an infrastructure-based data-driven safety analysis. The Program uses a data driven analysis to identify and address high collision concentration locations and other locations with similar roadway characteristics on the State Highway System. This approach for evaluating the SHS provided a consistent methodology in the way roads were analyzed and crash data was collected and filtered.

Five different types of GIS data were collected and analyzed to evaluate the local roadway systems and the possible relationships and factors for fatal and serious injury crashes. These GIS data and the data sources are as follows:

Crash Data

VRU crashes resulting in fatalities or serious injuries for the last ten years using the SWITRS database via the CHP

- SWITRS is a statewide database that collects and processes data collected from crash scenes

Roadway Data

California Road System (CRS) roadway network with functional classifications

- The GIS inventory of the state's public roadway system maintainted by Caltrans
- Statewide High-Quality Transit Areas (HQTAs)

HQTAs are areas within half a mile of well serviced transit stops or transit corridors with headways of 15 minutes or less.

Demographic Data

- Shapefile of City and County boundaries in California
- Statewide Adjusted Urban Area Boundaries
- US Census and American Community Survey (ACS) demographic data

Equity Data

CalEnviroScreen 4.0 Shapefiles

- CalEnviroScreen scores every census tract in the state on a system of metrics used to determine environmental conditions. A composite score is created and ranked against all other tracts in a percentile score

Senate Bill (SB) 535 Disadvantaged Communities Census Tract data

- SB 535 disadvantaged communities are the top 25% most disadvantaged CalEnviroScreen communities

Shapefiles of census tracts, block groups, and blocks of the 2020 US Census

Center for Disease Control (CDC) Social Vulnerability Index (SVI)

- SVI is a measure developed to determine the potential negative effects on communities caused by external stresses on human health, using 16 census variables

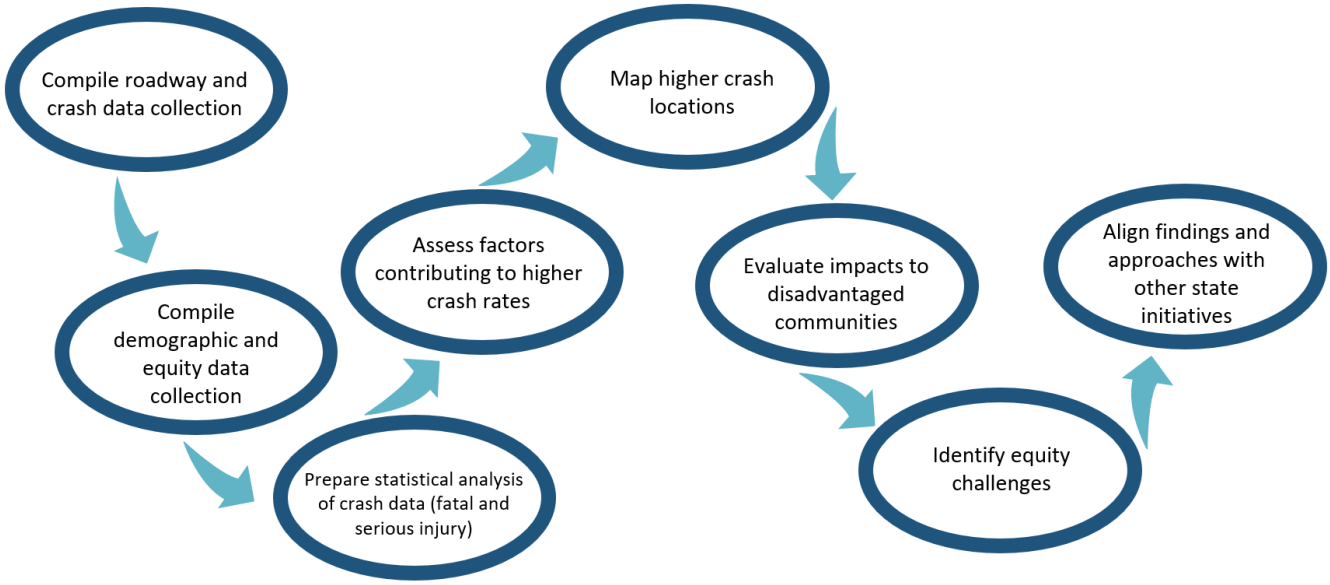
Pedestrian and Bicycle Activity Data

User volume data from Replica. Replica is a data aggregation service that compiles roadway user information by mode, origin / destination, demographics, and trip purpose using mobile source data such as cell phones and connected vehicles.

- In addition to this GIS data, supplemental information was also collected to fill possible gaps in the GIS data and provide more context for any correlations. This information included:
  - » Data from the US Census on population, race/ethnicity, sex, age, income, car ownership, commute distance/times
  - » Modal Vehicle Miles Travelled (VMT), Average Daily Traffic (ADT), and average speeds as available from Caltrans and Replica
  - » Speed limits on roadways where available; proxy with functional classification if not available

The GIS data and supplemental information was compiled to examine and analyze local roadway crash trends, factors, and patterns for pedestrians and bicyclists. This analysis identified locations and populations most impacted by VRU fatal and serious injury crashes using the steps outlined in **Figure 8.**

Figure 8: Data-Driven Analysis Process



3.2. Summary of Quantitative Crash Data Analysis

The quantitative analysis for VRUs used several different types of analysis and demographic considerations in developing a statewide overview of the VRU activity patterns and fatal and serious injury crash trends for California. Demographic factors included socioeconomic status, household characteristics, race, ethnicity, employment, and transportation needs. This data showed how different population groups were affected based on these factors. Overall, the quantitative analysis process combined crash data, risk factors, identification of high-risk areas, and demographics to provide statewide level overview of VRU trends. These trends were used to identify key strategies that can be employed broadly across the state to respond to the specific challenges that lead to the greatest number of VRU fatal and serious injury crashes. The strategy matrix includes strategies for urban and rural areas, as well as opportunities to provide more equitable safety improvements statewide.

3.2.1. Trends Studied

The quantitative analysis focused on multiple trends, as shown in the list below. Supporting charts and figures are included in **Appendix A**.

- VRU fatal and serious injury crashes on intersections vs. roadways
- VRU fatal and serious injury crashes per functional classification of roadways
- VRU fatal and serious injury crashes where alcohol is a contributing factor
- Lighting conditions where alcohol is a contributing factor for VRU fatal and serious injury crashes
- Drug use as a factor for fatal and serious injury crashes for vulnerable road users
- Lighting conditions in bicycle fatal and serious injury crashes
- Lighting conditions in pedestrian fatal and serious injury crashes
- Lighting conditions by month for bicycle fatal and serious injury crashes
- Lighting conditions by month for pedestrian fatal and serious injury crashes
- Statewide pedestrian activity
- Statewide pedestrian fatal and serious injury crash rates
- Communities with highest pedestrian fatal and serious injury crash rates – urban areas
- Statewide bicycle activity
- Statewide bicycle fatal and serious injury crash rates
- Communities with highest statewide bicycle fatal and serious injury crash rates
- Communities with highest VRU fatal and serious injury crash rates – rural
- Communities with highest VRU fatal and serious injury crash rates – urban

Functional Classification

Functional classification is an eligibility factor for federal funding programs. Streets and highways are grouped into categories according to the use they are intended to serve. Therefore, the VRU safety improvement network was categorized as shown in **Table 2**. The category with the most fatal and serious injury crashes per mile is 'Other Principal Arterial' and the second highest category is 'Local.'

Caltrans Functional Classification	Miles
1 - Interstate	4.0
2 - Other Fwy or Expwy	2.2
3 - Other Principal Arterial	120.8
4 - Minor Arterial	68.4
5 - Major Collector	23.4
6 - Minor Collector	0.0
7 - Local	73.0

Table 2: Safety Improvement Network Total Mileage by Caltrans Functional Classification (Source: SWITRS 2011-2020, Caltrans Roadway Network Shapefile)

Table 3 below provides an overview of the number of crashes on each functional class (FC) as designated by the Caltrans CRS compared to each class's share of the roadway miles in the state. The Other Principal Arterial and Minor Arterial functional classifications had a much higher share of crashes relative to overall roadway mileage.

Table 3: Functional Classification of Roadways and Shared Vunerable Road User Crashes (Source: SWITRS 2011-2020, Caltrans Roadway Network Shapefile)

Functional Classification	No. of Fatal and Serious Injury Crashes	% of Total	% of State Roadway Mileage	Primary Challenge
Interstate	1,698	5%	2%	While low in number, highway workers, people without alternate routes, unhoused, and those dealing with vehicular breakdowns, mix with high-speed traffic. Solutions that provide more separation between vulnerable users and vehicular traffic are most useful on these facilities
Other Freeway (FWY) or Expressway (EXPWY)	1,452	4%	1.5%	
Other Principal Arterial	11,520	32%	5%	These facilities are more likely to have land uses and transit facilities that attract pedestrian and bicycle trips, while they also serve higher speed vehicle traffic. Marked and high visibility crossings, refuge areas, slower speeds and traffic calming treatments that reduce the likelihood of vulnerable users conflicting with vehicles are ideal for these facilities
Minor Arterial	8,983	25%	7.5%	

Functional Classification	No. of Fatal and Serious Injury Crashes	% of Total	% of State Roadway Mileage	Primary Challenge
Major Collector	4,831	13.5%	8%	These facilities have lower rates of injury relative to their centerline miles because they tend to have lower speeds, fewer land uses that attract vulnerable road users, and may not be built with as many lanes that increase crossing distances. However, land uses such as schools and parks are common on these roadways. Treatments that slow vehicles, reduce crossing distances, and add separation from vehicle traffic are ideal for these facilities.
Minor Collector	198	.5%	2%	
Local	7,118	20%	73%	Local roadways are a start or end destination for many vulnerable road user trips. Altough local roadways may have lower volumes and speeds, they often intersect roadways with fewer crossing opportunities, sidewalks, or other amenities to separate VRUs from vehicular traffic. Driveways and vehicle access points may create conflicts between VRUs and vehicles. They also have many more driveways and vehicle access points can create conflict points between VRUs and vehicles. Traffic calming, sidewalks, and visibility improvements may be appropriate treatments for these roadways.

Crash Characteristics

This section summarizes the key observations related to VRU crashes. Detailed charts are presented in **Appendix A**.

Intersections

Nearly 28% of vulnerable road user fatal and serious injuries occurred at intersections. Crashes occurring mid-block away from intersections have higher speeds and are more likely to produce higher levels of injury, even though a much larger proportion of crashes happen at intersections. Because vulnerable road users can be injured at much lower speeds, a greater number of those intersection crashes result in more significant injuries. This is one of the reasons that countermeasures that provide more separation for pedestrians and bicyclists from vehicular traffic at intersections can be important tools in reducing these types of crashes.

Presence of Drugs and Alcohol

3.3% of crashes were reported as "non-applicable", with 90% of crashes reported drug use was "not suspected or unknown" meaning the status could not be verified.

22% of fatal and serious VRU crashes involved alcohol consumption to some degree. Alcohol involvement is defined as the driver, bicyclist or pedestrian having reported any recent alcohol use regardless of impairment status. Most alcohol-involved crashes occur at night, with only about 17% occurring in daylight hours compared with nearly 44% of that same group of crashes without consideration of alcohol. This finding highlights the need for more nighttime visibility, continued emphasis on impaired driving enforcement, and separation between vulnerable road users and vehicular traffic.

Lighting Conditions

Most bicycle crashes occur at night, while the majority of pedestrian crashes occur during daylight hours. Locations where vehicles turn over bicycle lanes and other similar conflict points may be a priority for lighting as well as the promotion of bicycle lights and high-visibility clothing. As shown in **Appendix A**, a large portion of pedestrian crashes occur during the day, compared to bicycle crashes, which mostly occur at night. This could be attributed to more people being out during daylight hours than at night. Additional information is shown in **Appendix A** on page 51.

Time of Year

Month-to-month trends were observed among VRU involved fatal and serious injury crashes. **Pedestrian crashes were more likely to occur during months with shorter daylight hours (October to January) while bicycle crashes peak during the summer months**, potentially due to more recreational cycling.

The number of pedestrian crashes occurring during daylight was relatively consistent throughout the year with most of the annual variation occurring at night in areas with streetlights. Bicycle crashes were more consistent at night throughout the year with variations occurring during daylight hours. Again, this points to the potential for more daytime recreational cycling contributing to summer increases, while pedestrian activity is more constant and impacted by shorter daylight hours in the winter.

Pedestrian Activity

Statewide pedestrian activity is generally concentrated in populated areas, with significant activity in the most urban areas of Southern California and the Bay Area. Pedestrian crashes follow a similar pattern, but with less intense peaking in the urban centers and more even distribution in smaller cities. Suburban communities and cities outside the core metropolitan areas had higher rates of pedestrian fatal and serious injuries relative to the amount of walking than the more urbanized centers.

Figures 9-14 on the following pages show a combination of the following criteria:

- Relative intensity of pedestrian activity
- The number of fatal and serious injury pedestrian crashes
- The proportion of those crashes relative to the amount of activity pedestrian traffic in each area

The top 20 areas for rate of pedestrian serious injuries and fatalities are labeled on the map in **Figure 11**.

Figure 9: Statewide Pedestrian Activity (Source: Replica, 2022)

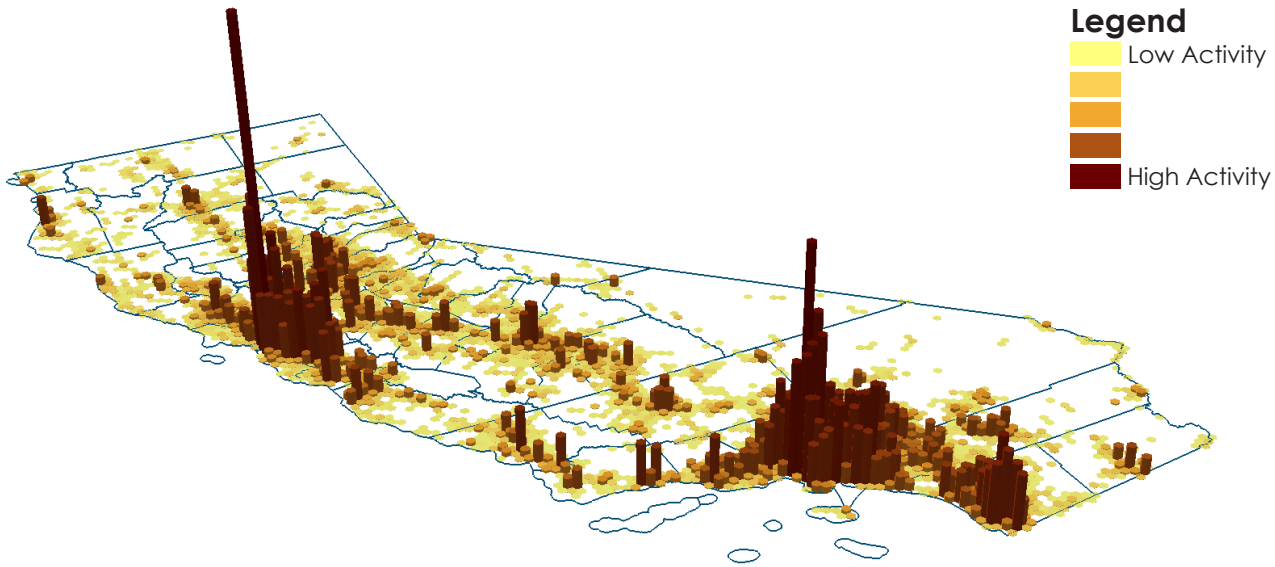


Figure 10: Statewide Pedestrian Fatal and Serious Injury Crash Activity (Source: Replica, 2022)

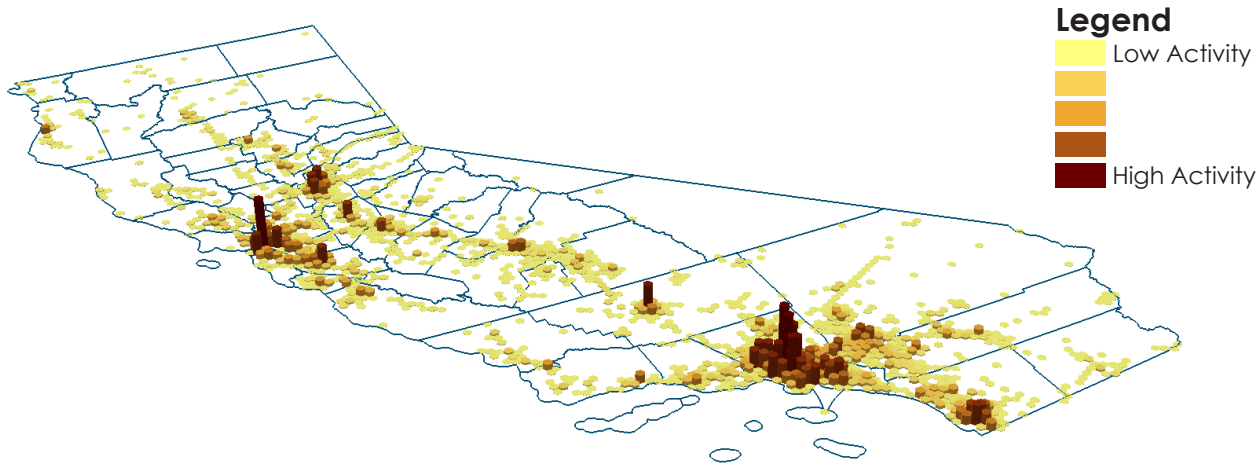
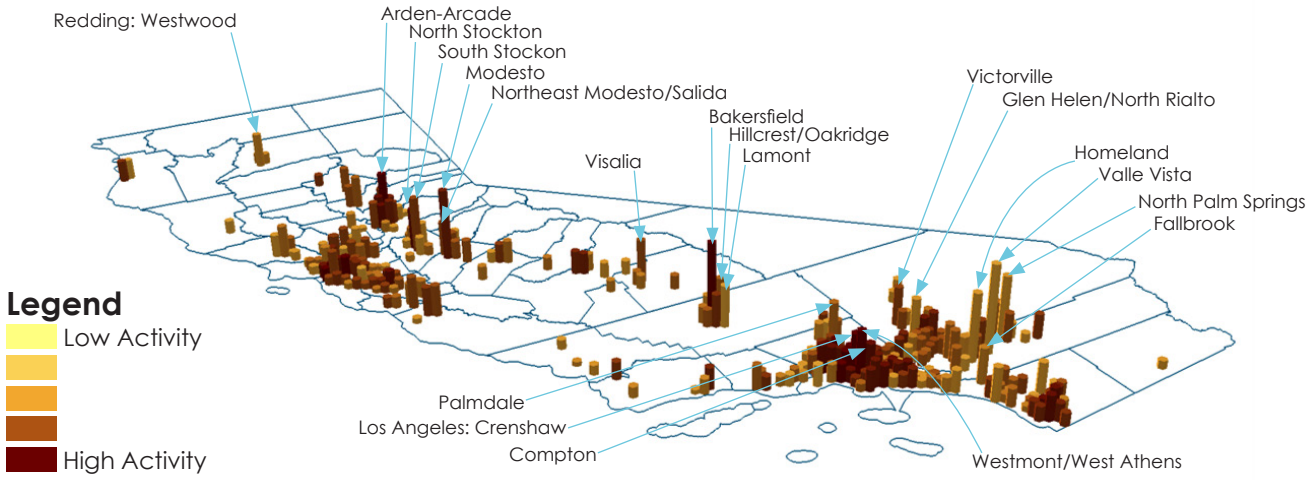


Figure11: Areas with Highest Statewide Pedestrian Fatal and Serious Injury Crash Rates (Source: SWITRS 2011-2020)



Bicycle Activity

Statewide bicycle activity is more concentrated in suburban areas near larger cities, and near university campuses with significant portions of activity in Southern California and the Bay Area. Fatal and serious injury bicycle crashes are fewer than pedestrian crashes, and are mostly concentrated in the Los Angeles area, Bay Area, Sacramento, Santa Barbara, and cities throughout the San Joaquin Valley. The areas with high rates of bicycle fatal and serious injury crashes relative to the amount of bicycle traffic are scattered across urbanized areas of the state. The top 20 neighborhoods for rate of bicycle fatalities and fatalities and serious injuries are labeled on the map in **Figure 14**.

