

Roadway Departure Safety Workshop

Central Gold Country, California

FHWA California Division
April 19, 2017
Jackson, California

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Research and Education Center (SafeTREC)

Topics

A. Introduction

B. Counties

- Amador
- Calaveras
- Tuolumne
- Mariposa
- Madera

C. Potential Countermeasures

D. Overview

E. Summary

F. Questions / Contact Information

Central Gold Country Counties

County	Population	Road Miles	CHP Division	Caltrans District
Amador	37,383	601	Valley	10
Calaveras	45,171	1,036	Valley	10
Tuolumne	53,804	2,293	Central	10
Mariposa	17,410	1,461	Central	10
Madera	152,389	2,147	Central	9
Total	306,714	6,078		

Roadway Departure Fatal and Severe Injuries Population Based Rates Per Year (2011/2015)

County	RwD Fatal / Severe Injuries	Population	Number / 100,000 Population
Amador	88	37,383	47.08
Calaveras	124	45,171	54.90
Tuolumne	134	53,804	49.81
	63	17,410	72.37
	148	154,697	19.42

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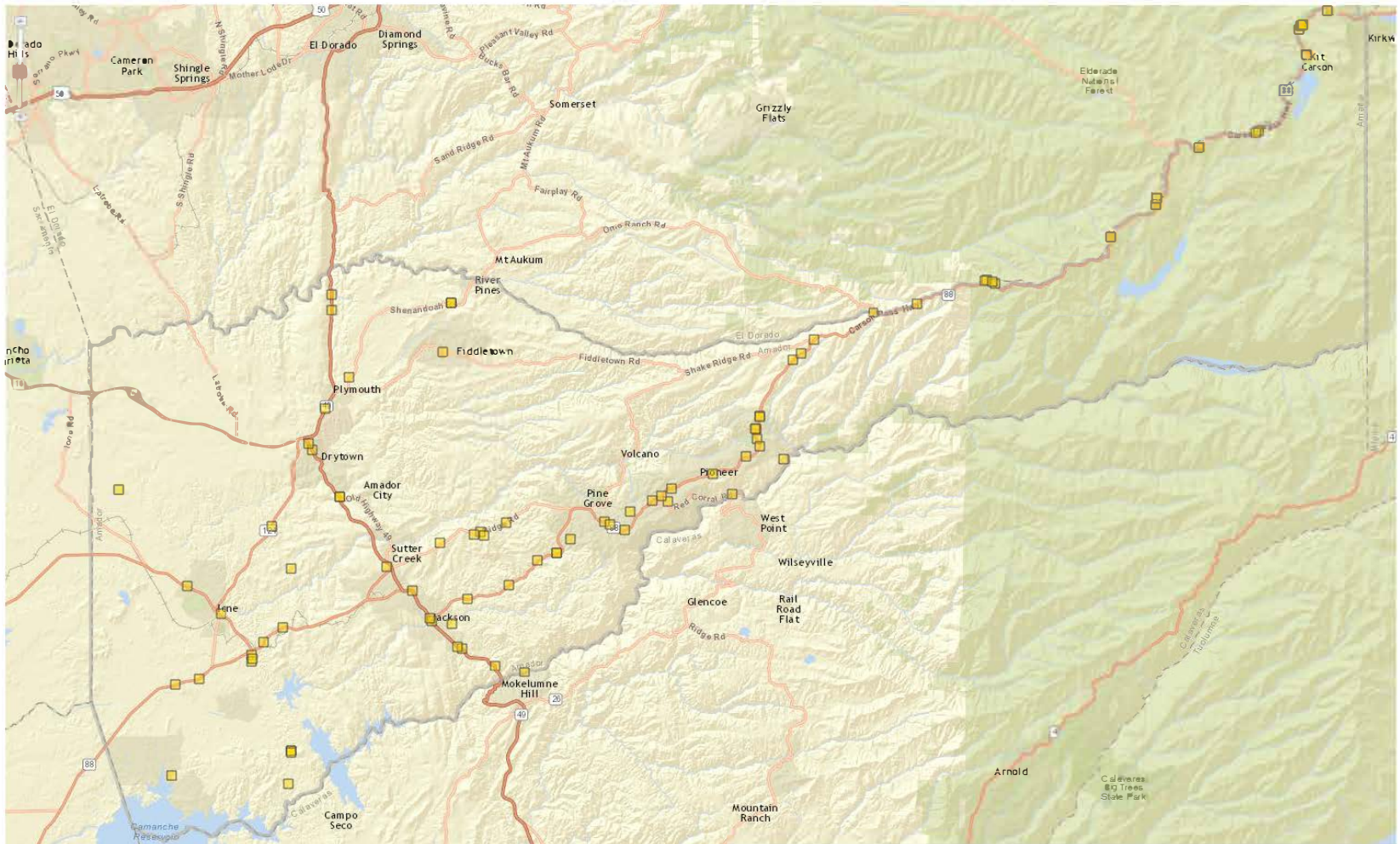
C. Potential Countermeasures

D. Overview

E. Summary

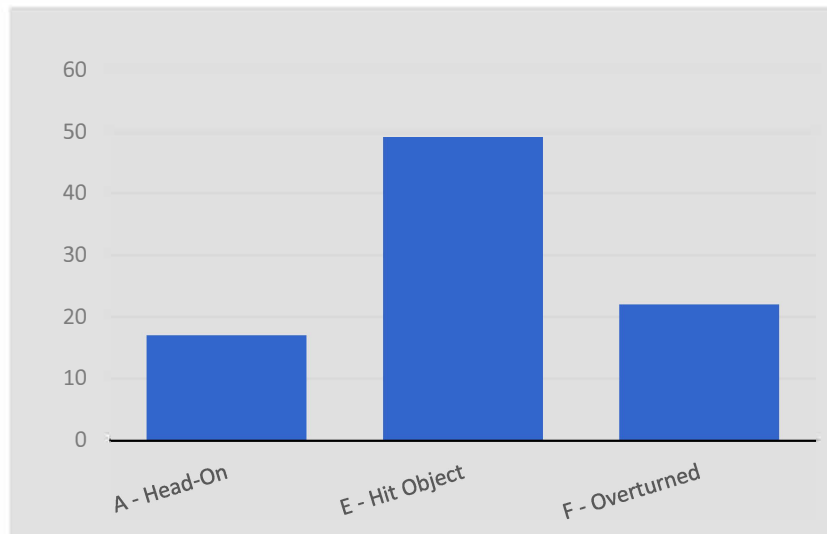
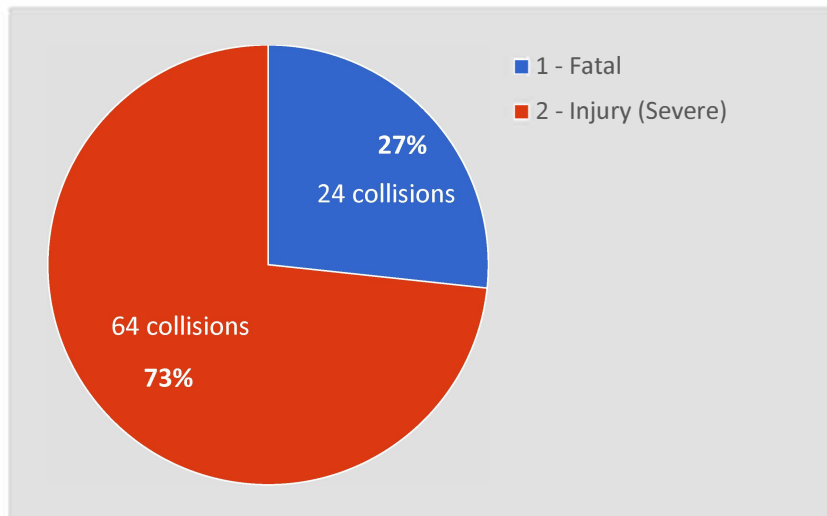
F. Questions / Contact Information