Figure 12: Statewide Bicycle Activity (Source: Replica 2022)

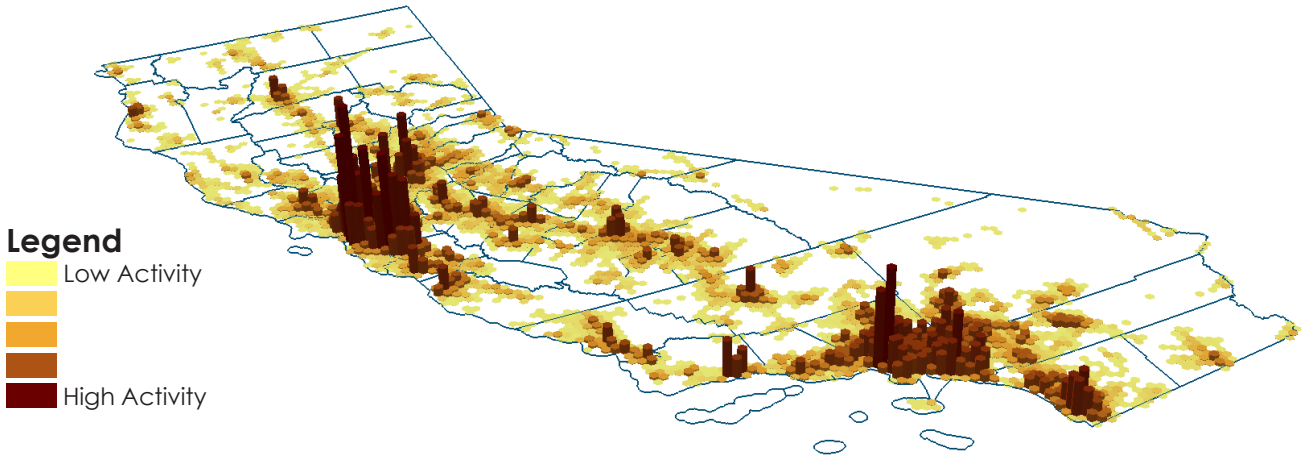


Figure 13: Statewide Bicycle Fatal and Serious Injury Crash Activity (Source: Replica 2022)

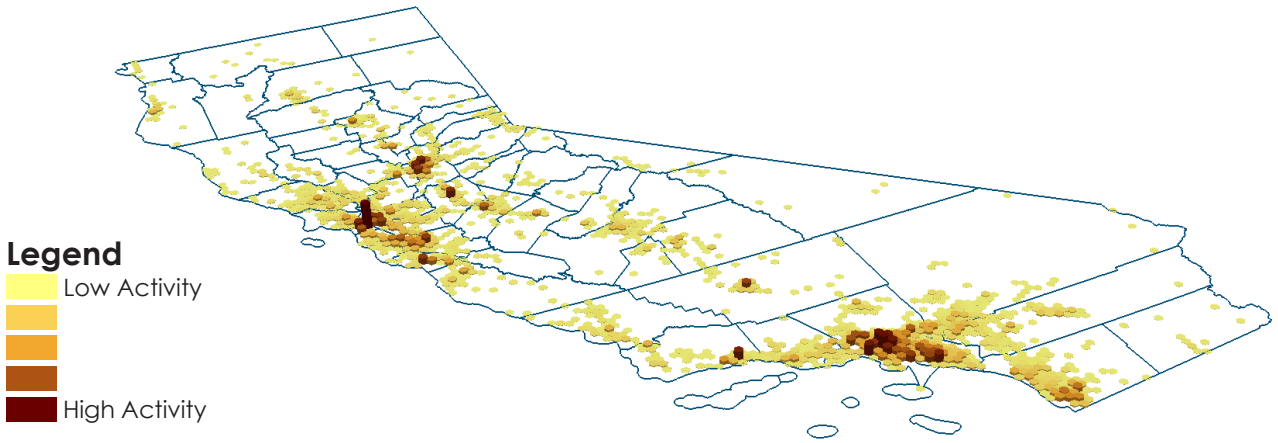
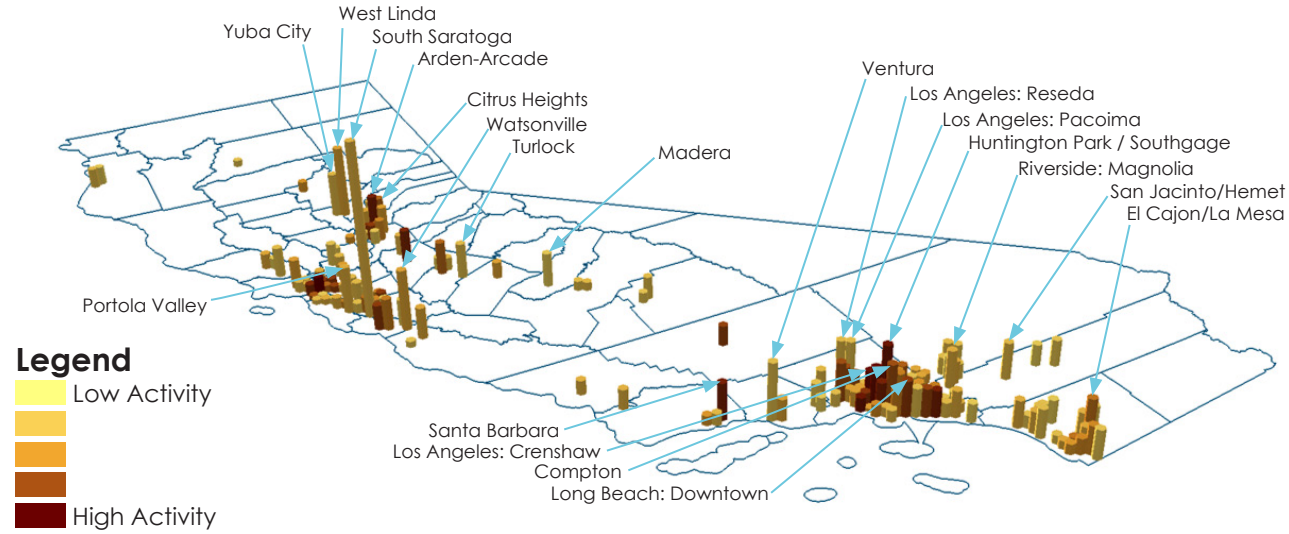


Figure 14: Areas with Highest Statewide Bicycle Fatal and Serious Injury Crash Rates (Source: SWITRS 2011-2020)



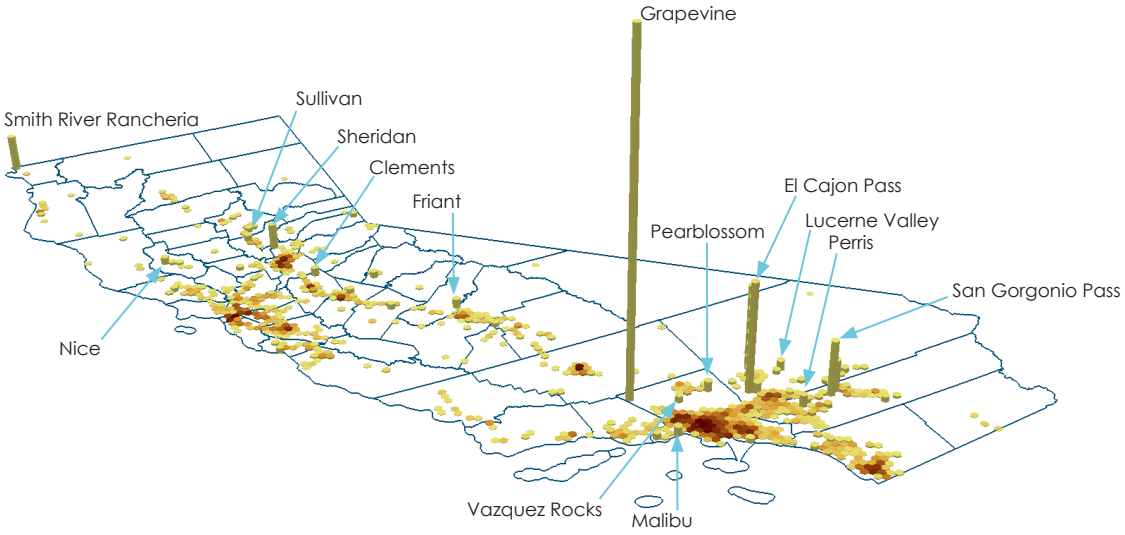
Highest-Crash Rate Locations

Figure 15 on the following page shows the locations of the highest fatal and serious injury crash locations for bicycles and pedestrians throughout the state. High bicycle crash rate locations are most prominent in the coastal areas with narrow and windy mountain roads near the Bay Area, as well as coastal Ventura and Orange counties. Pedestrian crashes are more concentrated in inland communities, particularly in the

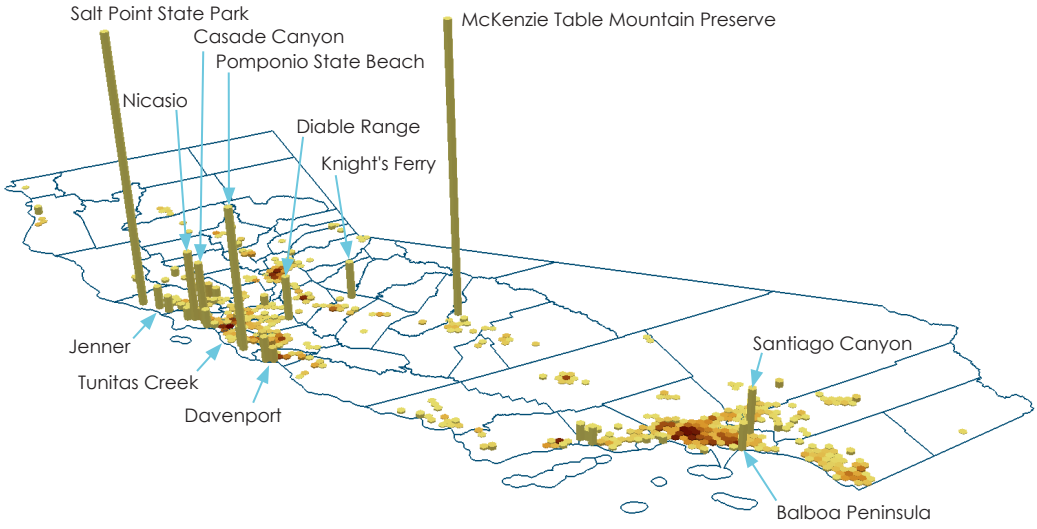
San Joaquin Valley, Inland Empire, and Coachella Valley regions. These areas tend to have fatal and serious injury crashes on highway or freeway facilities where there are limited alternate routes for those on foot. These locations highlight the need for systemic improvements on the rural roadway system in parallel with investment in urban areas.

Figure 15: Areas with Highest Fatal and Serious Injury VRU Crash Rates – Rural (Source: SWITRS 2011-2020, US Census Bureau)

Pedestrian



Bicyclist



3.3. Demographics and Equity

Equity is a key component of the VRU Safety Assessment and has been highlighted as such in the FHWA Guidance document. A key outcome of this process is the identification of VRU Safety Improvement Areas, which are referred to as high-risk areas in FHWA VRU Safety Assessment guidance. These areas include communities with higher rates of fatal and serious crashes involving vulnerable road users, and have significant areas classified as transportation disadvantaged per SB 535 in California through CalEnviroscreen 4.0 or through the Justice40 initiative federally. SB 535 created a system of metrics that define disadvantaged communities throughout California based on several environmental factors. These designations are determined by census tract and assigned a score based on the constituent factors. Justice40 is a similar tool to SB 535 but created by the United States Department of Transportation (USDOT) for use on a national scale as part of the IIJA.

Pedestrian and bicyclist fatalities and serious injuries have varying impacts on different communities. This section evaluates the demographic trends associated with vulnerable road user fatalities and serious injuries.

The equity analysis provides tools to help decision makers meet specific needs of underserved communities. The Governor's Executive Order (EO) N-16-22 encourages state agencies and departments to take additional actions to embed equity analysis and inclusive practices to more effectively advance equity and to respond to identified disparities with changes to the organizations' mission, vision, goals, data tools, policies, programs, operations, community engagement, tribal consultation policies and practices, and other actions as necessary to serve all Californians.

This section highlights demographic and equity by the following:

Race | Income | Age | Sex | Tribal Areas

For all crash types, including those without a vulnerable road user involved, the majority of victims are male. Compared to other racial demographic groups, Black residents are disproportionately killed or seriously injured due to crashes, with a 7.5% higher fatality and injury rate than other members of the population. Black bicyclists are also overrepresented in comparison to the rest of the population. These findings are described in more detail on the following pages.

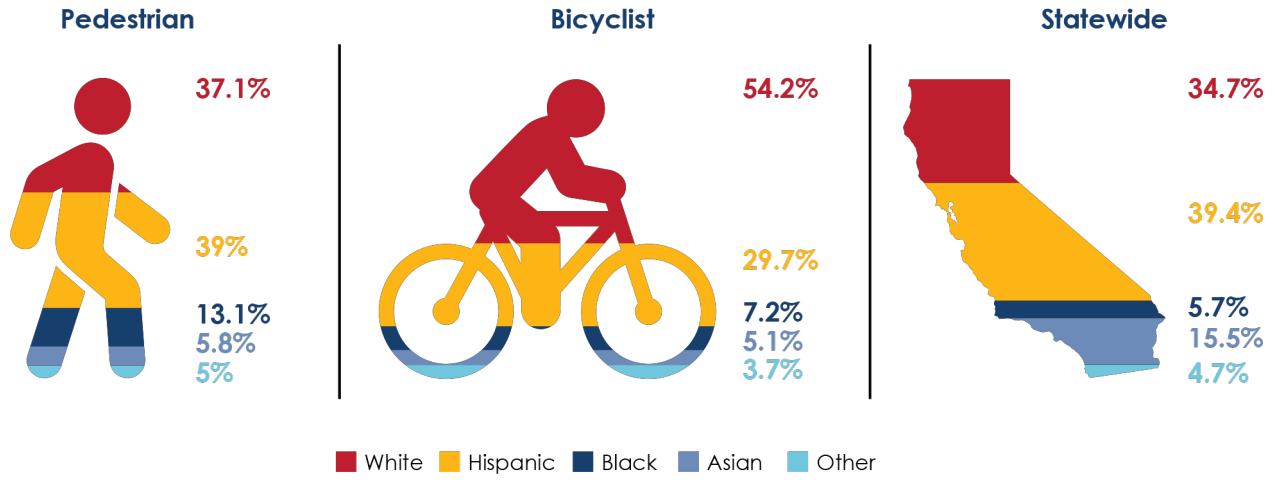
3.3.1. Race and Ethnicity

There are notable differences between California's statewide race demographics and the race of VRU crash victims from 2011 to 2020, indicating that some races are more likely to be involved in crashes than others. This information is shown in the **Figure 16** on the following page:

- Asian residents are less likely to be involved in a crash relative to their share of population size in both VRU crashes. Whereas Asian residents make up 15.5% of the state's population,5.8% of pedestrian crashes, and 5.1% of bicycle crashes, which is less than a third of the group's share of the population
- Black residents are more likely to be involved in a crash relative to their share of the population in both VRU crashes. Whereas Black residents make up 5.7% of the state's population, 7.2% of bicycle crashes, and 13.1% of pedestrian crashes, the latter of which is more than double the group's share of the state's population
- Hispanic residents are roughly as likely to be involved in pedestrian crashes relative to their share of the state's population, but less likely to be involved in bicycle crashes. Whereas Hispanic residents make up 39.4% of the state's population, 39.0% of pedestrian crashes, and 29.7% of bicycle crashes.
- White residents are slightly more likely to be involved in pedestrian crashes relative to their share of the state's population, and more likely to be involved in bicycle crashes. Whereas White residents make up 34.7% of the state's population, 37.1% of pedestrian crashes, and 54.2% of bicycle crashes, the latter of which is about a third higher than the group's share of the state's population.
- Native Americans, Alaska Natives, Pacific Islanders make up 4.7% of the state's population, 5% of pedestrian crashes, and 3.7% of bicycle crashes.

Efforts to reduce vulnerable road user crashes should consider these racial disparities. Equitable solutions should identify locations where prioritized improvements should be implemented to benefit disproportionately impacted groups.

Figure 16: Race of Crash Victims vs. State of California Race Demographics (Source: SWITRS 2011-2020)



3.3.2. Fatal and Serious Injury Crashes by Demographics

Across age groups of victims in VRU crashes, two peaks exist, one in 20–24-year-olds and the other in 50–54-year-olds. However, those 50-54 are most likely to be involved in a bicycle crash, while 20–24-year-olds are most likely to be involved in a pedestrian crash. Compared to the population breakdown of California, these peaks were more pronounced than 20-24- and 50–54-year-olds share of the population. **Figures 17, 18, and 19** provide these findings in detail.

Figure 17: Number of Pedestrian Fatal and Serious Injury Victims by Age (Source: SWITRS 2011-2020)

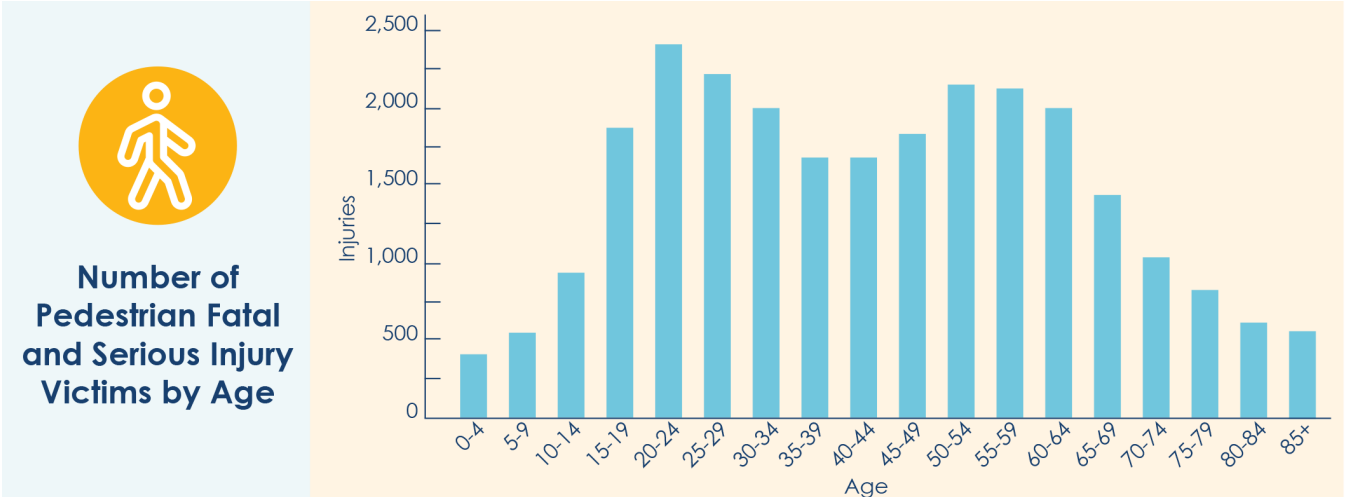


Figure 18: Number of Bicycle Fatal and Serious Injury Victims by Age (Source: SWITRS 2011-2020)

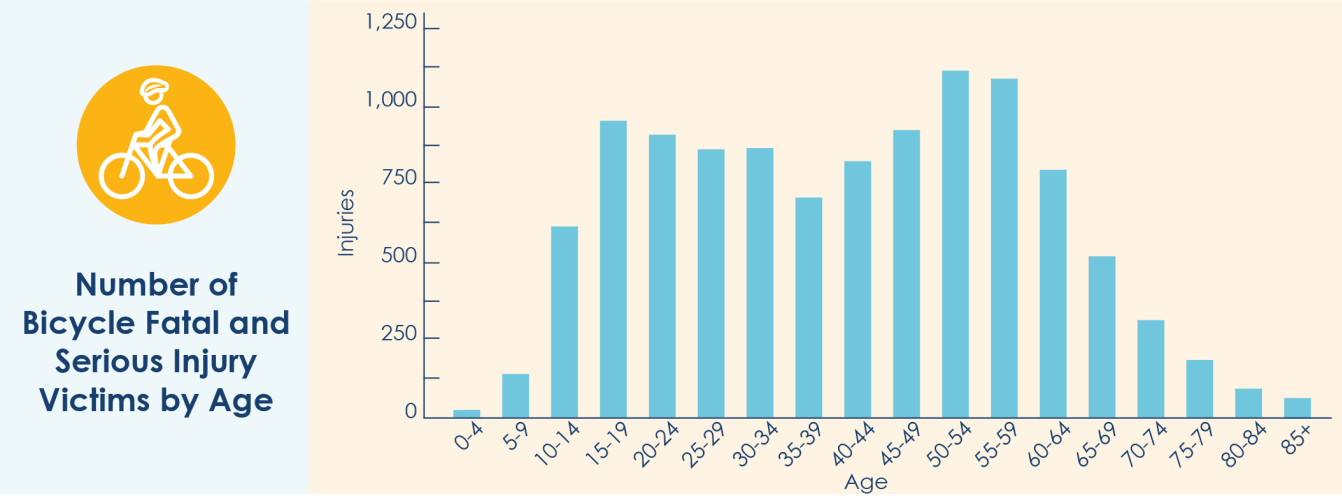
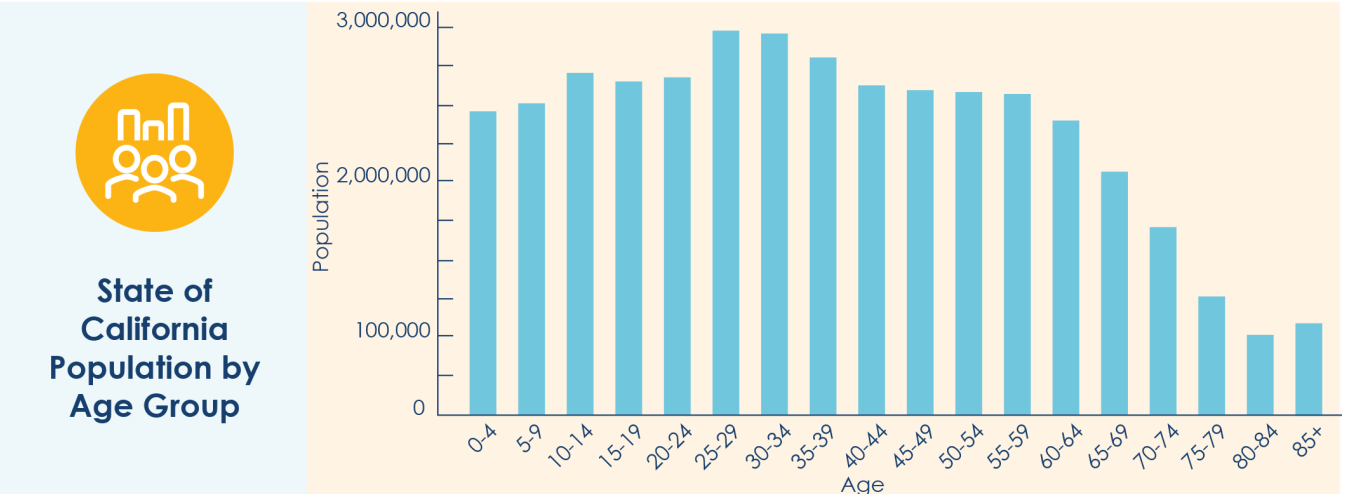


Figure 19: State of California Population by Age Group (Source: US Census Bureau)



Stratifying fatal and serious injury crashes by sex, it was found that most of the crash victims were men. This is shown in **Figure 20**. Of seriously injured or killed pedestrians, 63% were males and 82.5% of seriously injured or killed bicyclists were male. This indicates that men are more likely to be victims of fatal and serious injury crashes and that educational outreach is needed. This could indicate the need for systemic improvements both to reduce the number of fatalities and serious injuries, but also to make the roadway system more accessible and comfortable for all users regardless of sex and age. **Figure 21** identifies the number of VRU fatal and serious injury crashes per 100,000 people, with the northern half of the state showing more counties with higher numbers of these crash rates.

Figure 20: VRU Fatal and Serious Injury Crashes Victims by Sex (Source: SWITRS 2011-2020)

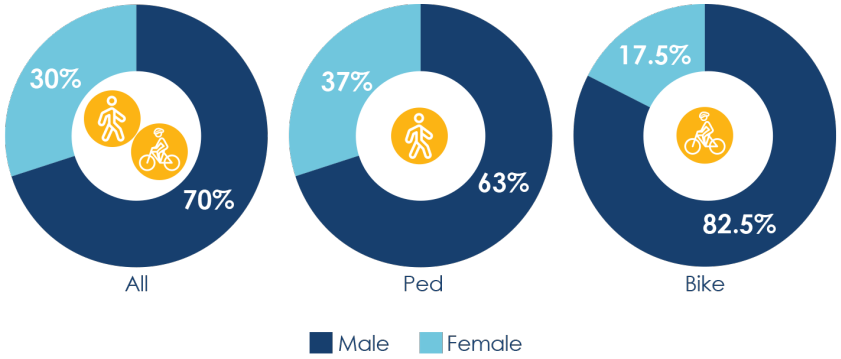
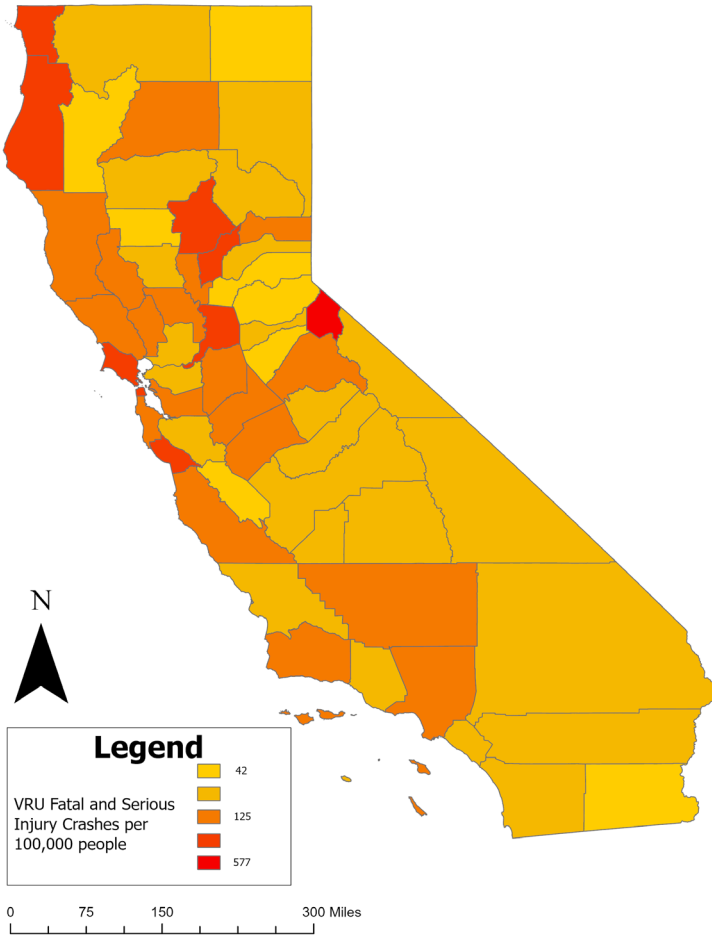


Figure 21: VRU Fatal and Serious Injury Crashes per 100,000 People by County (Source: SWITRS 2011-2020, US Census Bureau)



3.3.3. Fatal and Serious Injury Crashes and the Social Vulnerability Index

The SVI is based on the CDC and Prevention and Agency for Toxic Substances and Disease Registry that determines social vulnerability of every census tract. The SVI is used to help facilitate health officials and emergency response planners identify and locate communities that will need support before, during, and after a hazardous event.

The CDC provides a vulnerability score for each of the four categories of each census tract. Socioeconomic status, household characteristics, racial and ethnic minority status, housing type, and transportation are summarized and weighted to give each census tract a rank score. **Table 4** shows the percentage of crashes within high vulnerability tracts and low vulnerability tracts. High and low vulnerability tracts were determined by an overall score measured on a scale from zero to one, with zero representing areas with the lowest levels of vulnerability and one indicating the highest level of vulnerability. The following score is divided into four quartiles:

- 0 to .25 – low level of vulnerability
- 0.25 to 0.50 – low to medium level of vulnerability
- 0.50 to 0.75 – medium to high level of vulnerability
- 0.75 to 1.00 – high level of vulnerability

For the purpose of VRU safety assessment, census tracts falling within the fourth quartile were considered high vulnerable tracts, and the first quartile were considered low vulnerable tracts as the focus of the analysis. Out of 9,044 census tracts in California, 2,261 were identified as highly vulnerable tracts (0.75 to 1.00) and 2,262 were identified as low vulnerable tracts (0 to .25).

Table 4: Number of Crashes by Social Vulnerability Index Score (Source: CDC/ASTDR SVI 2020)

Social Vulnerability Index	Pedestrian	Bicycle	Population
Highly Vulnerable Tracts	39%	27%	26%
Low Vulnerable Tracts	14%	25%	24%

Crashes were overlaid with both high and low vulnerability tracts. A breakdown of pedestrian and bicycle crashes were conducted for tracts categorized as high and low vulnerability tracts. The score provides a relative measure of vulnerability, allowing for comparisons between communities. In both the high and low vulnerability tracts, the highest percentage of crashes were bicycle crashes. Out of the total population, 26% of the population live in high vulnerability tracts and 24% of the population live in low vulnerability tracts.

3.3.4. Fatal and Serious Injury Crashes in SB 535 Communities

SB 535 establishes initial requirements for minimum funding levels to disadvantaged communities. SB 535 requires that at least 25% of California Climate Investment (CCI) funds received in these communities go to projects that benefit disadvantaged communities, with at least 10% going to projects located within these communities. The legislation is based on geographic, socioeconomic, public health, and environmental hazard criteria designation. The analysis process is based on crashes overlaid with SB 535 disadvantaged community tracts. In disadvantaged community tracts, there is a higher percentage of pedestrian crashes than bicycle crashes, as shown in **Table 5**.

Table 5: Percentage of Crashes in SB 535 Disadvantaged Communities (Source: CalEnviroScreen 2022)

	Pedestrian	Bicycle	Population
SB 535 Disadvantaged Communities	43%	30%	28%

3.3.5. Fatal and Serious Injury Crashes in Justice 40 Communities

The U.S. Department of Energy (USDOE) has emphasized a goal that 40% of the overall benefits of federal investments which can include climate change, clean energy, and energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, remediation and reduction of legacy pollution, and the development of critical clean water and wastewater infrastructure must be towards disadvantaged communities that are marginalized, underserved, and overburdened by pollution. Justice 40 identifies disadvantaged communities based on five areas:

- Climate and Disaster Risk Burden
- Environmental Burden
- Health Vulnerability
- Social Vulnerability
- Transportation Insecurity

Tracts that ranked high in these areas were considered disadvantaged communities.

Table 6: Number of Crashes in Justice 40 Disadvantaged Communities (Source: US Department of Transportation 2020)

	Pedestrian	Bicycle	Population
Justice 40 Disadvantaged Communities	68%	55%	35%

3.3.6. Fatal and Serious Injury Crashes in Tribal Communities

The California SHSP Crash Data Dashboard provides users with the ability to filter crash data to tribal land. The tribal filter identifies crashes that are within five miles of the tribal boundary. This data is made available in collaboration with the Native American Advisory Committee (NAAC) and through geocoding efforts from Safe Transportation Research and Education Center (SafeTREC) at the University of California, Berkeley.

According to the California SHSP Crash Data Dashboard, the percentage of pedestrian fatal and serious injury crashes has increased overall since 2011 for tribal communities. The percentage of bicycle fatal and serious injury crashes has increased relatively during the same time period. Details of this data can be seen in **Figures 22-25**.

Figure 22: State of California Tribal Pedestrian Fatal Crashes (Source: SWITRS 2011 – 2020)

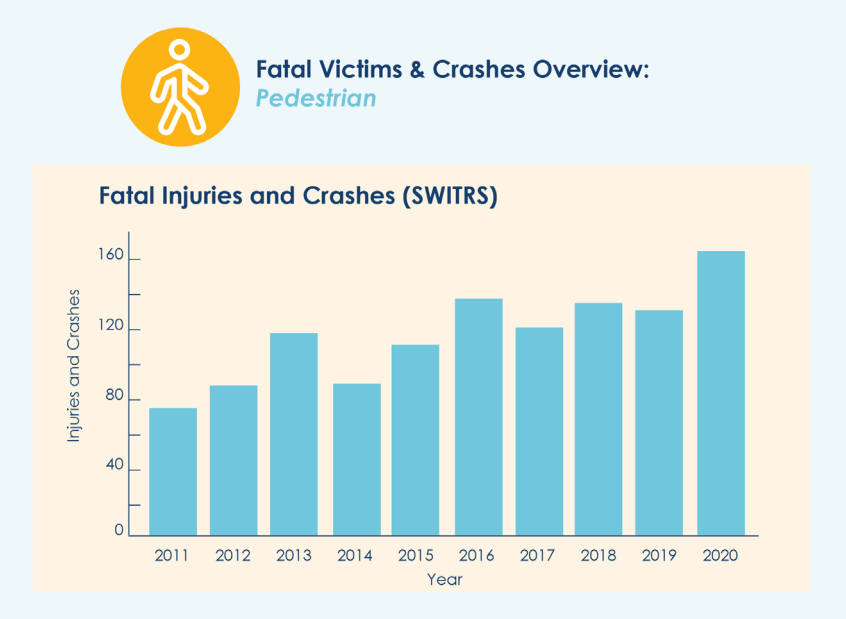


Figure 23: State of California Tribal Pedestrian Serious Injury Crashes (Source: SWITRS 2011 -2020)

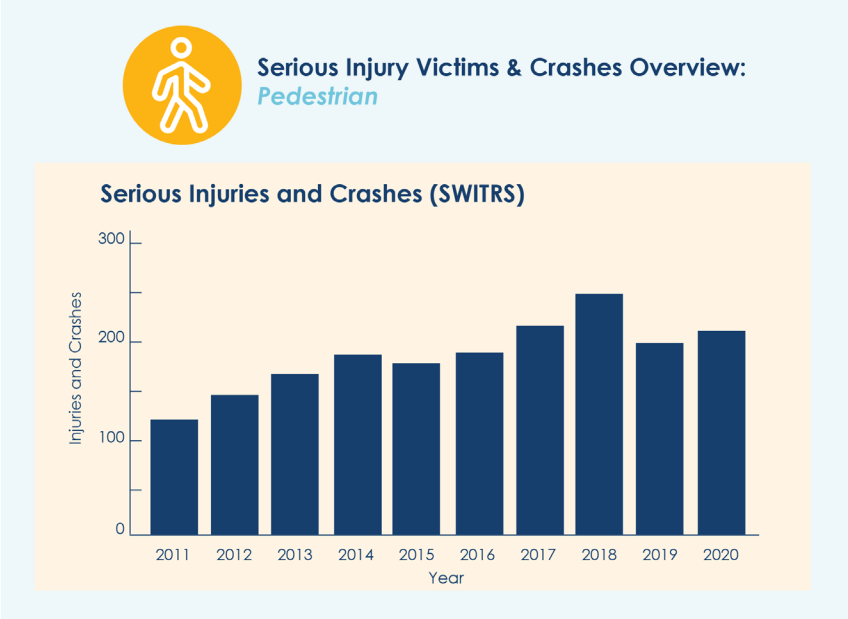


Figure 24: State of California Tribal Bicycle Fatal Crashes (Source: SWITRS 2011 -2020)