Amador County Road Departure collisions from 2011-2015



88 fatal or severe road departure collisions (head on, hit object and overturned collision factors) from 2011 to 2015 in all of Amador County

Amador County Summary Statistics

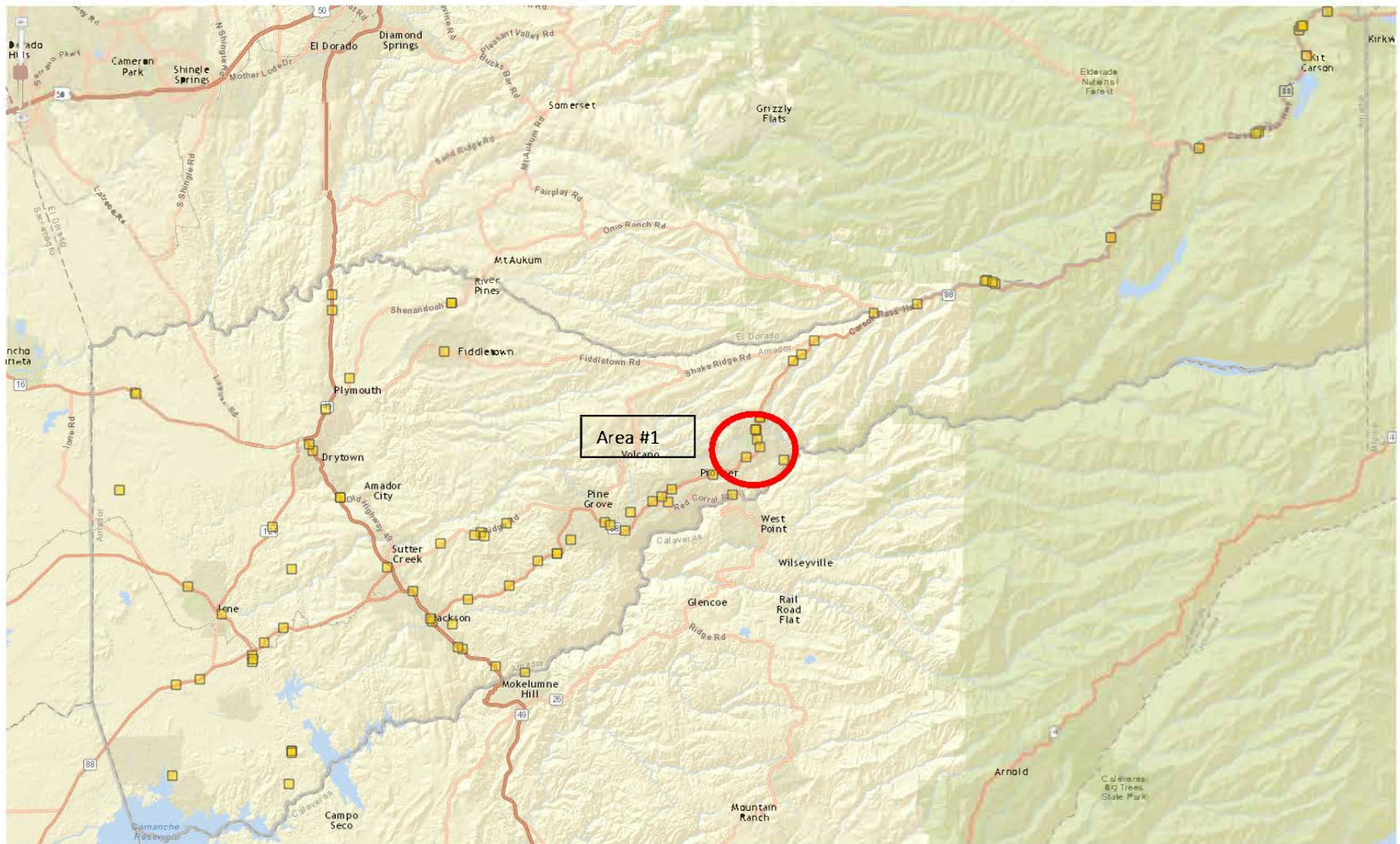


- Summary statistics for 88 collisions.

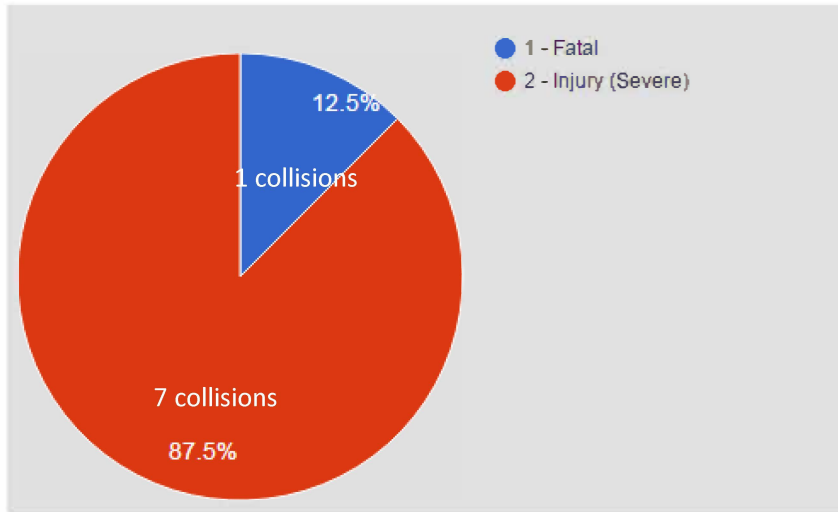
Primary Collision Factor	Collisions	Percentage
Wrong Side of Road	35	39.8%
Unsafe Speed	18	20.5%
Driving or Bicycling Under the Influence of Alcohol or Drug	15	17%
Improper Turning	12	13.6%
Other Than Driver (or Pedestrian)	3	3.4%
- - Not Stated	1	1.1%
Improper Passing	1	1.1%
Automobile Right of Way	1	1.1%
Pedestrian Right of Way	1	1.1%
Other Improper Driving	1	1.1%

Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	50	56.8%
Non-Collision	21	23.9%
Other Motor Vehicle	16	18.2%
Pedestrian	1	1.1%

Amador County Focus Area

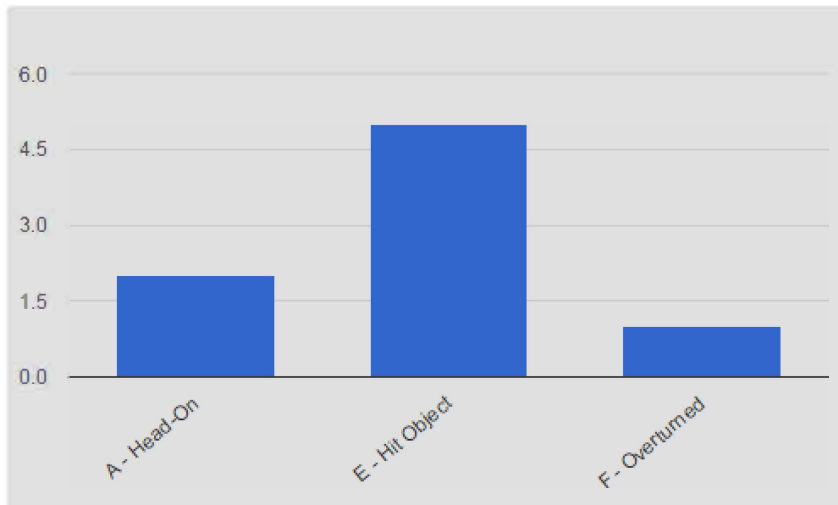


Amador County Focus Area



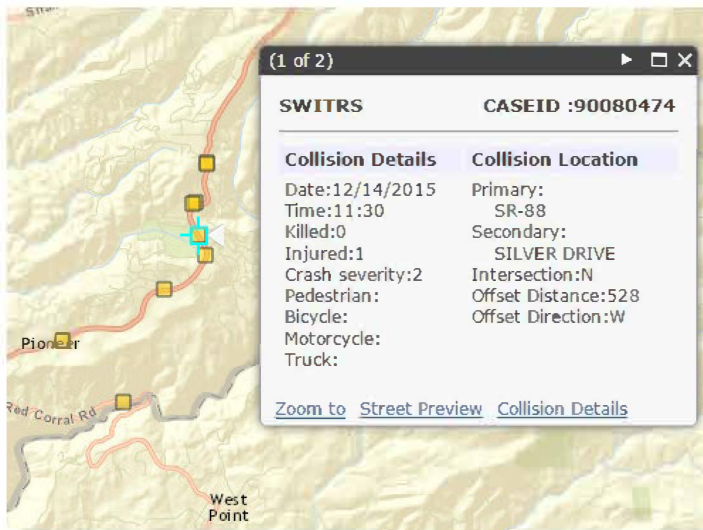
- Summary statistics for 8 collisions.

Primary Collision Factor	Collisions	Percentage
Driving or Bicycling Under the Influence of Alcohol or Drug	3	37.5%
Wrong Side of Road	3	37.5%
Unsafe Speed	1	12.5%
Other Than Driver (or Pedestrian)	1	12.5%



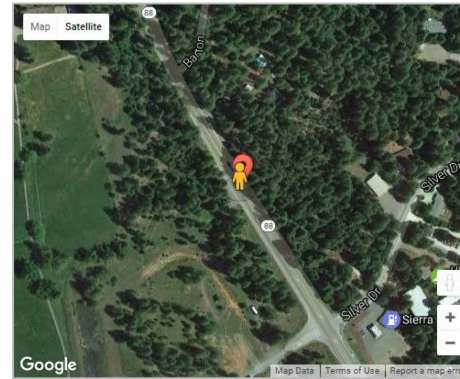
Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	5	62.5%
Other Motor Vehicle	2	25%
Non-Collision	1	12.5%

Amador County Focus Area



Example of collision in Area 1

Collision Details: Case ID 90080474



County	AMADOR	City	UNINCORPORATED
Date (Y-M-D)	2015-12-14	Time	11:30
Nearby Intersection	SR-88 & SILVER DRIVE		
Coordinate Location	38.4534136, -120.5295913		
State Highway	Y	Route	- Postmile 0
Injured Victims	1	Fatalities	0
Alcohol	NO	Weather	Clear
Primary Collision Factor	Wrong Side of Road	Involved with	Fixed Object