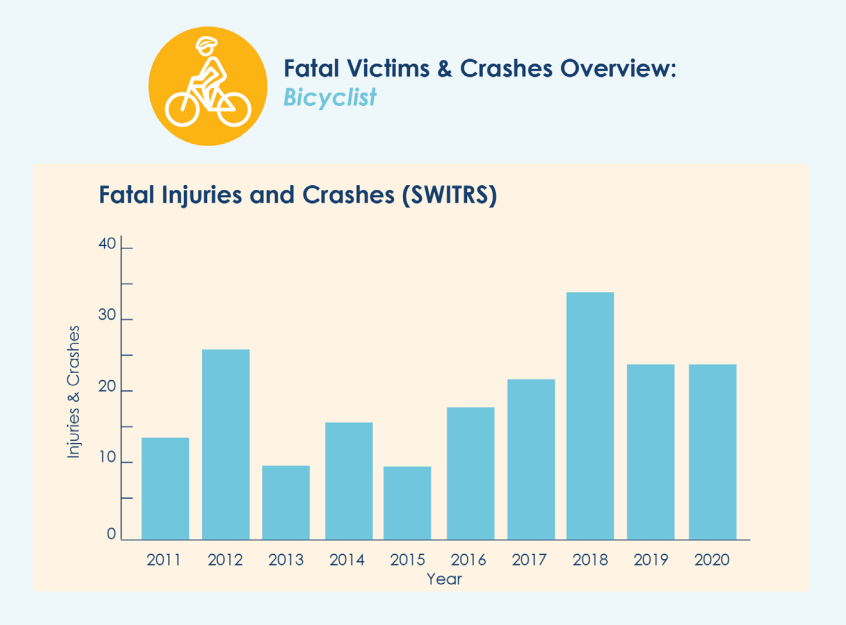
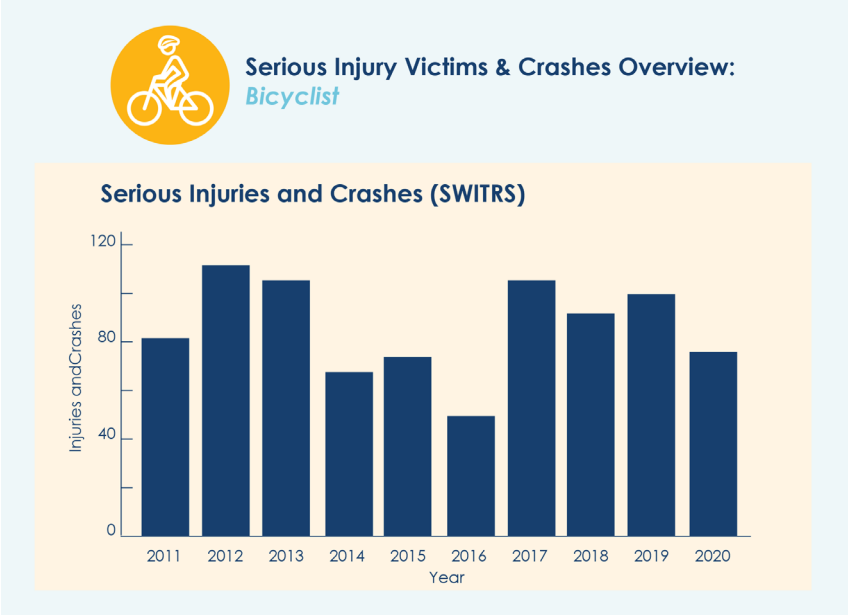
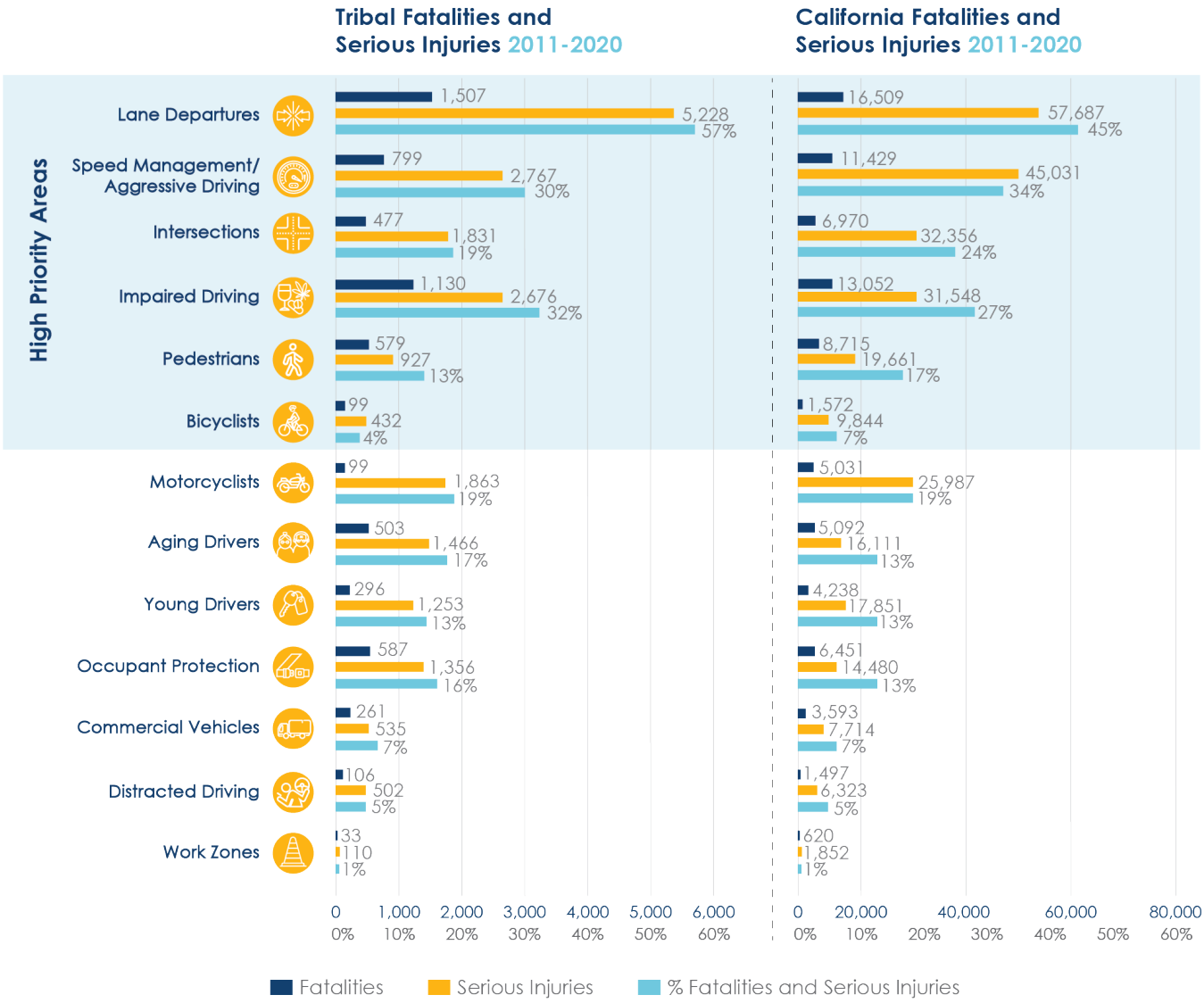


Figure 25: State of California Tribal Bicycle Serious Injury Crashes (Source: SWITRS 2011 -2020)



Comparing tribal areas to California as a whole, pedestrian and bicycling are among the top five challenge areas. Challenge areas represent the greatest opportunities to reduce fatalities or serious injuries. The pedestrian challenge area and bicycle challenge area includes crashes where at least one fatal or serious injury victim is a pedestrian or bicyclist. Of crashes in tribal areas, 17% involve a vulnerable road user, compared to California where the rate is 24%. Further details of these challenge areas are listed in **Figure 26**.

Figure 26: State of California Tribal Fatal Crashes (Source: SWITRS 2011-2020)



3.4. Pedestrian/Bicycle Safety Improvement Areas and Analysis

The pedestrian/bicycle safety improvement areas were based on a selection criterion that considered:

- Density of fatal and serious injury crashes involving VRUs
- Presence of SB 535 or Justice 40 communities
- Statewide representation
- Community size and character

Below is a list of the identified safety improvement areas.

VRU Safety Improvement Areas

Northern California

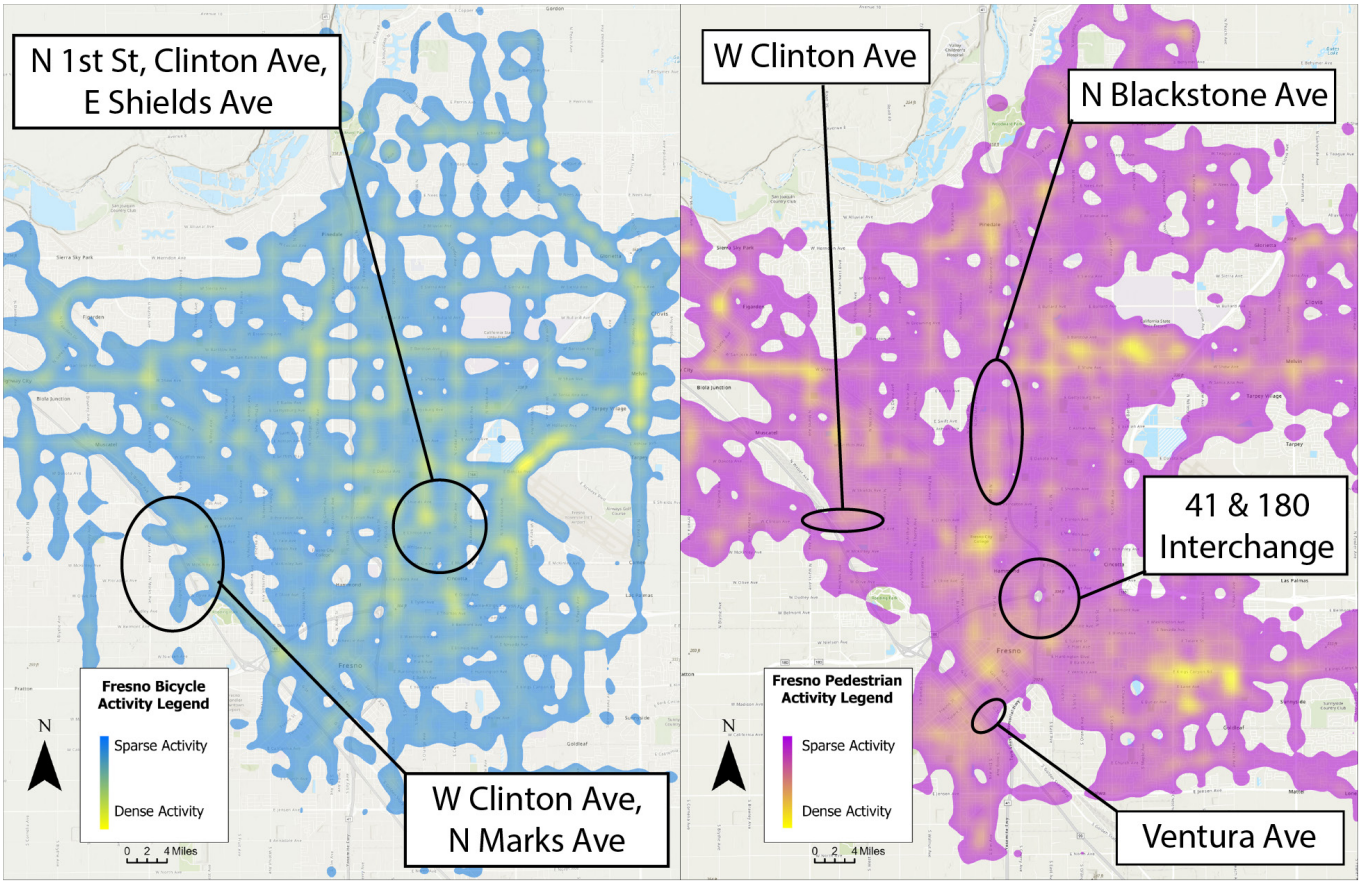
- Fresno
- Sacramento County
- Stockton
- Visalia
- Watsonville
- Yuba City

Southern California

- Bakersfield
- Compton
- Los Angeles
- Riverside
- San Bernardino
- South Gate
- Victorville

Figure 27 shows the pedestrian and bicycle heat activity maps that were shared with the pedestrian and bicycle safety improvement areas. These maps include circled "hot spots" where high frequencies of crashes occurred in comparison to the activity. More information on these heat maps for all of the safety improvement areas can be found in **Appendix A**.

Figure 27: Fresno VRU Activity Heat Maps



4. SUMMARY OF CONSULTATION

4.1. Process

The stakeholder engagement built off of the work conducted during the last update to the SHSP, allowing SHSP stakeholders to remain involved and provide more direct input on VRU safety. The stakeholder engagement process for the VRU Safety Assessment involved partners representing local and regional government agencies, advocacy groups, and nonprofit organizations in California. Caltrans and the project team initiated the coordination process by sending informative emails to stakeholder contacts, providing an overview of the VRU Safety Assessment, and emphasizing the collaborative approach to seek their feedback. Statewide stakeholder groups contacted included, but were not limited to, the SHSP Pedestrian Challenge Area team, the SHSP Bicycle Challenge Area team, the California Walk and Bike Technical Advisory Committee, the ATP Technical Advisory Committee, and the HSIP Program Implementation Plan Metropolitan Planning Organization (MPO) outreach group. The full list of the consultation meeting stakeholder organization attendees is located in **Appendix B**.

Caltrans and the project team organized two open house webinars to further facilitate understanding and provide an opportunity to engage with the statewide group of stakeholders. These webinars served as platforms to present comprehensive information about the VRU Safety Assessment, including the project timeline, analysis methodology, and VRU crash trends.

The objective was to inform the statewide group of stakeholders with a solid understanding of the assessment methodology and analysis before proceeding to more focused meetings with stakeholders in the VRU Safety Improvement Areas.

Following the open house stakeholder webinars, Caltrans and the project team held two additional meetings with communities representing VRU Safety Improvement Areas. These focused webinars allowed the Caltrans project team to delve deeper into specific community needs for VRU safety improvements and to gather feedback on proposed strategies. VRU Safety Improvement Area representatives provided feedback on how the VRU Safety Assessment could support their efforts to reduce fatalities and serious injuries of VRUs, the utilization of safety funding, potential community implementation strategies for VRU safety, ongoing VRU-related crash mitigation measures within the communities, observed challenges, and suggestions for enhancing the assessment process.

The subsections below detail the summaries of both consultation meetings and bicycle/pedestrian safety improvement area meetings, as well as the outcomes and feedback received from participants who attended these webinar sessions.

4.2. Summary of Outcomes

4.2.1. Consultation Meeting #1

The first consultation meeting for the VRU Safety Assessment took place on June 13, 2023. 71 people attended the webinar that consisted of members of public agencies, nonprofits, advocacy organizations, and community-based organizations (CBOs) from across California. The webinar detailed the entirety of the VRU Safety Assessment and its purpose and efforts, summarized the quantitative data uncovered thus far in the process, and provided a schedule for next steps.

A total of 39 questions were asked both verbally and written via Microsoft Teams chat. The responses from the group focused on suggestions around safety countermeasures, reducing speeds on local roads, and interest in adding to the analysis. The main message from this meeting was that participants wanted the inclusion of more data and analysis points in the assessment in future iterations of the assessment. These are listed below:

- Comparing crash rates on "slow speed street networks" to other roadways
- Data collection from hospitals regarding fatal and serious injury crashes
- Street and road designs for reducing speeds

In addition to data, public engagement and outreach efforts were also addressed by attendees in the meeting. Attendees recommended more targeted outreach to CBOs, stakeholders, the disability community, and regional transportation planning agencies (RTPA) across the State.

4.2.2. Consultation Meeting #2

The second consultation meeting for the VRU Safety Assessment took place on July 14, 2023. 18 people attended the webinar which also consisted of members of public agencies, nonprofits, and CBOs from across California. The response from this group of attendees was similar to the first consultation meeting, with questions and comments based around data collection and safety countermeasure suggestions. The main message received in this meeting was the request for improved pedestrian and bike infrastructure. At the end of the presentation, a Microsoft Teams poll of three questions was given to garner feedback from the attendees regarding safety concerns, countermeasures, and the SSA. Questions asked in the poll included:

- **What are the biggest safety concerns on local roads?**
  - » Responses included high speeds, right turns on red, drivers failing to yield or stop, larger vehicles, distracted drivers, not enough separation between cars, and vulnerable road users
- **Are there any countermeasures you have seen that were effective in reducing fatal and serious VRU crashes?**
  - » Responses included separating cars from bicyclists and pedestrians, crosswalk visibility enhancements, leading pedestrian intervals, dedicated bike signals, roundabouts, road diets, and treatments to reduce speed
- **Funding aside, if you were to apply the SSA framework to your streets for VRU crashes, what would you do differently from what you have done in the past?**
  - » Responses included more involvement with local public health, elected official buy-in, focus on reducing vehicle speeds in all circumstances rather than managing for level of service, implement more complete streets components, create connected networks for vulnerable road users, ensure roadside hazards protect pedestrians and bicyclists, increase citizen participation, more multidisciplinary stakeholder engagement, and investment in sidewalks and dedicated bike lanes

4.2.3. VRU Safety Improvement Area Consultations

The pedestrian and bicycle safety improvement area consultations consisted of two separate webinars. The first webinar took place on July 24, 2023, while the second was on August 7, 2023.

The first Safety Improvement Areas Consultation had 27 attendees, representing identified Safety Improvement Areas from across California. The Safety Improvement Areas Consultation included attendees from Fresno, Stockton, Bakersfield, Los Angeles, Sacramento, Visalia, Watsonville, Compton, Riverside, and South Gate. This meeting consisted of a presentation as well as two breakout groups, one for the Northern California region and one for the Southern California region.

The second Safety Improvement Areas Consultation had 17 attendees, representing identified Safety Improvement Areas from across California. The Safety Improvement Areas Consultation included attendees from Fresno, Stockton, Bakersfield, Los Angeles, Sacramento, Visalia, Watsonville, Compton, Riverside, and South Gate. This meeting consisted of a presentation as well as interactive polling questions and a discussion throughout.

The main takeaways are listed below from the participants feedback received during this meeting. The feedback is split into Northern California and Southern California for the improvement area geographical identification:

Northern California Groups

- Infrastructure and funding are the biggest challenges
- Rural communities need to be prioritized, and cannot be overlooked
- Separated bikeways are one of the most preferred countermeasures to improve safety

Southern California Groups

- Funding and right-of-way challenges are the biggest hurdles, especially in residential neighborhoods
- Technical support and grant opportunities are needed to provide funding to local agencies to implement VRU safety countermeasures
- Community engagement and education is important and should be implemented frequently
- Infrastructure upgrades, such as buffered bike lanes, should be implemented on higher bicycle and vehicular volume, higher speed areas
- Widening sidewalks as a preferred safety countermeasure
- Monitor projects and maintain up-to-date studies to keep safety measures and improvements current

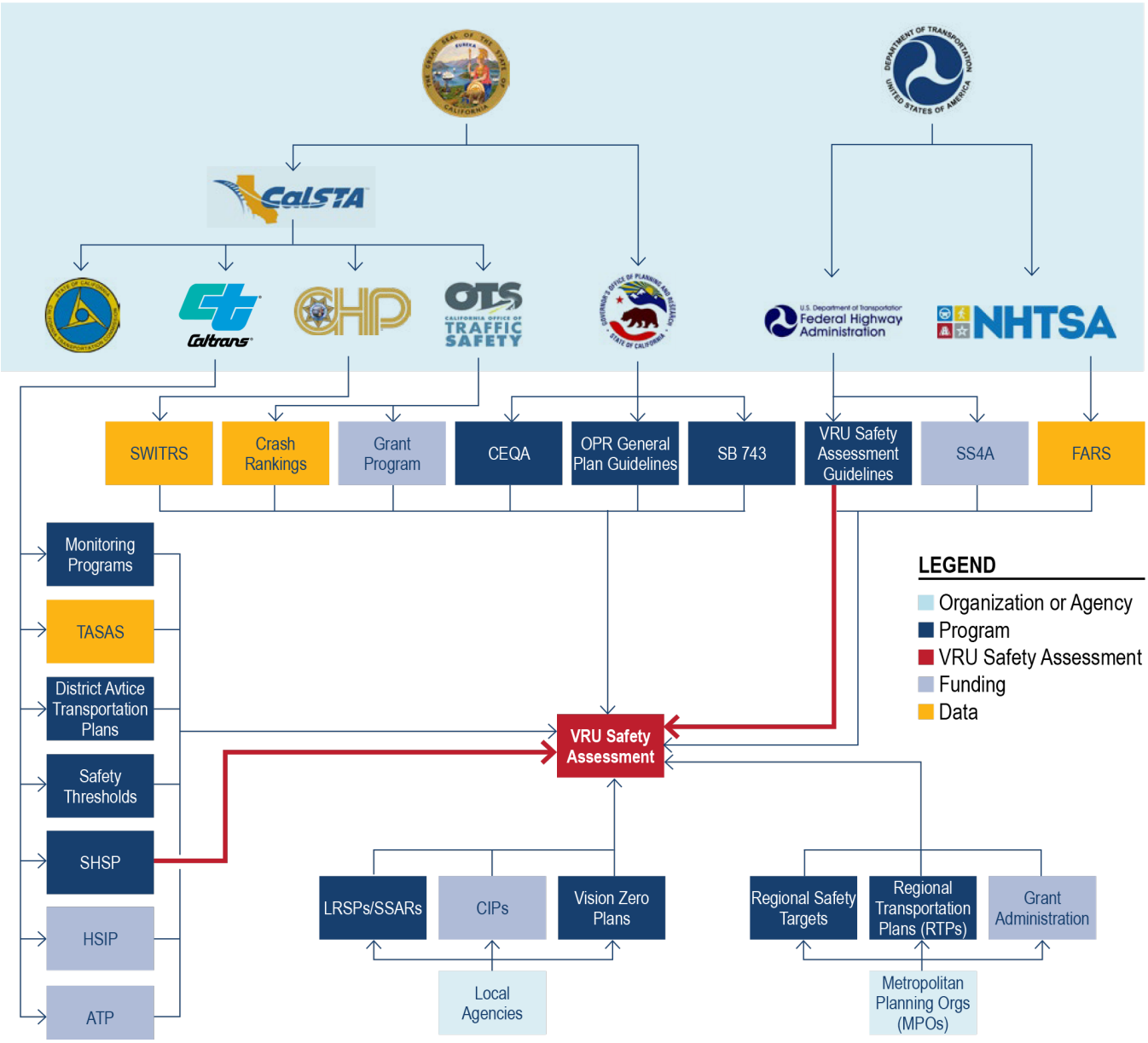
5. PROGRAM OF STRATEGIES

While the data driven analysis and trends are crucial to this assessment, strategies for safety improvement for VRUs are equally crucial for successful implementation. In alignment with FHWA guidance, the VRU Safety Assessment is intended to be a planning level document. Additional effort will be necessary to further develop the locations into context-sensitive projects and strategies as part of the transportation planning process. The specific safety improvement locations identified in this document build upon existing state and local efforts. The Caltrans Pedestrian and Bicyclist Safety Improvement Monitoring Programs and LRSPs developed in safety improvement areas are compiled as part of the program of locations and strategies to improve VRU safety. This section details the VRU safety improvement strategies in the form of a Safety Countermeasure Selection Matrix table. This Selection Matrix lists context-sensitive strategies for improving safety such as infrastructure upgrades and educational outreach. Strategies are categorized by their potential effectiveness and impact to improve safety. In addition to the Selection Matrix, an interactive StoryMap is available to provide an overall summary of the assessment. The interactive StoryMap also includes an explore feature which allows users to zoom in on specific areas to view VRU safety data at a more granular level.

5.1. California VRU Program Inventory

The following figure shows the various agencies, plans, programs, funding sources, and databases related to VRUs in the State of California. The graphic below is intended to provide information on the overall scope of the vulnerable road user safety efforts in California and help stakeholders make connections between different programs.

Figure 28: VRU Safety Assessment Flow Chart



5.2. VRU Safety Improvement Strategies

Initiatives

California's HSIP teams prioritize highway safety strategies that will result in the greatest reduction of fatalities and serious injuries on the State's public roadways. As part of its HSIP Implementation, Caltrans (Department) has several ongoing initiatives and identified opportunities specifically related to improving VRU safety. A short description of some of those initiatives is presented below:

1. The Department has established and completed the two-year Highway Maintenance (HM) 4 safety pilot program to deliver pedestrian related safety enhancements across the state.

2. Local HSIP funding increased the crosswalk enhancements set-aside and added rectangular rapid flashing beacons as an eligible safety countermeasure. Local HSIP also rolls over left over monies from other set-asides to further augment the crosswalk enhancements set-aside.

3. The Department is in the process of developing countermeasures guidance for use by both state and local agencies. This guidance will include pedestrian and bicyclist safety Proven Safety Countermeasures (PSCs).

4. In addition to enhancing VRU safety under the HSIP, the Department invests in Americans with Disabilities Act (ADA) Pedestrian Infrastructure and Complete Streets projects on the state highway system that provide safety benefits to VRUs in addition to meeting their mobility needs. These dedicated efforts demonstrate the state's focus on VRU safety and mode share.

5. To accelerate the progress towards our safety goal, Caltrans is committing to exceed the IIJA VRU Special Rule obligation requirement by 2025 by increasing IIJA HSIP funds towards VRU safety. Some of the recently implemented and initiated efforts are expected to support this commitment. For example, the recently rolled out pedestrian and bicyclist network screening programs will enable Caltrans to identify additional spot locations for VRU safety improvements. At a broader regional level, the recently initiated Road Safety Infrastructure Plan effort will enable Caltrans to engage local partners and help develop a longer-term and shared vision for comprehensively addressing VRU safety needs on the state highway system.

VRU Safety Countermeasures Selection Matrix

The VRU Safety Countermeasures Selection Matrix is a table that outlines FHWA Proven Safety Countermeasures, countermeasures from the Crash Modification Factors (CMF) Clearinghouse, and the California Local Roadway Safety Manual (LRSM). The Selection Matrix was developed by reviewing existing LRSPs, and Safe Streets for All (SS4A) guidance. The Selection Matrix also incorporates countermeasures recommended in Vision Zero plans developed in these VRU Safety Improvement Areas.

As of August 2023, eight of the 13 Vision Zero plans for the VRU Safety Improvement Areas were available to include in this assessment. These plans included the following jurisdictions:

- City of Bakersfield
- City of Compton
- City of Fresno
- County of Los Angeles
- County of Sacramento
- County of San Bernardino
- City of Watsonville
- City of Yuba City

The VRU Countermeasures Selection Matrix is meant to be used to plan and select the preferred safety countermeasure based on the context of the facility on which it is being implemented. It is not intended to replace engineering judgement or design standards. Additional safety countermeasures may be considered. Early identification of suitable VRU safety countermeasures will assist decision makers in making a more informed choice.

The following figures provide a summary of context-sensitive selection criteria for each countermeasure based on location, roadway functional class, speed limit, volume, and impact. **Figure 29** describes preferred application for countermeasures based on specific roadway functional class and location. **Figure 29** also describes how each countermeasure enhances VRU safety, and their ancillary impacts.

Figure 29: VRU Countermeasures Selection Score Cards

✓ Applicable ~ Somewhat Applicable ✗ Not Applicable N No Impacts Y Impacts $ Cost

Add or Enhance Lighting

Roadway Functional Class:
- ✓ Arterial
- ✓ Collector
- ✓ Local

Location:
- ✓ Segment
- ✓ Intersection

Additional Criteria:
✓ ✓ ✓ ✓ ✓ Any Slope

Speed Limit: Any

Volume: Any

Effectiveness:
- Separated Space: ✗
- Separated Time: ✗
- Attentiveness/Awareness: ✓
- Reduce Speeds: ✗
- Reduce Impact Forces: ✗

Impact:
- Emergency Vehicles: N
- Cost: $$

Bike Boxes

Roadway Functional Class:
- ✓ Arterial
- ✓ Collector
- ✗ Local

Location:
- ✗ Segment
- ✓ Intersection

Additional Criteria:
✓ ✓ ✓ ✓ <5%

Speed Limit: <=45 mph

Volume: Any

Effectiveness:
- Separated Space: ✓
- Separated Time: ~
- Attentiveness/Awareness: ✓
- Reduce Speeds: ~
- Reduce Impact Forces: ✗

Impact:
- Emergency Vehicles: Y
- Cost: $

Convert to Mini Roundabout

Roadway Functional Class:
- ✗ Arterial
- ✓ Collector
- ✓ Local

Location:
- ✗ Segment
- ✓ Intersection

Additional Criteria:
✓ w/conditions ✗ ✗ ✓ w/conditions <0%

Speed Limit: <=35

Volume: Any

Effectiveness:
- Separated Space: ~
- Separated Time: ✗
- Attentiveness/Awareness: ~
- Reduce Speeds: ✗
- Reduce Impact Forces: ✗

Impact:
- Emergency Vehicles: Y
- Cost: $$$

Curb Extensions

Roadway Functional Class:
- ✓ Arterial
- ✓ Collector
- ✓ Local

Location:
- ✓ Segment
- ✓ Intersection

Additional Criteria:
✓ ✓ ✓ ✓ ✓ with conditions with conditions with conditions <5%

Speed Limit: Any

Volume: Any

Effectiveness:
- Separated Space: ✗
- Separated Time: ✗
- Attentiveness/Awareness: ✓
- Reduce Speeds: ✓
- Reduce Impact Forces: ~

Impact:
- Emergency Vehicles: Y
- Cost: $$$

Figure 29: VRU Countermeasures Selection Score Cards (continued)

Figure 29: VRU Countermeasures Selection Score Cards (continued)

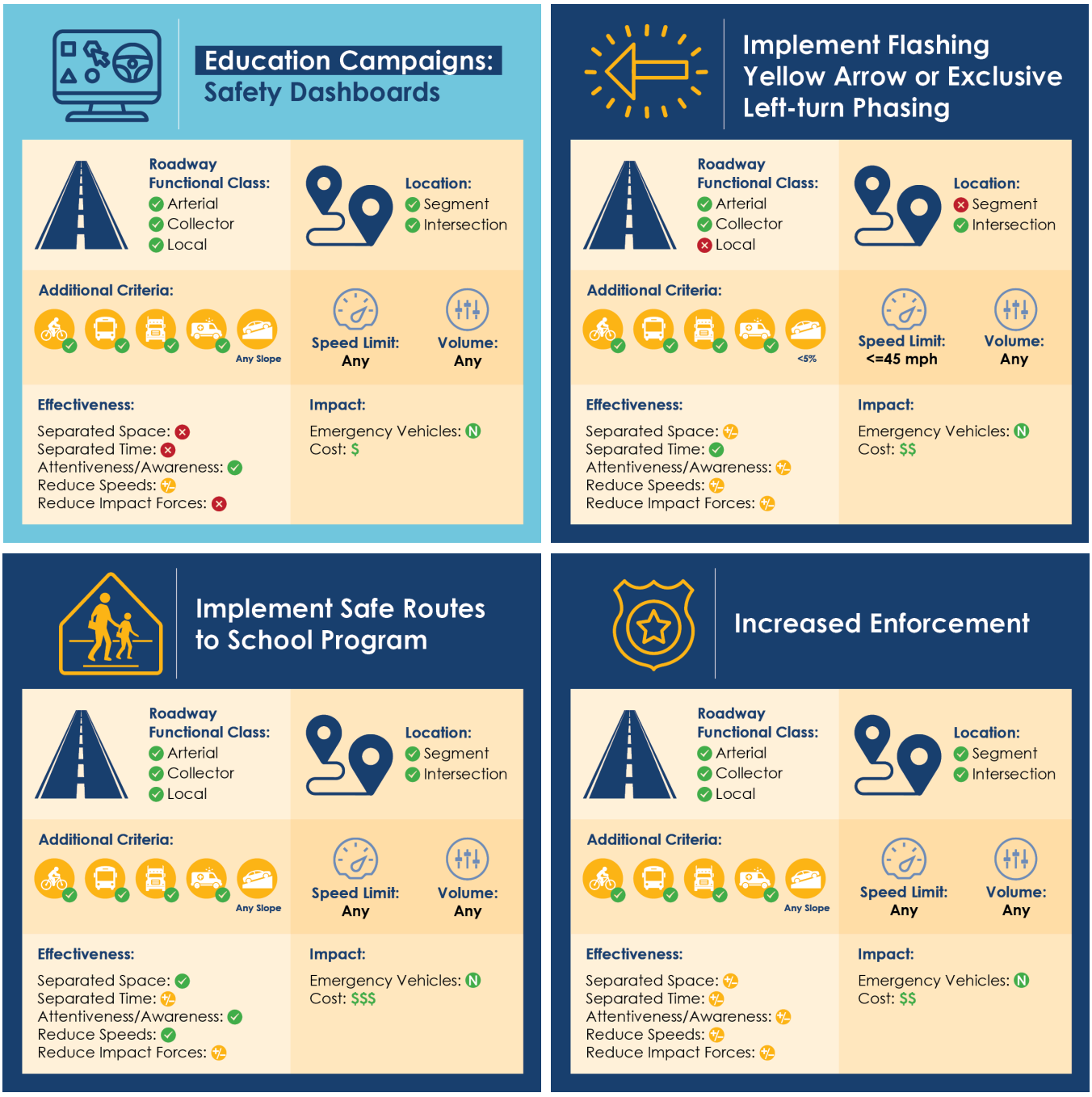


Figure 29: VRU Countermeasures Selection Score Cards (continued)

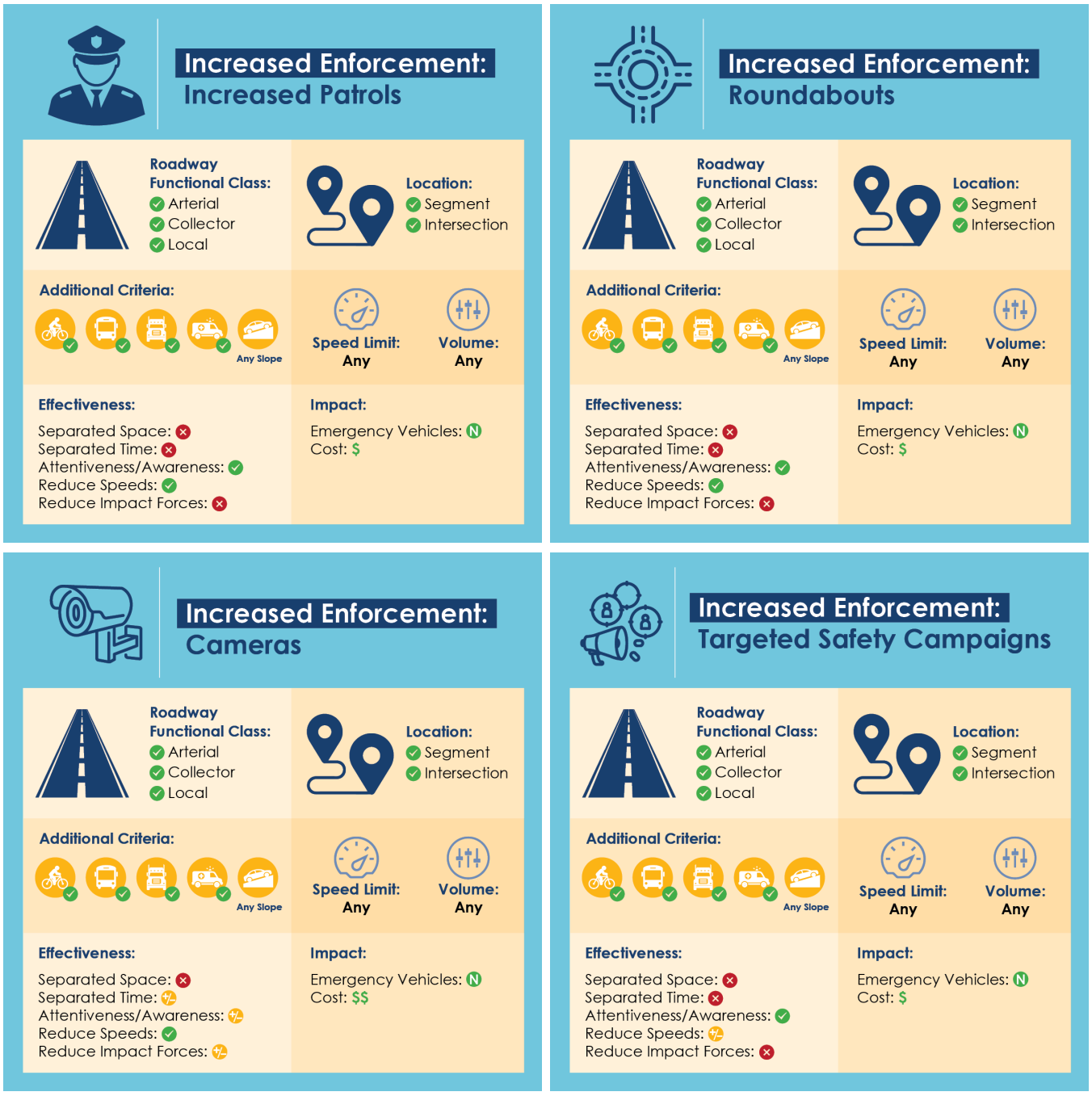


Figure 29: VRU Countermeasures Selection Score Cards (continued)

Figure 29: VRU Countermeasures Selection Score Cards (continued)

Figure 29: VRU Countermeasures Selection Score Cards (continued)

Install Rectangular Rapid Flashing Beacon

Roadway Functional Class:
- Arterial
- Collector
- Local

Location:
- Segment
- Intersection

Additional Criteria:
Any Slope

Speed Limit: Any

Volume: Any

Effectiveness:
Separated Space:
Separated Time:
Attentiveness/Awareness:
Reduce Speeds:
Reduce Impact Forces:

Impact:
Emergency Vehicles: N
Cost: $$

Install Separated Bike Lanes

Roadway Functional Class:
- Arterial
- Collector
- Local

Location:
- Segment
- Intersection

Additional Criteria:
Any Slope

Speed Limit: Any

Volume: Any

Effectiveness:
Separated Space:
Separated Time:
Attentiveness/Awareness:
Reduce Speeds:
Reduce Impact Forces:

Impact:
Emergency Vehicles: N
Cost: $$

Install Sidewalk (to Avoid Walking Along Roadway)

Roadway Functional Class:
- Arterial
- Collector
- Local

Location:
- Segment
- Intersection

Additional Criteria:
Any Slope

Speed Limit: Any

Volume: Any

Effectiveness:
Separated Space:
Separated Time:
Attentiveness/Awareness:
Reduce Speeds:
Reduce Impact Forces:

Impact:
Emergency Vehicles: Y
Cost: $$

Install/Upgrade Pedestrian Crossing

Roadway Functional Class:
- Arterial
- Collector
- Local

Location:
- Segment
- Intersection

Additional Criteria:
<8%

Speed Limit: Any

Volume: Any

Effectiveness:
Separated Space:
Separated Time:
Attentiveness/Awareness:
Reduce Speeds:
Reduce Impact Forces:

Impact:
Emergency Vehicles: N
Cost: $$

Figure 29: VRU Countermeasures Selection Score Cards (continued)

5.3. Interactive StoryMap

The StoryMap provides an interactive way to view highlights from the first California Vulnerable Roads Users (VRU) Safety Assessment Report. The VRU Safety Assessment is intended to guide pedestrian and bicycle safety improvements on all roads across California. The StoryMap combines the components of the assessment and quickly summarizes all stages of the analysis, making for streamlined consumption of the data interactively. The Explore Map allows the user to apply the safety assessment in more local areas to better understand the impacts of the assessment. The VRU Safety Assessment StoryMap can be found at https://dot.ca.gov/programs/safety-programs/shsp.