Street View



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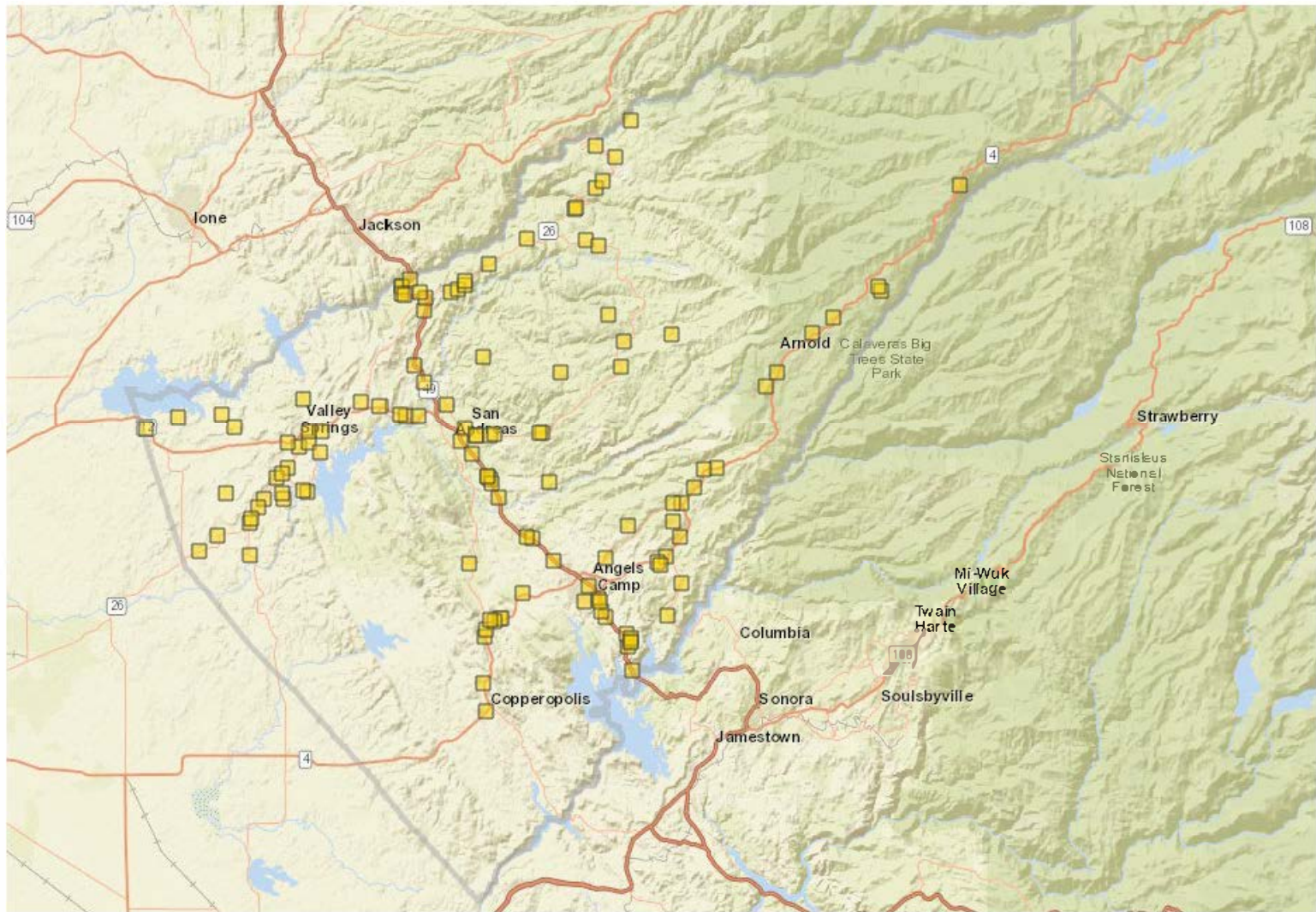
C. Potential Countermeasures

D. Overview

E. Summary

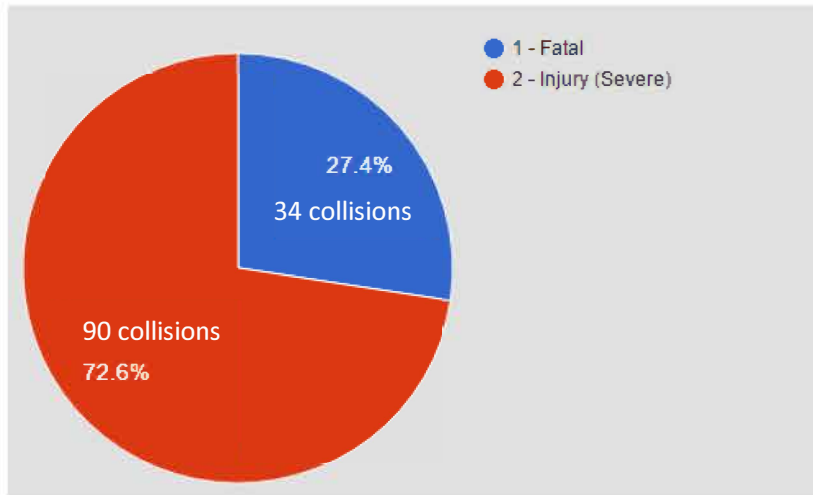
F. Questions / Contact Information

Calaveras County Road Departure collisions from 2011-2015



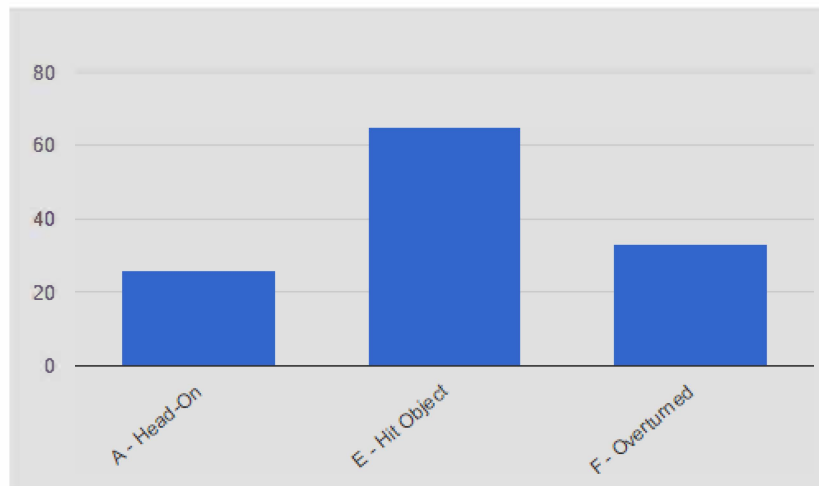
124 fatal or severe road departure collisions (head on, hit object and overturned collision factors) from 2011 to 2015