5.4. Funding Programs and Project Implementation

This section identifies funding programs available for agencies in California from Federal, State, and regional sources and how they can be implemented to reduce fatal and serious injury VRU crashes. The selected funding programs are listed below. Refer to **Appendix C** for more detailed information on each funding resource.

Federal

- Highway Safety Improvement Program (HSIP)
- Safe Streets and Roads for All (SS4A) Grant Program
- Surface Transportation Block Grant (STBG) Program
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE)

Grant Program

- Reconnecting Communities and Neighborhoods (RCN) Program
- Capital Investment Grants Program Transit Oriented Development (TOD) Pilot Program
- Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program

State

- Active Transportation Program (ATP)
- Local Partnership Program (LPP)
- Solutions for Congested Corridors Program (SCCP)
- Local Roadway Safety Plan (LRSP) and Systemic Safety Analysis Report
- Program (SSARP)
- Sustainable Transportation Planning (STP) Grants
- Office of Traffic Safety (OTS) Grants

Additional funding resources are available from regional agencies such as RTPAs and MPOs.

For some of these programs, the primary focus is safety, or safety improvements are inherently baked into awarded projects, whether for VRUs or for all modes. Examples include the HSIP, SS4A, ATP, and OTS grant programs. For other programs, safety may not be the primary focus of the program, but there are components that can be used to improve VRU safety. Examples include the RAISE, RCN, SMART, and SCCP grant programs. Furthermore, while most grant programs dedicate funds for implementation or both planning and implementation activities, the TOD Pilot Program, STP Grants, and LRSP/SSARP only fund planning activities.

Table 7 on the following page shows the applicability of the above Federal and State funding programs for each of the countermeasures identified in the VRU Safety Assessment Countermeasures Selection Matrix. It is important to note that, depending on the guidelines of the funding opportunity, which may change with each funding cycle, the relevance and implementation of each countermeasure may vary.

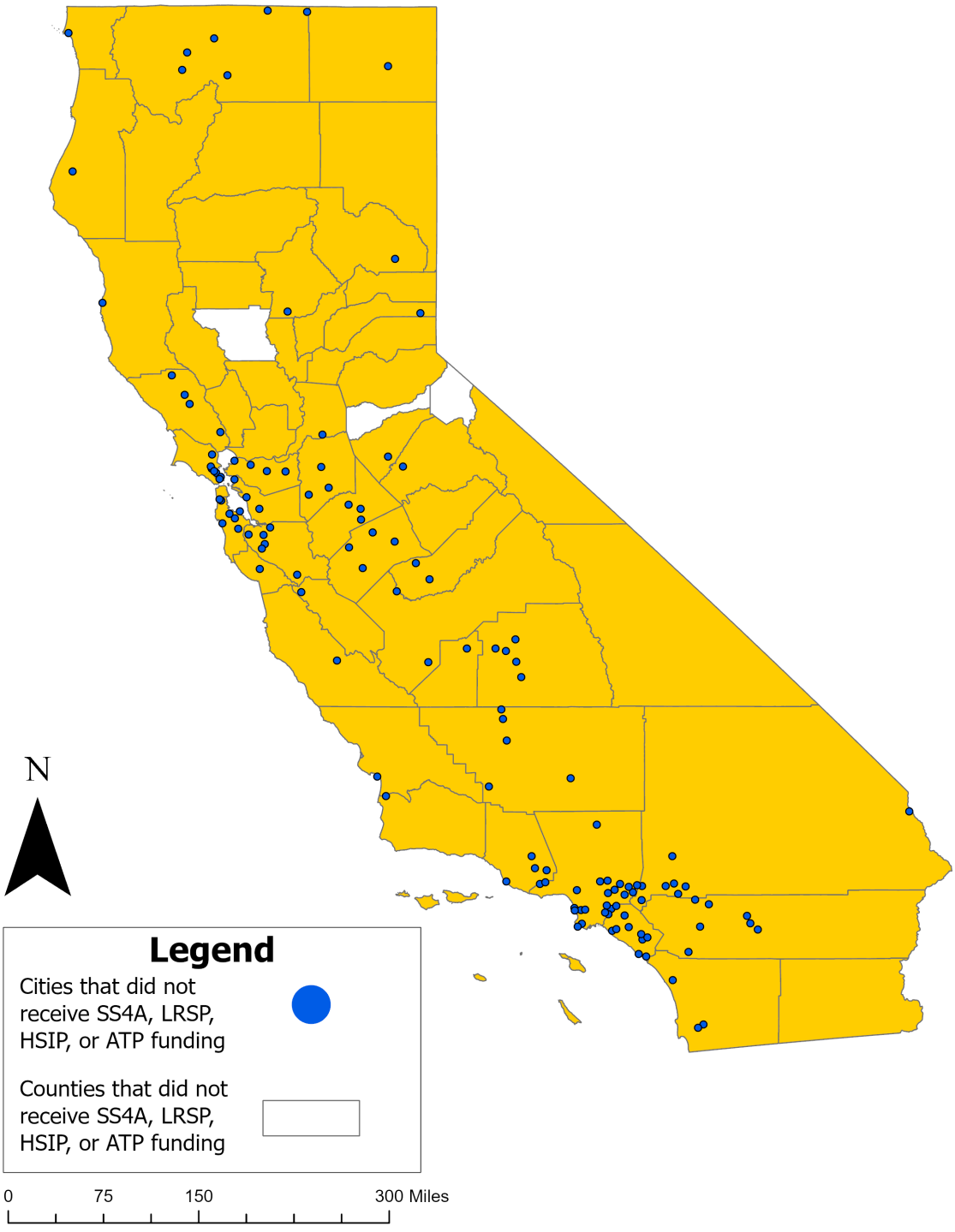
Figure 30 displays 132 cities and three counties within the state that did not receive funding from the SS4A, ATP, LRSP, or HSIP funding sources within the last five years .

Table 7: Applicability of VRU Safety Assessment Countermeasures Selection Matrix among Various Funding Opportunities

Countermeasure Selection *These programs fund planning activities only.	HSIP	SS4A	STBG	RAISE	RCN	TOD Pilot*	SMART	ATP	LPP	SCCP	LRSP & SSARP*	OTS	STP*
Add or enhance lighting	X	X	X	X	X	X			X	X	X		X
Bike Boxes	X	X	X	X	X	X		X	X	X	X		X
Consolidate Driveways Near Intersections	X	X	X	X	X	X			X	X	X		X
Convert to Mini Roundabout	X	X	X	X	X				X	X	X		X
Curb extensions	X	X	X	X	X	X		X	X	X	X		X
Education campaigns		X						X			X	X	X
Drivers Education Programs		X						X			X	X	X
Visibility Campaigns		X						X			X	X	X
Active Transportation Rodeos		X						X			X	X	X
Safety Dashboards		X						X			X	X	X

Countermeasure Selection *These programs fund planning activities only.	HSIP	SS4A	STBG	RAISE	RCN	TOD Pilot*	SMART	ATP	LPP	SCCP	LRSP & SSARP*	OTS	STP*
Implement Flashing Yellow Arrow or Exclusive Left Turn Phasing	X	X	X	X	X		X		X	X	X		X
Implement Safe Routes to School Program		X						X			X	X	X
Increased Enforcement		X						X			X	X	X
Increased Patrols		X						X			X	X	X
Roadblocks		X						X			X	X	X
Cameras		X						X			X	X	X
Targeted Safety Campaigns		X						X			X	X	X
Install Bike Lane Through Intersections	X	X	X	X	X	X		X	X	X	X		X
Install Edge-Lines and Rumble Strips	X	X	X	X	X				X	X	X		X
Install Flexible Bollards	X	X	X	X	X	X		X	X	X	X		X
Install Large Roundabout (with Separated Cycle Path)	X	X	X	X	X	X		X	X	X	X		X
Install Pedestrian Refuge Island	X	X	X	X	X	X		X	X	X	X		X
Install Raised Median	X	X	X	X	X	X		X	X	X	X		X
Install Raised Bicycle Crossing	X	X	X	X	X	X		X	X	X	X		X
Install Raised Pedestrian Crossing	X	X	X	X	X	X		X	X	X	X		X
Install Rectangular Rapid Flashing Beacon	X	X	X	X	X	X		X	X	X	X		X
Install Separated Bike Lanes	X	X	X	X	X	X		X	X	X	X		X
Install Sidewalk (to Avoid Walking Along Roadway)	X	X	X	X	X	X		X	X	X	X		X
Install/Upgrade Pedestrian Crossing	X	X	X	X	X	X		X	X	X	X		X
Modify Signal Phasing to Implement Leading Pedestrian Interval (LPI)	X	X	X	X	X	X	X	X	X	X	X		X
Road Diet	X	X	X	X	X	X		X	X	X	X		X
Upgrade Pedestrian Countdown Heads	X	X	X	X	X	X	X	X	X	X	X		X
Widen Shoulder	X	X	X	X	X				X	X	X		X

Figure 30: City and County Government that have not received Road Safety Funding (Source: Caltrans, USDOT)



6. ALIGNMENT WITH A SAFE SYSTEM APPROACH

The VRU Safety Assessment utilizes a SSA framework to inform policy and practice decisions that ensure VRU safety. The SSA utilizes a comprehensive and holistic approach to eliminate fatal and serious injuries for all road users. It recognizes humans make mistakes, humans are vulnerable, and that a reactive and proactive approach emphasizing shared responsibility is necessary to prevent fatalities and serious injuries, especially those of VRUs, on the States roadway systems.

The SSA Framework (Framework) is the lens through which all transportation decisions should be made to prevent roadway deaths and serious injuries should a crash occur. In every policy and practice decision, the Framework should be used to inform which policies are adopted and which street elements are designed, to ensure the safety of all road users. Applying more framework elements creates redundancy in the system to hopefully prevent a crash from resulting in individuals being killed or seriously injured.

VRUs are more vulnerable to crash impacts because they have less protection than a person in a motor vehicle. VRUs are exposed to the direct force of a crash which may result in fatalities and serious injuries. Implementing the SSA is particularly important for improving safety for our most vulnerable road users; people who walk and bike. For example, if speeds cannot be reduced, then VRUs must be separated in space at a level that reduces impacts if a crash occurs.

The following section describes how each section of this assessment integrates the SSA.

1. Historical Trends and Data Analysis

This assessment only uses fatal and serious injury crash data to keep the focus on SSA and is aligned with the USDOT's National Roadway Safety Strategy

2. Consultation

a. One of the core SSA principles is that responsibility is shared. As part of the consultation during this assessment, Caltrans engaged local governments and regional transportation planning organizations, including tribal governments, to gain local knowledge of primary contributing factors for VRU crashes and identify/develop strategies to address VRU safety

b. Aligning with California SHSP's Five Es (education, enforcement, engineering, emergency response, and emerging technologies), the project team consulted with California OTS for education discussion; CHP for enforcement discussion; and various local governments on engineering (infrastructure improvements)

3. Program of Strategies

a. One of the SSA principles is that safety is proactive. As documented in this assessment, Caltrans implemented systemic monitoring programs as its strategy to proactively address VRU safety

b. Caltrans has made a commitment to achieving the goal of eliminating fatalities and serious injuries on our roads by 2050 through the Director's Policy on Road Safety (DP-36) which aligns with the National Roadway Safety StrategyDP-36 also commits the department to eliminating race-, age-, mode- and ability- based disparities in road safety outcomes for all road users. To meet these goals, Caltrans will fully utilize the federal HSIP allocation and augment it with state funds to improve the safety of the state as well as the local roadway system. In recent years, this augmentation has been as high as four times the federal HSIP allocation

c. The Safety Countermeasures Selection Matrix developed through this assessment focuses on education, engineering, and enforcement strategies. The Selection Matrix also identifies whether each proposed strategy reduces speed and or impact and separates road users

d. Caltrans' Complete Streets Policy commits Caltrans to ensuring all transportation projects funded or overseen by Caltrans to provide comfortable, convenient and connected complete streets facilities for people walking, biking, and taking transit unless an exception is documented and approved. This policy directly contributes to unwavering commitment to VRU safety through state and federally administered safety programs. It also addresses the Safer Streets and Safer Speeds principles of SSA

e. The Caltrans administered ATP aims to increase the proportion of trips accomplished by walking and biking and increasing safety mobility for non-motorized road users

7. CONCLUSION

The California VRU Safety Assessment identifies safety improvement areas and strategies to reduce VRU fatalities and serious injuries. This assessment, which was developed through an analysis of all California public roads and outreach with local governments and other stakeholders, can be utilized by all levels of government to focus their efforts on implementing strategies that will reduce VRU fatalities and serious injuries.

The deliverables in this assessment are intended to aid in the decision making process and implementation of future safety improvement projects. Defining VRU Safety Improvement Areas provides additional justification for local governments to apply for grant funding and to work with Caltrans on projects connecting the SHS with the local road network. The VRU Safety Countermeasures Selection Matrix provides guidance on a subset of strategies to improve safety throughout the state and within the VRU Safety Improvement Areas. In addition, the StoryMap provides a condensed, interactive version of the information learned from this process and allows users to access more detailed geospatial data.

A summary of the key takeaways gleaned from this assessment are included below:

- The number of VRU fatal and serious injury crashes in California and the United States have increased at nearly the same rate
- VRU fatal and serious injury crashes occur most often on weekdays, with Friday being the day most crashes occur
- Most pedestrian fatalities and serious injuries that involve alcohol occur at night to a greater extent than other alcohol related crash types
- October is the month with the highest number of VRU fatal and serious injury crashes, and crashes were more likely to occur in months where daylight hours were shorter (October-March)
- Almost 80% of VRU crashes occur on one of three functional roadway classifications:
  - One third of VRU crashes occur on Other Principal Arterial roads
  - One quarter occur on Minor Arterial roads
  - One fifth occur on Local roads

- Racial minorities are more likely to be involved in a fatal or serious injury crash as pedestrians, while White road users are more likely to be involved in a fatal or serious injury crash as bicyclists
- People in underserved communities are more likely to be involved in VRU fatal and serious injury crashes
- Male VRUs are more likely to be involved in fatal or serious injury crashes

Furthermore, this assessment emphasizes the importance of shared responsibility amongst all stakeholders including road users, system managers, and communities to work collaboratively to prevent crashes from leading to fatalities and serious injuries. Through increased collaboration and awareness, it is possible to develop and implement evidence-based policies, update current road infrastructure, and utilize available funding to promote safer roads for everyone.

Ultimately, this VRU Safety Assessment presents a call to action, urging stakeholders to prioritize the lives of pedestrians, bicyclists, and other vulnerable road users. Implementation of the recommendations in this assessment can help California make significant strides towards a safer and more inclusive experience for all road users.

Caltrans and its partner agencies will use the VRU Safety Assessment to support project development and prioritization as it develops the district level Road Safety Infrastructure Plans to guide future HSIP project selection. This assessment will be updated into future revisions to the California SHSP.

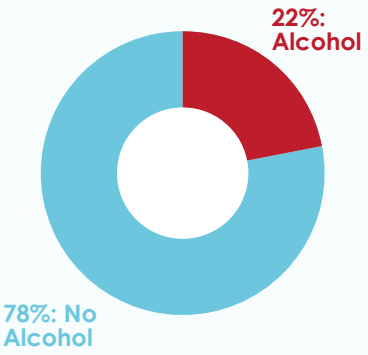
APPENDIX A - VULNERABLE ROAD USER (VRU) SAFETY STATISTICS IN CALIFORNIA

VRU Safety Statistics In California (Source: SWITRS 2011-2020)

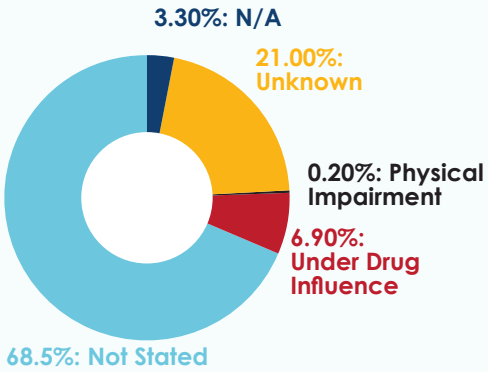
Of all pedestrian fatalities and serious injury crashes, 28% occur at intersections, and 72% of pedestrian fatalities and serious injury crashes occur in roadway segments.

Intersection 28%

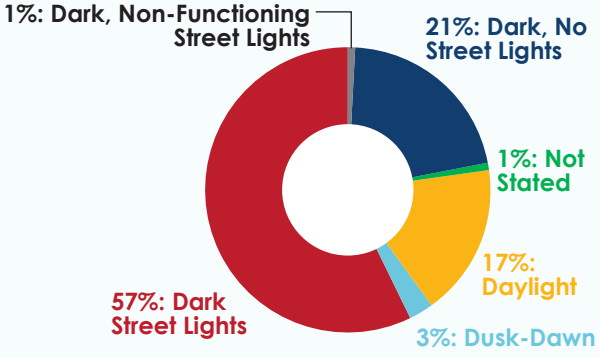
Roadway Segment 72%



Of all pedestrian fatalities and serious injury crashes for vulnerable road users, 22% had **alcohol involvement** to some degree.

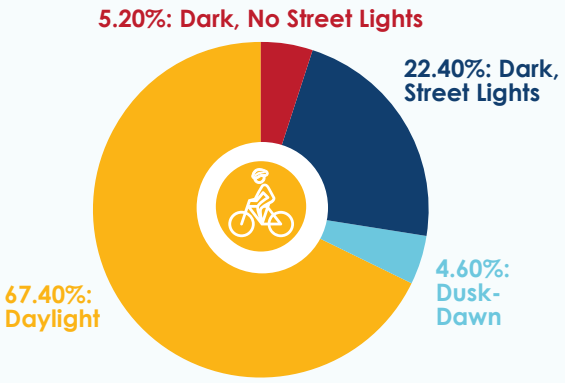


Drug use was a contributing factor in about 7% of crashes.

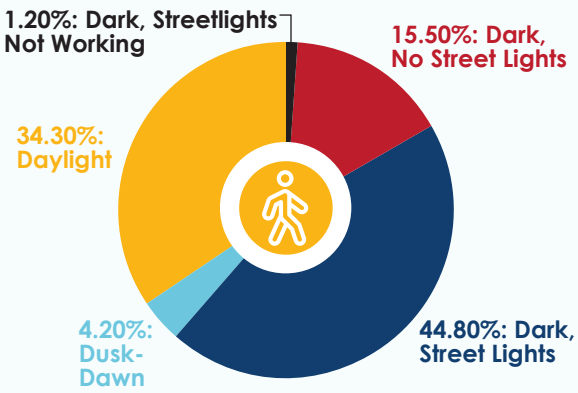


Most alcohol-involved crashes occur at night, with only about 17% occurring in daylight hours compared with nearly 44% of that same group of crashes without consideration of alcohol.