Calaveras County Summary Statistics



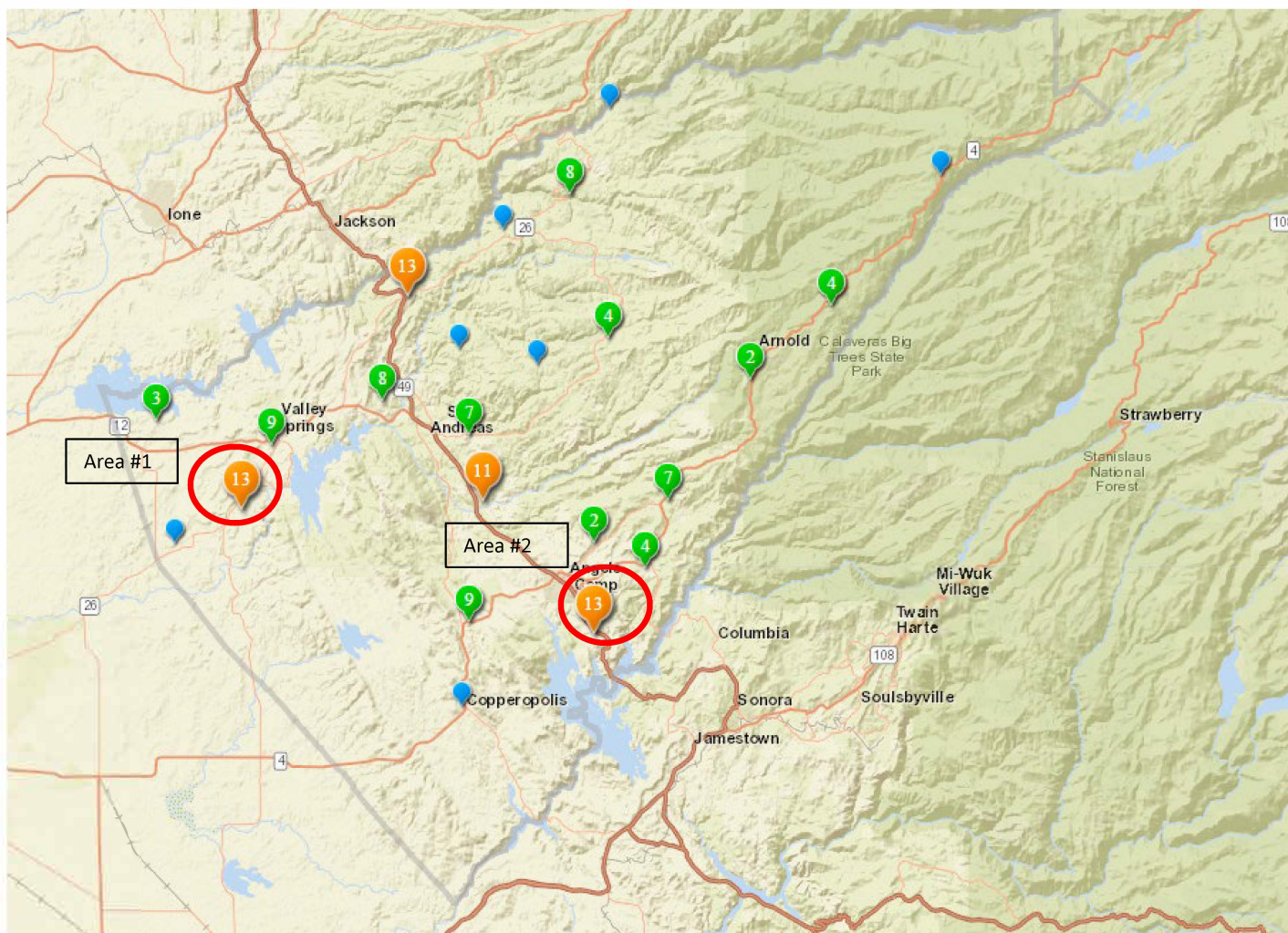
- Summary statistics for 124 collisions.

Primary Collision Factor	Collisions	Percentage
Improper Turning	38	30.6%
Driving or Bicycling Under the Influence of Alcohol or Drug	34	27.4%
Wrong Side of Road	26	21%
Unsafe Speed	16	12.9%
Automobile Right of Way	3	2.4%
Other Than Driver (or Pedestrian)	3	2.4%
Unknown	2	1.6%
- - Not Stated	1	0.8%
Other Hazardous Violation	1	0.8%

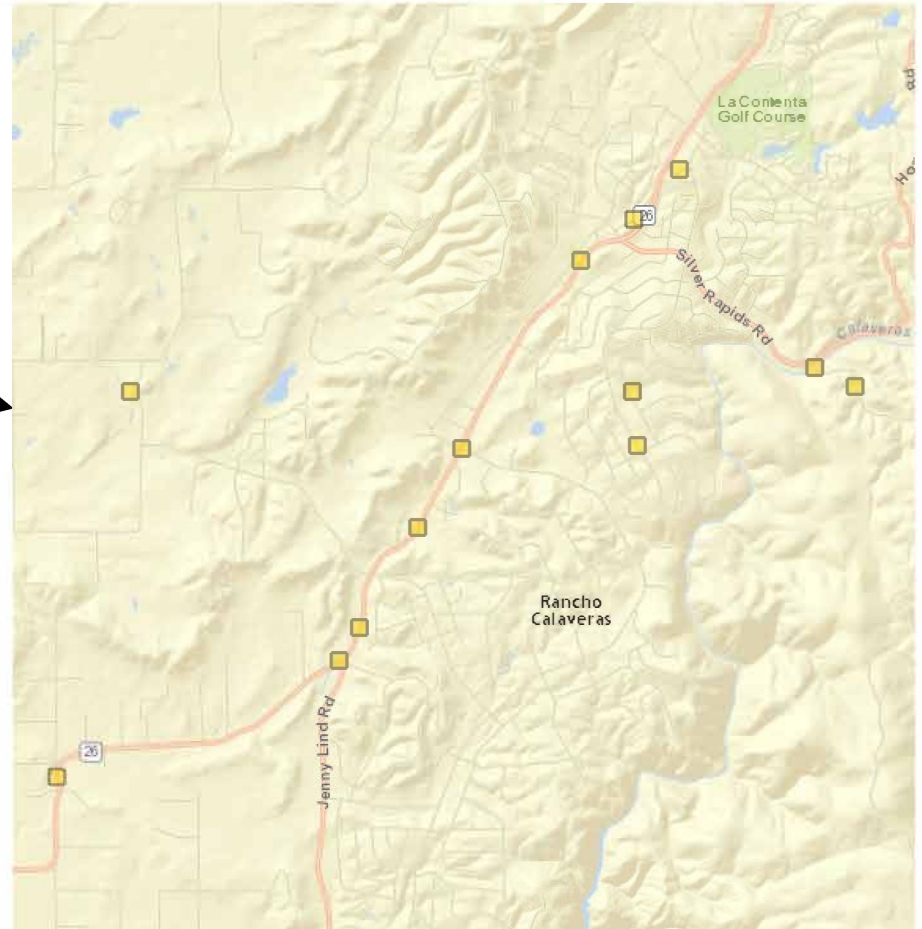
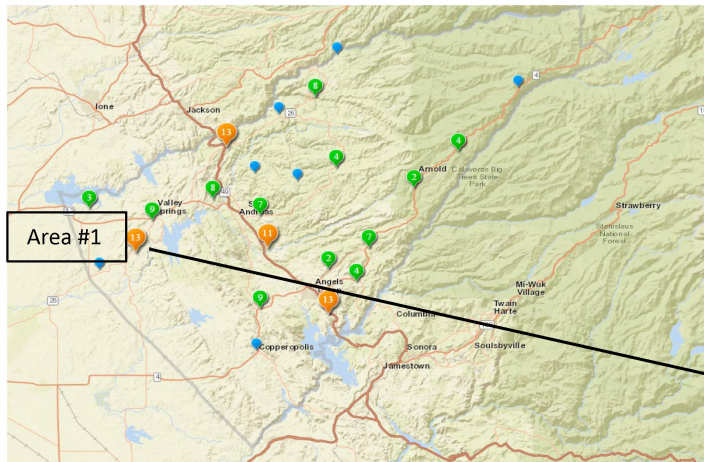


Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	65	52.4%
Non-Collision	31	25%
Other Motor Vehicle	24	19.4%
Other Object	2	1.6%
Bicycle	1	0.8%
Animal	1	0.8%