Lighting Conditions (Source: SWITRS 2011-2020)

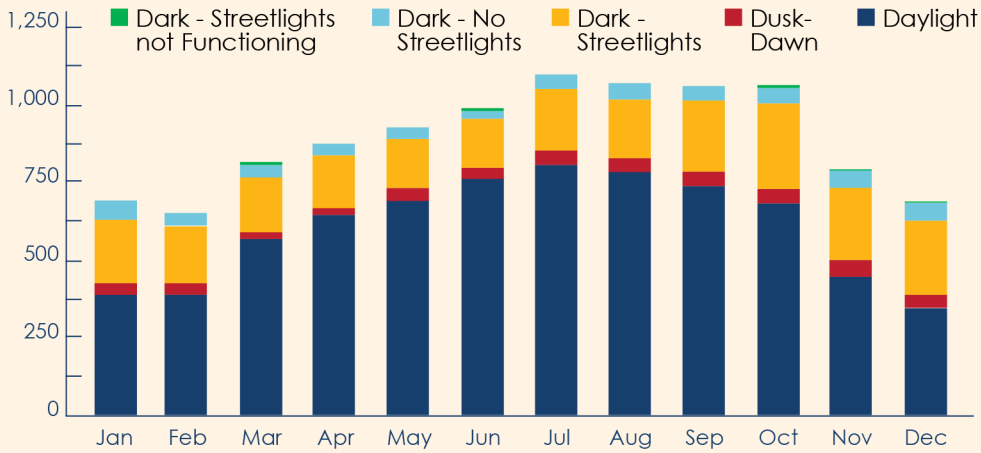


Lighting Conditions in Bicycle Crashes

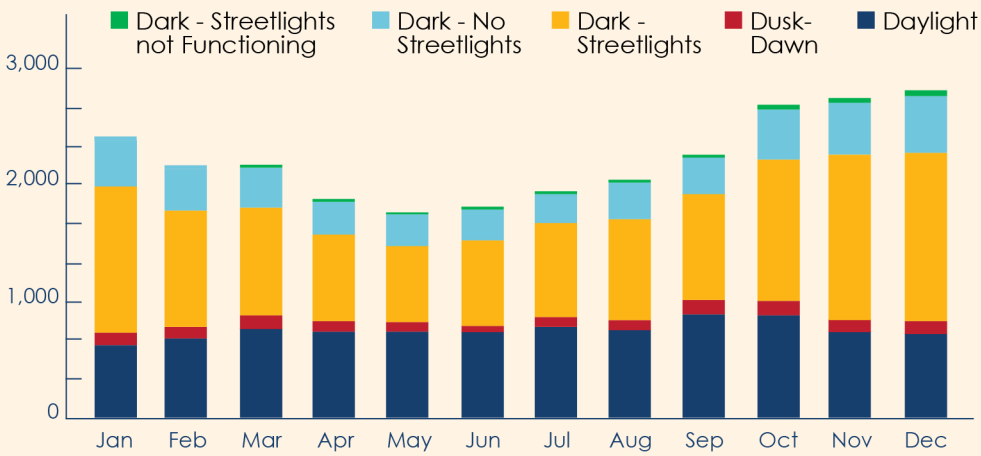


Lighting Conditions in Pedestrian Crashes

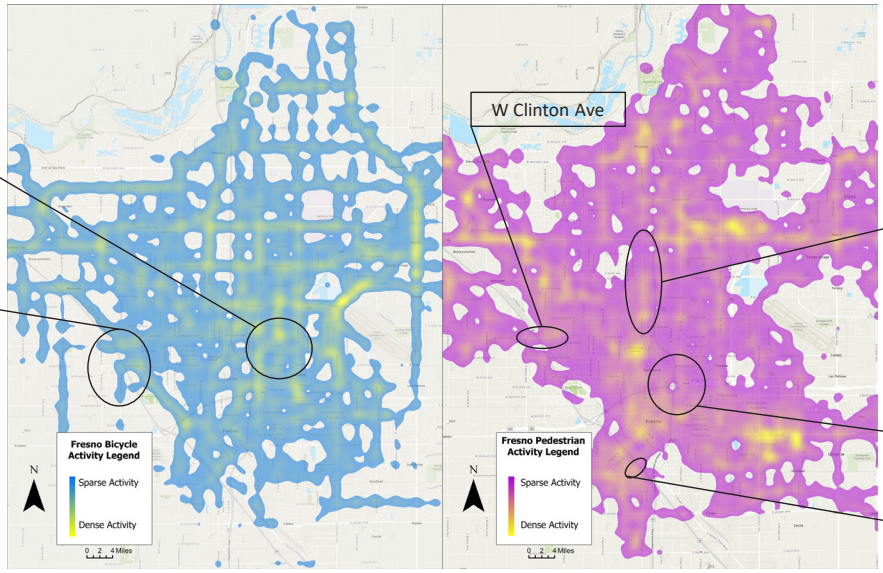
Lighting Conditions by Month in Bicycle Crashes



Lighting Conditions by Month in Pedestrian Crashes

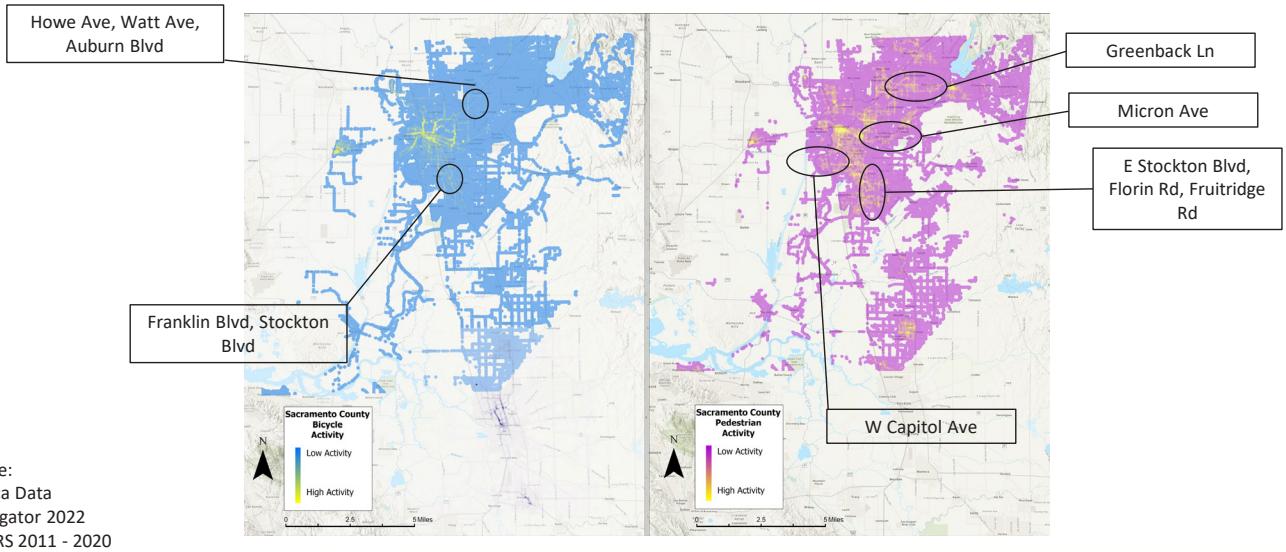


Fresno VRU Activity Heat Maps



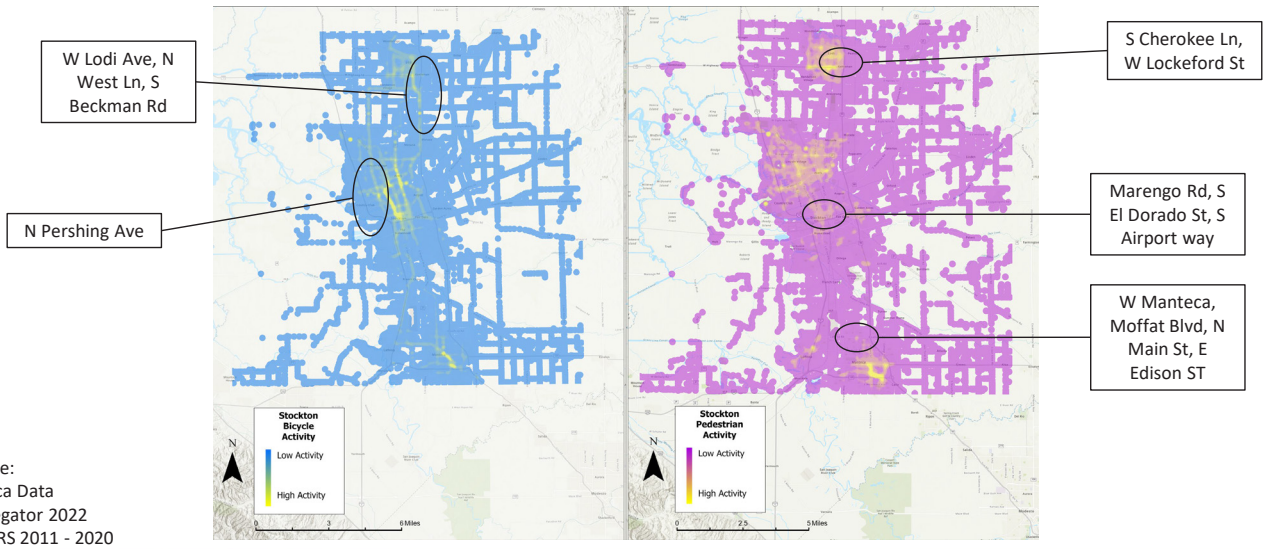
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Sacramento Co VRU Activity Heat Maps



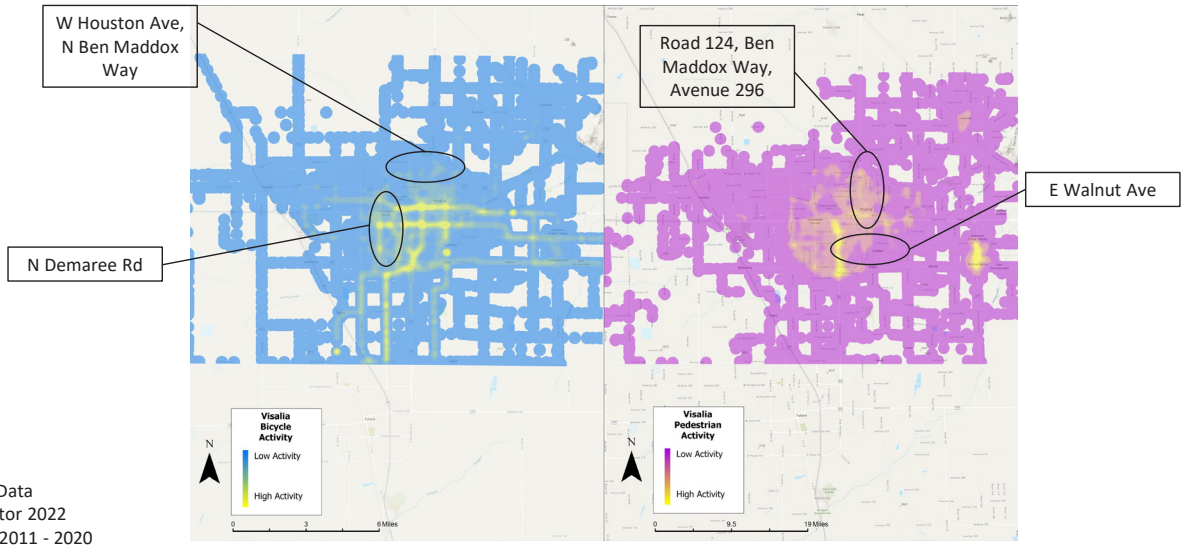
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Stockton VRU Activity Heat Maps



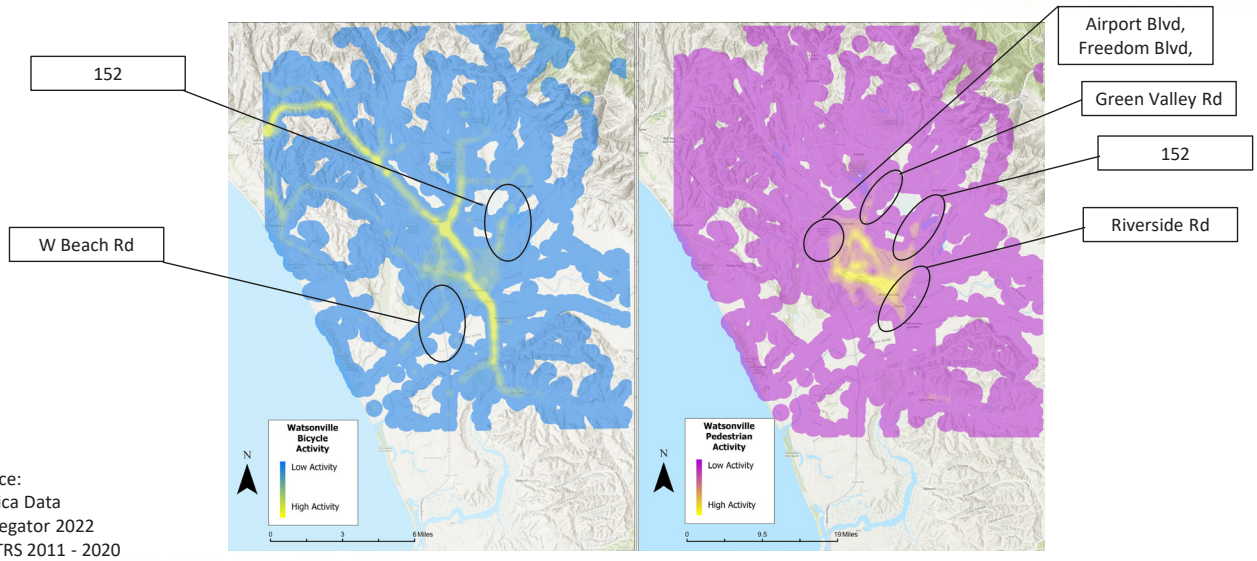
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Visalia VRU Activity Heat Maps



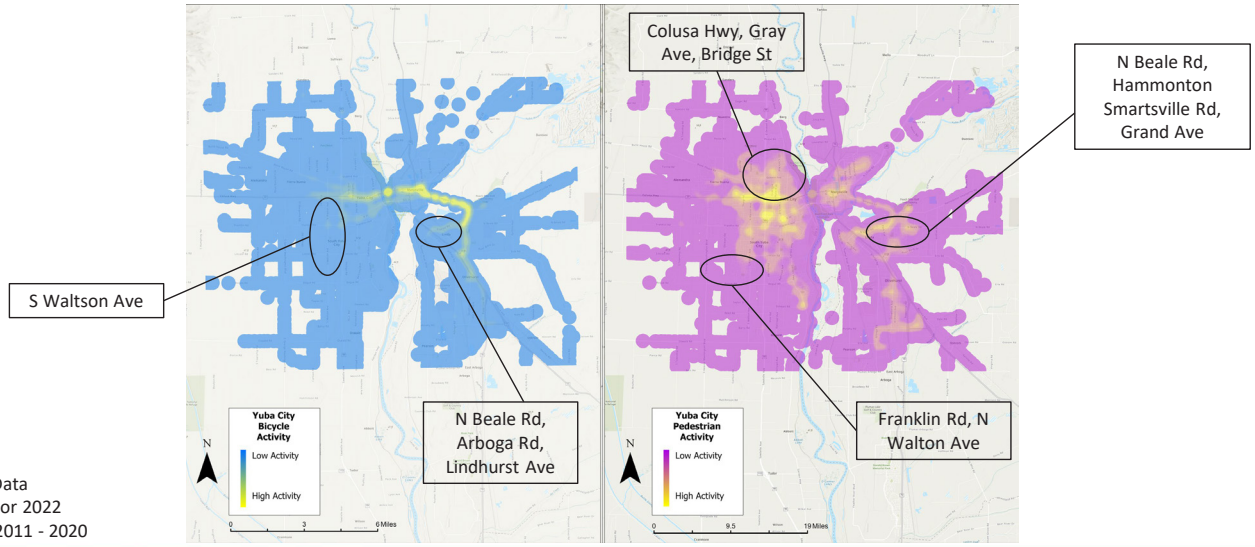
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Watsonville VRU Activity Heat Maps



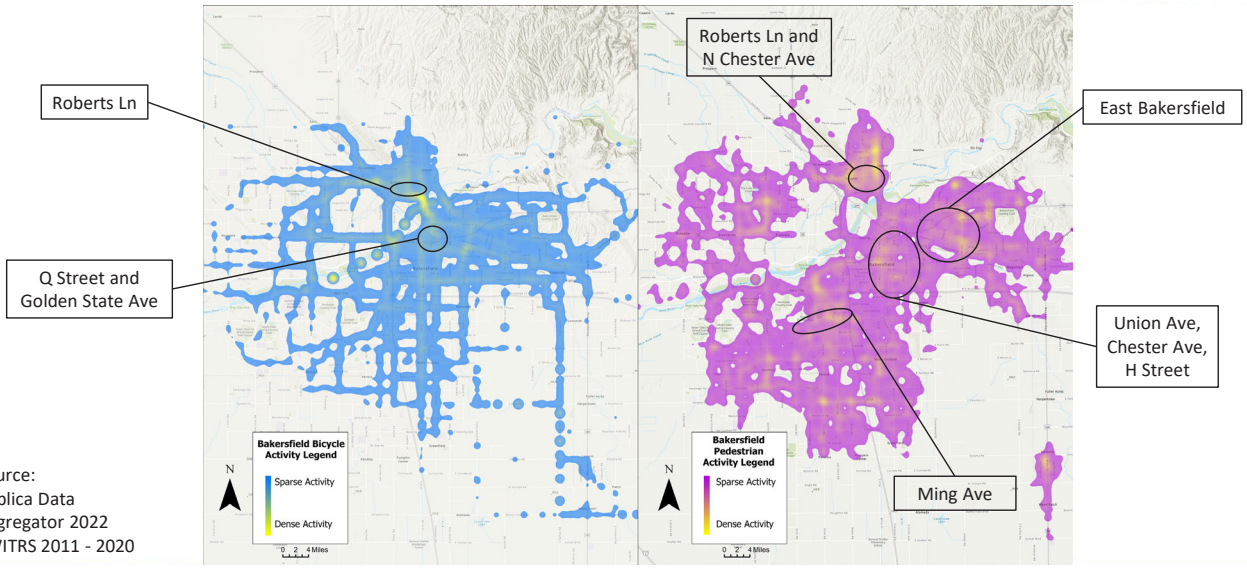
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Yuba VRU Activity Heat Maps



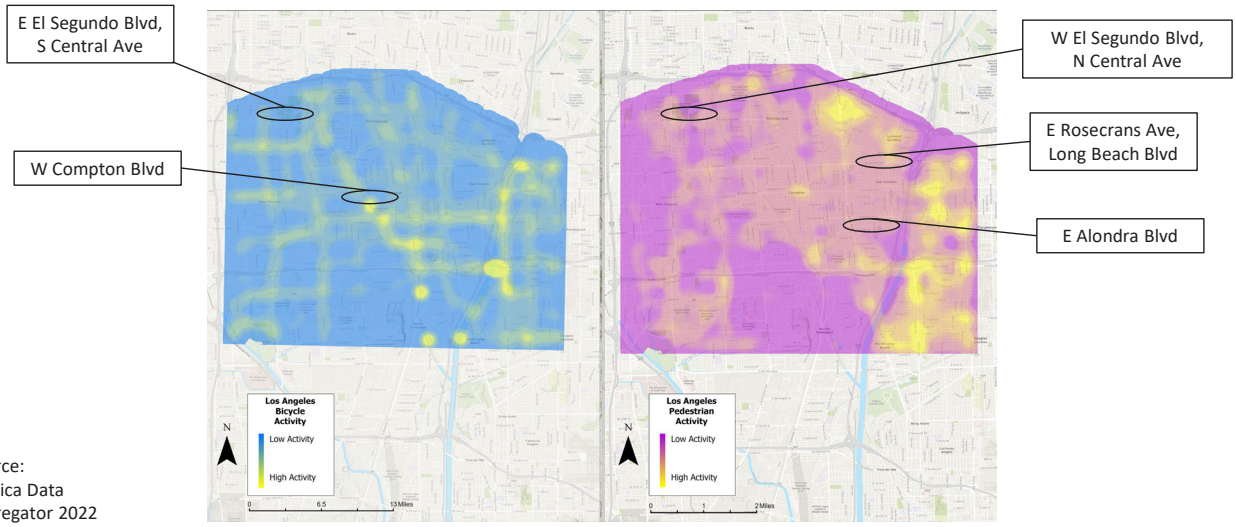
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Bakersfield VRU Activity Heat Maps



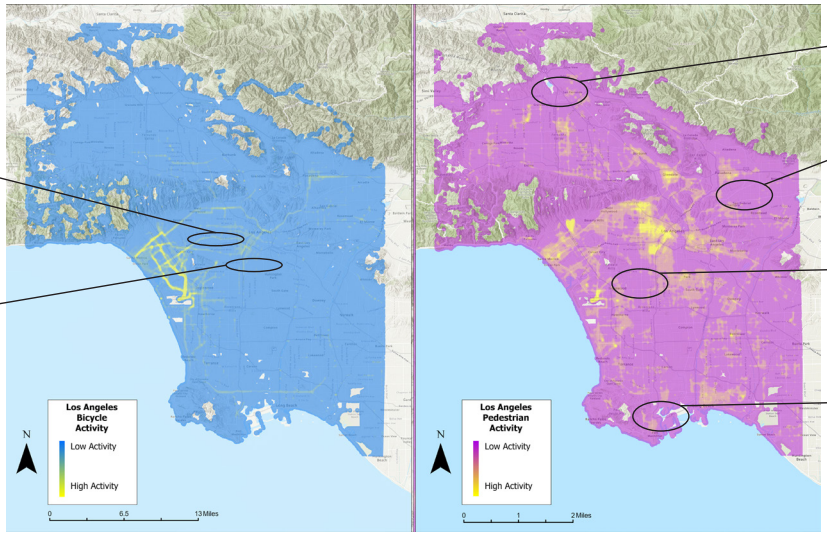
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Compton VRU Activity Heat Maps



Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Los Angeles VRU Activity Heat Maps



Venice Blvd, Wilshire Blvd

E Florence Ave, S Broadway, Atlantic Ave

Van Nuys Blvd, San Fernando Rd

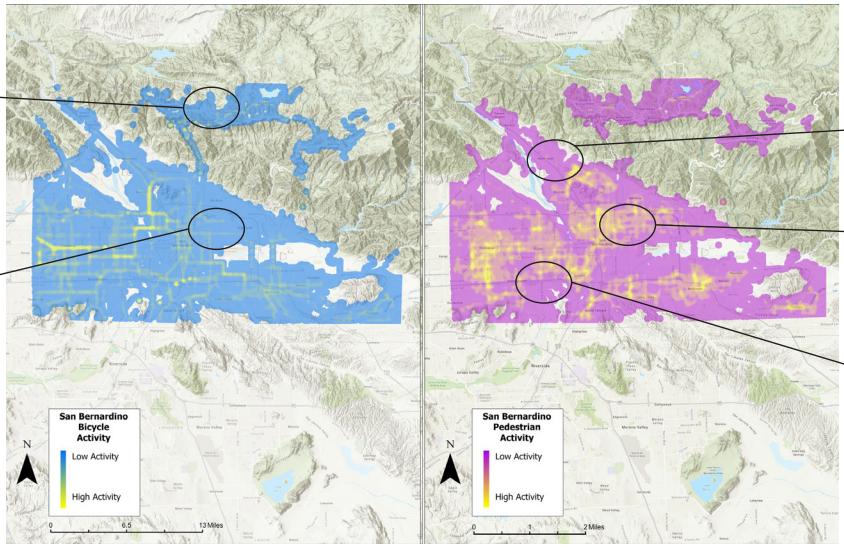
E Garvey Ave

S Western Ave, W Manchester Ave, S Figueroa St

E Ocean Blvd, E Broadway, W 6th St

Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

San Bernardino VRU Activity Heat Maps



Knapps Cutoff, Lakes Edge Rd

S Waterman Ave, Baseline St, W 5th St

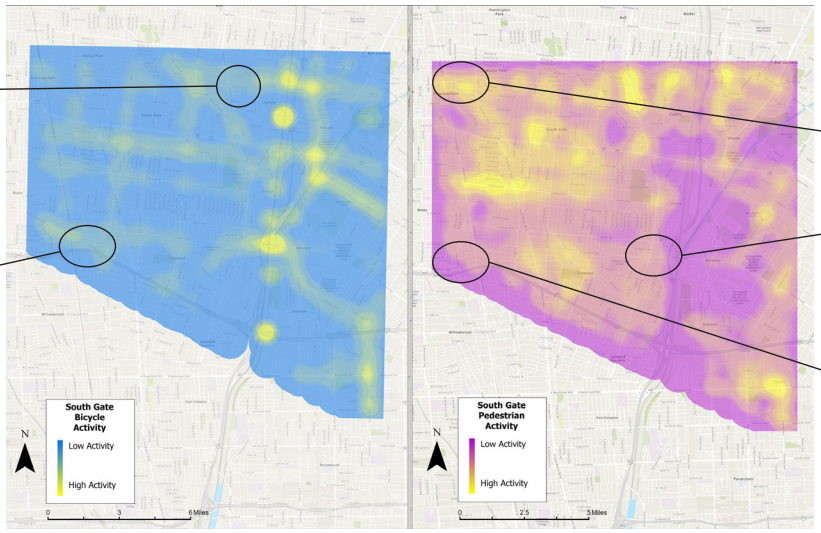
W Frontage Rd, Baseline St, S Waterman Ave

Baseline St, 5th St, E 9th St

Cedar Ave, Valley Blvd

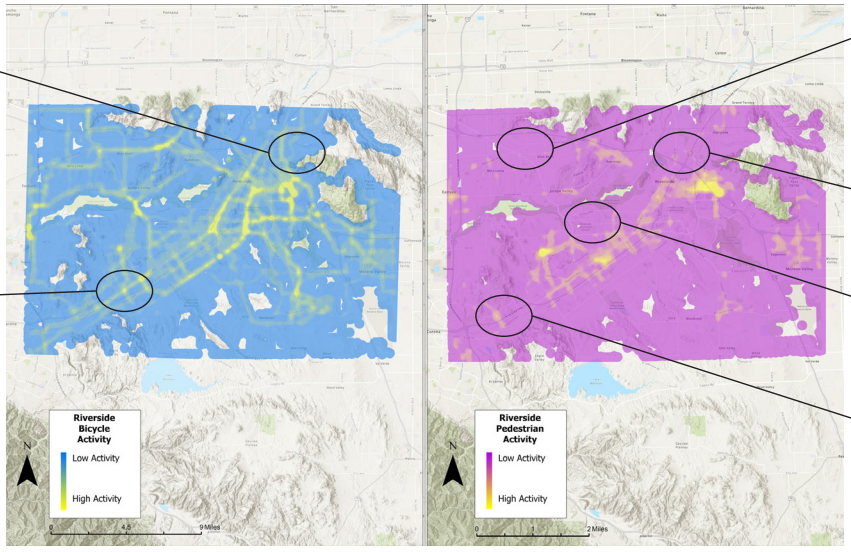
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

South Gate VRU Activity Heat Maps



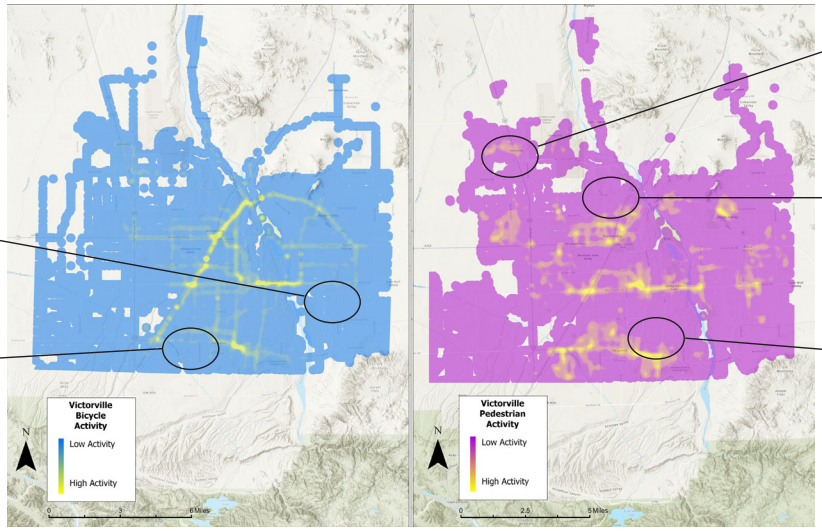
Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Riverside VRU Activity Heat Maps



Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

Victorville VRU Activity Heat Maps



Bear Valley Rd, Klowa Rd, Nisqually Rd

Main St, Hickory Ave, 2nd Ave

Air Expressway Blvd, Chamberlaine Way, El Mirage Rd

Mojave Dr, Amargosa Rd, Hook Blvd

Peach Ave, Santa Fe Ave, Hesperia Rd, 3rd Ave

Source:
Replica Data
Aggregator 2022
SWITRS 2011 - 2020

APPENDIX B - CONSULTATION MEETING AND SHSP CHALLENGE AREA STAKEHOLDER LIST

- American Automobile Association
- Automobile Club of Southern California- Public Affairs
- Bay Area Metro
- Bicycle Commuter Services
- Bike Santa Cruz County
- BikeWalkCV
- Blue Zones Project
- Boys and Girls Club of Kern County
- Butte County Association of Governments
- CA Office of Traffic Safety Program Manager
- CA Operation Lifesaver
- California Department of Public Health (CDPH)
- CalWalks
- California Association of Bicycling Organizations
- California Department of Motor Vehicles
- California Department of Public Health
- California Department of Transportation (Caltrans)
- California Highway Patrol (CHP)
- California Office of Traffic Safety
- California Polytechnic State University Pomona
- California State Transportation Agency
- California State University Bakersfield
- California Walks
- Caltrans District 7
- Caltrans District 8
- Caltrans, District 3
- Calveras County
- Cherryland Community Association
- Circulate San Diego
- Citizen
- City Fairfield
- City Fremont
- City Heights Community Development Corporation
- City of Bakersfield
- City of Bell Gardens
- City of Culver City
- City of Eastvale

- City of El Cerrito Public Works Department
- City of Escondido
- City of Fairfield
- City of Fontana
- City of Long Beach
- City of Los Angeles
- City of Los Angeles - Streets LA
- City of Mission Viejo
- City of Mission Viejo Public Works
- City of Monterey
- City of Monterey Park Police Department
- City of Mount Shasta
- City of Palmdale
- City of Redwood City
- City of Riverside
- City of Santa Monica
- City of South Gate
- City of Stockton
- City of Stockton - Public Works - Traffic Engineering
- City of Visalia
- City of Watsonville
- City of Yuba City
- Coalition for Responsible Transportation Planning
- Coalition for Responsible Transportation Priorities
- County Engineers Association of California
- County Public Health
- Dignity Health
- Dokken Engineering
- East Side Riders Bike Club
- Emergency Medical Services Authority
- FDR Democratic Club of San Francisco
- FHWA - CA Division Office
- Fehr and Peers
- Fresno Bike
- Fresno Council of Governments
- Fresno County
- Fresno County Bicycle Coalition
- Fresno County Department of Public Health
- GHD
- HHSA/Healthy Shasta
- Interwest Consulting Group

- Kern Council of Governments
- Kern High School District
- Kimley-Horn
- Long Beach Police Department
- Los Angeles County
- Los Angeles County Department of Public Health
- Los Angeles Department of Transportation (LADOT)
- Los Angeles Police Department (LAPD)
- Madera County Transportation Commission
- Merced County Association of Governments (MCAG)
- Mission Pedestrian
- MobilityVision, Inc.
- Moraga Planning Commission
- Mott MacDonald
- Napa Valley Transportation Authority
- National Highway Traffic Safety Administration (NHTSA)
- NorthBay Medical Center
- Orange County Health Care Agency
- Orange County Public Works
- Rock E. Miller & Associates
- Sacramento Area Council of Governments (SACOG)
- STEPS DUI Program Bakersfield
- Sacramento County
- Sacramento County Department of Transportation
- Sacramento Wheelmen
- Safe Routes Partnership
- Safe Routes to School National Partnership
- Safe Routes to School Nevada County
- Safety Center
- San Diego Association of Governments (SANDAG)
- San Francisco Hills
- San Francisco Municipal Transportation Agency (SF Muni)
- San Joaquin County Public Health Services
- San Joaquin County Public Health Services - Child Passenger Safety Program
- San Luis Obispo Council of Governments (SLOCOG)
- Santa Ana City Council
- Santa Clara Valley Medical Center
- Santa Cruz County Cycling Club
- Santa Cruz County Public Health Department
- Scripps Health
- Shasta Living Streets

- Shasta Regional Transportation Agency
- Snell Foundation
- Solano Transportation Authority
- Southern California Association of Governments (SCAG)
- Stanford University
- Stantec
- Street Racing Kills
- Students Against Destructive Decisions
- Tahoe Regional Planning Agency
- Traffic Engineering Expert Witness
- Tulare County
- UC Berkeley - Institute of Transportation Studies
- UC Davis
- University of California Berkeley
- University of California Berkeley Safe Transportation Research and Education Center (TREC)
- University of California San Diego Training, Research, and Education for Driving Safety
- Utilitarian Cyclists
- Vespa Club of America
- WALK Sacramento

APPENDIX C - VRU SAFETY GRANT PROGRAMS

This appendix catalogues and describes examples of funding opportunities that may be used to help eligible entities plan and implement countermeasures from the VRU Safety Assessment Countermeasures Selection Matrix. This appendix also provides the list of the stakeholders that that attended the Consultation Meetings detailed in Sections 4.2.1 – 4.2.3.

Program	Description	Resources/Links
Federal Programs		
Highway Safety Improvement Program (HSIP)	Federal-aid program managed by Caltrans as state HSIP and local HSIP.	https://safety.fhwa.dot.gov/hsip/ https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/highway-safety-improvement-program
Safe Streets and Roads for All (SS4A)	USDOT administered grant program for local planning and demonstration and/or implementation projects.	https://www.transportation.gov/grants/SS4A
Surface Transportation Block Grant program (STBG)	FHWA administered grant program to preserve and improve roadway safety and performance.	https://www.fhwa.dot.gov/bipartisan-infrastructure-law/stbg.cfm https://dot.ca.gov/-/media/dot-media/programs/local-assistance/documents/guide/funding-guidebook.pdf

Program	Description	Resources/Links
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	USDOT administered large grant program for road, rail, transit, and port projects that promise to achieve national objectives and have a significant local or regional impact by improving transportation infrastructure.	https://www.transportation.gov/RAISEgrants/about
Reconnecting Communities and Neighborhoods (RCN)	USDOT administered program to prioritize disadvantaged communities, improve access to daily needs, and foster equitable development by removing, retrofitting, or mitigating highways or other transportation facilities that currently create barriers to community connectivity, mobility, access, and economic development.	https://www.transportation.gov/grants/rcnprogram
Transit-Oriented Development (TOD) Planning	Federal Transit Administration's (FTA) Capital Investment grant program to assist efforts to focus growth around transit stations to create compact, mixed-used communities with easy access to jobs and services.	https://www.transit.dot.gov/funding/grants/fact-sheet-pilot-program-transit-oriented-development-planning
Strengthening Mobility and Revolutionizing Transportation (SMART)	USDOT administered grant program for purpose-driven innovation to build data and technology capacity and expertise for State, local, and tribal governments.	https://www.transportation.gov/grants/SMART
State Programs		
Active Transportation Program (ATP)	Caltrans administered program funding projects that encourage increased mode share for walking and bicycling, improve mobility and safety for non-motorized users, enhance public health, and decrease greenhouse gas emissions.	http://www.dot.ca.gov/hq/LocalPrograms/atp/

Program	Description	Resources/Links
Local Partnership Program (LPP)	California Transportation Commission (CTC) and Caltrans administered program funding transportation improvements related to aging infrastructure, road conditions, active transportation, transit, and rail, and those that provide health and safety benefits.	https://catc.ca.gov/programs/sb1/local-partnership-program
Solutions for Congested Corridors Program (SCCP)	California Transportation Commission (CTC) and Caltrans administered program to projects that implement specific transportation performance improvements and are already identified in a regional transportation plan (RTP) and are part of a comprehensive corridor plan. Eligible improvements include adding new or improving existing transit and rail infrastructure, transit hubs, first/last-mile connections to transit hubs, closing gaps in street and active transportation networks, safety improvements, innovative technologies, and pedestrian and bicycle facilities	https://catc.ca.gov/programs/sb1/solutions-for-congested-corridors-program
Local Roadway Safety Plans (LRSPs) and Systemic Safety Analysis Report Programs (SSARPs)	Caltrans administered programs that fund planning and analysis activities at the local agency level. LRSPs, SSARPs, or an equivalent Action Plan are required by the State to apply for local HSIP funding. All of the countermeasures from the VRU Safety Assessment Countermeasure Selection Matrix are applicable for inclusion for planning purposes within an LRSP or SSARP.	https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/highway-safety-improvement-program/local-roadway-safety-plans

Program	Description	Resources/Links
Sustainable Transportation Planning (STP)	Caltrans administered program for planning efforts that assist vulnerable road user safety. While the funds cannot be used to implement countermeasures listed in the matrix (minus a Safe Routes to School Plan), they can be used for project-level planning for any of the listed infrastructure countermeasures, including data gathering and analysis, reports, procurement of consultants, public outreach and workshops, and up to 30% design and conceptual drawings.	https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/regional-and-community-planning/sustainable-transportation-planning-grants
Office of Traffic Safety (OTS) Grants	OTS grant program for projects aiming to improve traffic safety, including programmatic projects related to enforcement and education. Grant applications must be supported by local crash data and relate to one of OTS's priority programs, which includes pedestrian and bicycle safety as well as general roadway safety and traffic records.	https://www.ots.ca.gov/grants/

CALIFORNIA SAFE ROADS©

Vulnerable Road Users (VRU) Safety Assessment

NOVEMBER 2023