Calaveras County: Focus Areas

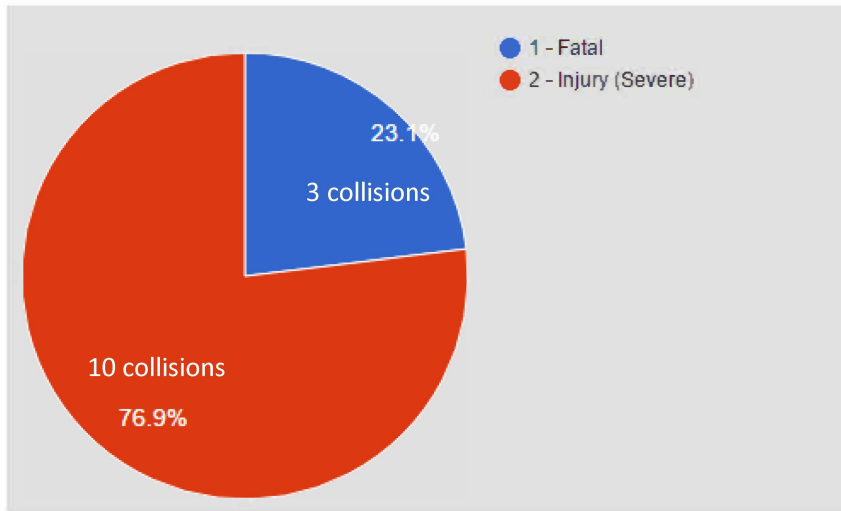


Calaveras County: Focus Area #1



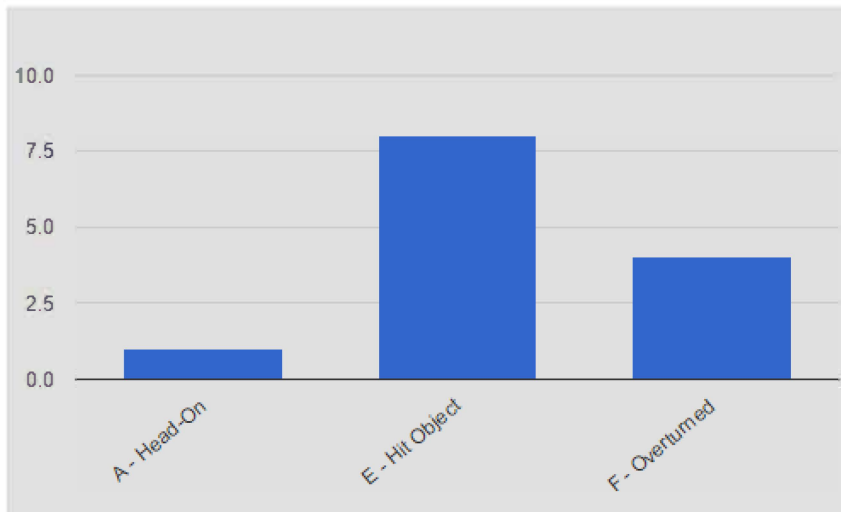
- 13 collisions in focus area

Calaveras County: Focus area #1 Summary Statistics



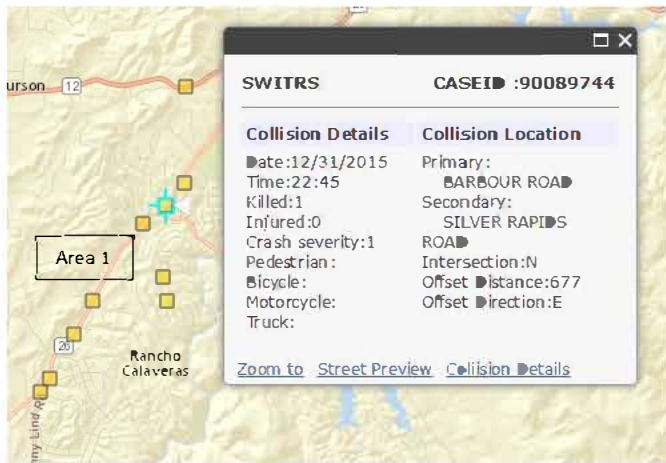
- 13 collisions in focus area

Primary Collision Factor	Collisions	Percentage
Driving or Bicycling Under the Influence of Alcohol or Drug	6	46.2%
Improper Turning	4	30.8%
Wrong Side of Road	2	15.4%
Unsafe Speed	1	7.7%



Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	8	61.5%
Non-Collision	4	30.8%
Other Motor Vehicle	1	7.7%

Calaveras County: Focus area #1



Example in Area 1

Collision Details: Case ID 90099744

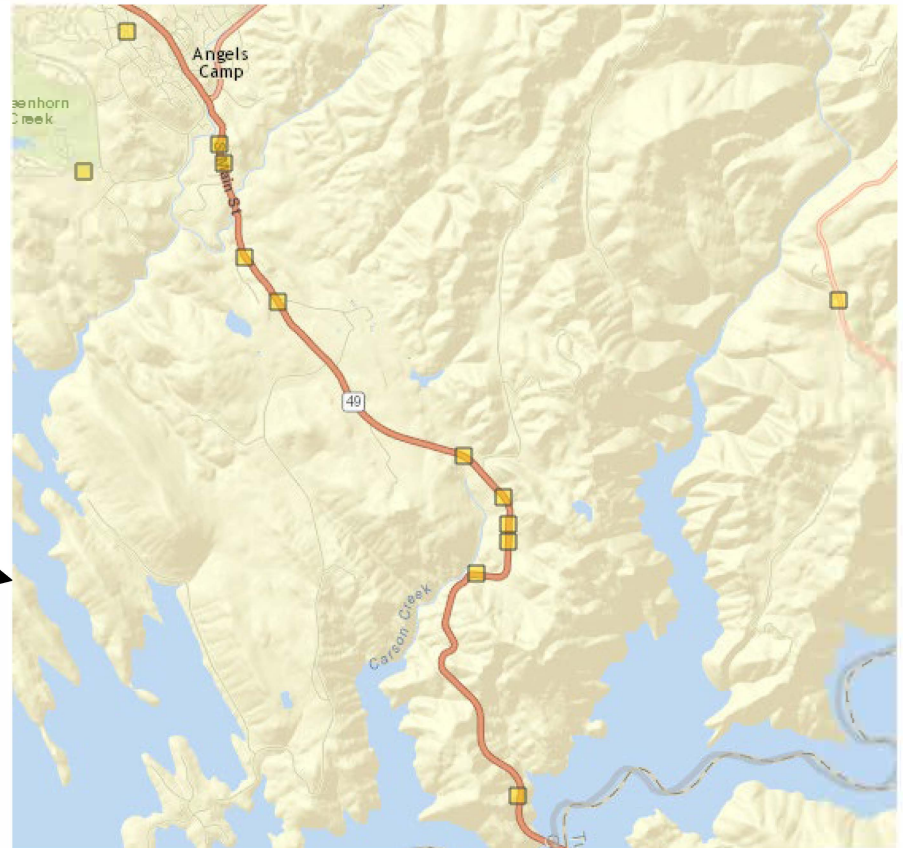
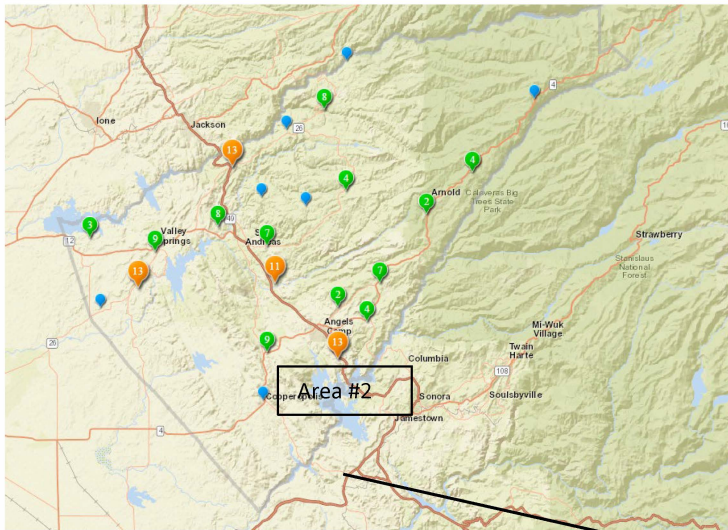


County	CALAVERAS	City	UNINCORPORATED
Date (Y-M-D)	2015-12-31	Time	22:45
Nearby Intersection	BARBOUR ROAD & SILVER RAPIDS ROAD		
Coordinate Location	38.1606437, -120.8453154		
State Highway	N	Route	-
Injured Victims	0	Fatalities	1
Alcohol	YES	Weather	Clear
Primary Collision Factor	Improper Turning	Involved vehicle	Non-Collision

Street View

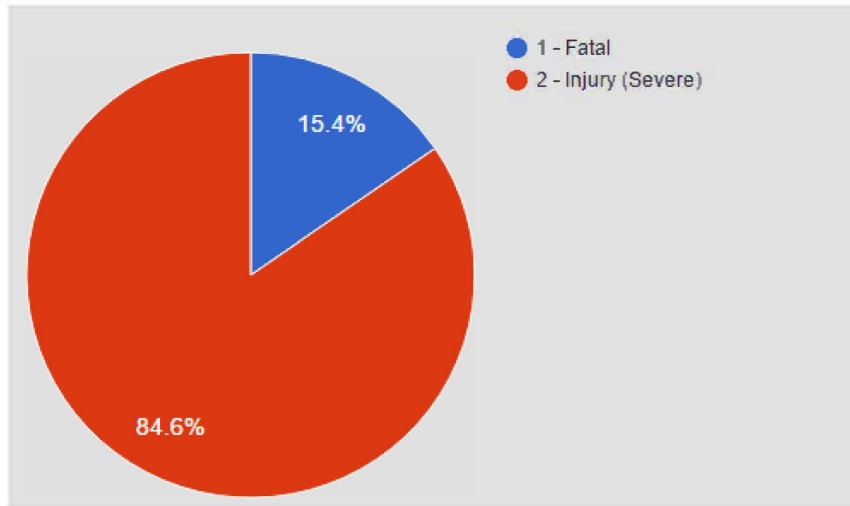


Calaveras County: Focus Area #2



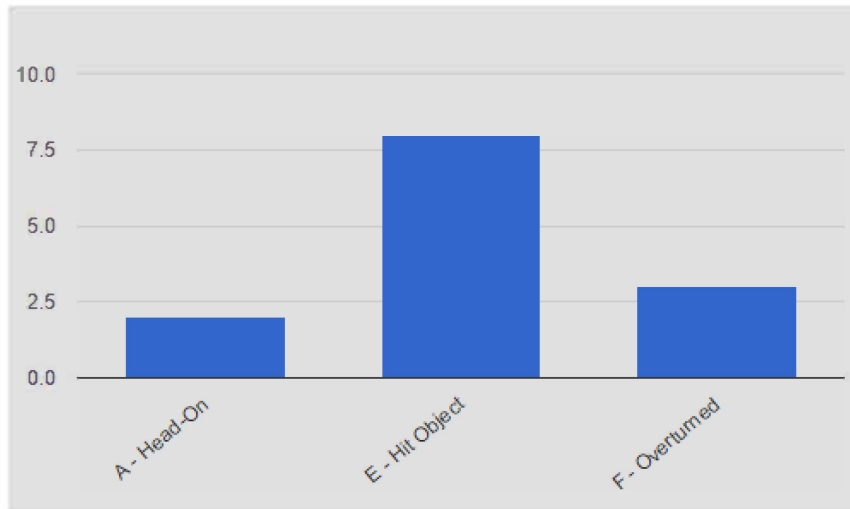
- 13 collisions in focus area

Calaveras County: Focus area #2 Summary Statistics



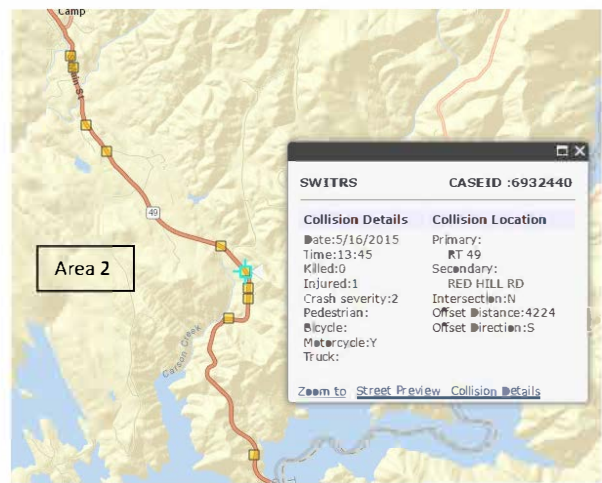
- 13 collisions in focus area

Primary Collision Factor	Collisions	Percentage
Improper Turning	4	30.8%
Wrong Side of Road	3	23.1%
Driving or Bicycling Under the Influence of Alcohol or Drug	2	15.4%
Unsafe Speed	2	15.4%
Automobile Right of Way	1	7.7%
Other Than Driver (or Pedestrian)	1	7.7%

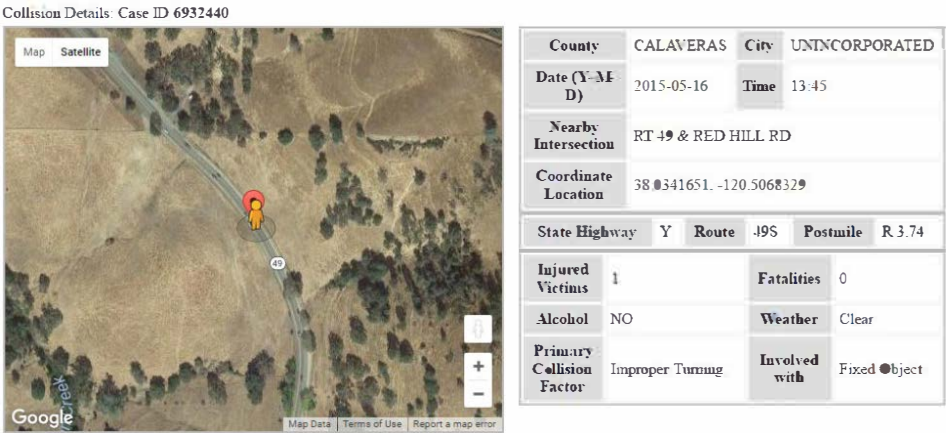


Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	8	61.5%
Non-Collision	3	23.1%
Bicycle	1	7.7%
Animal	1	7.7%

Calaveras County: Focus area #2



Example in Area 2



Topics

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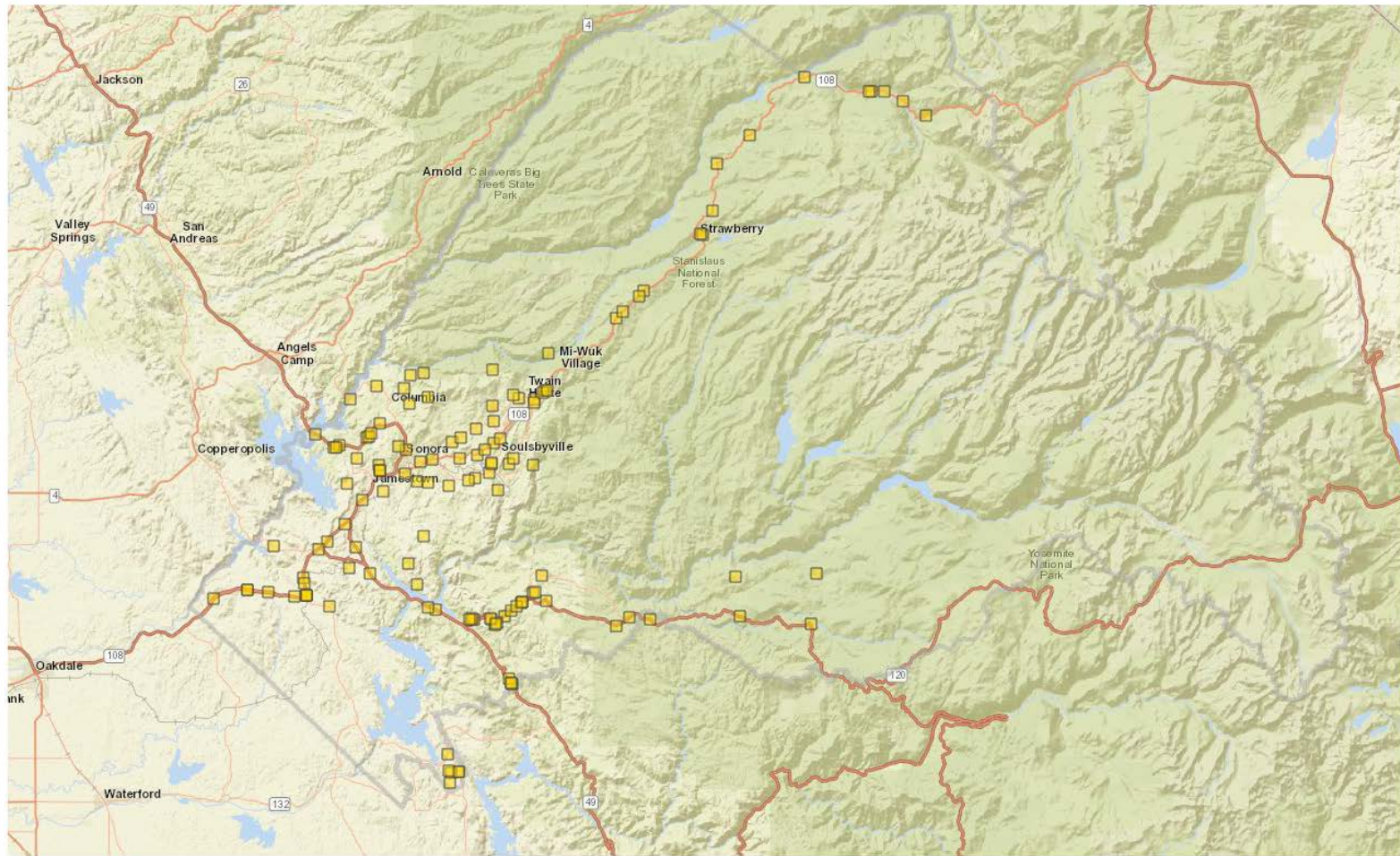
C. Potential Countermeasures

D. Overview

E. Summary

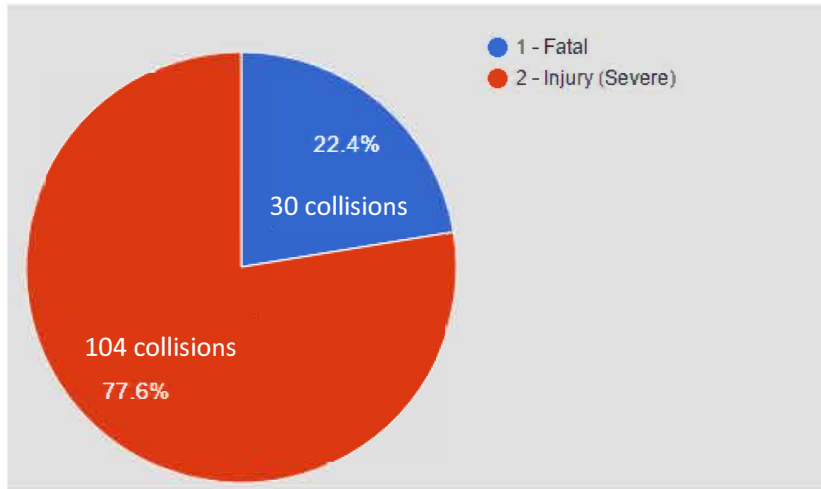
F. Questions / Contact Information

Tuolumne County Road Departure collisions from 2011-2015



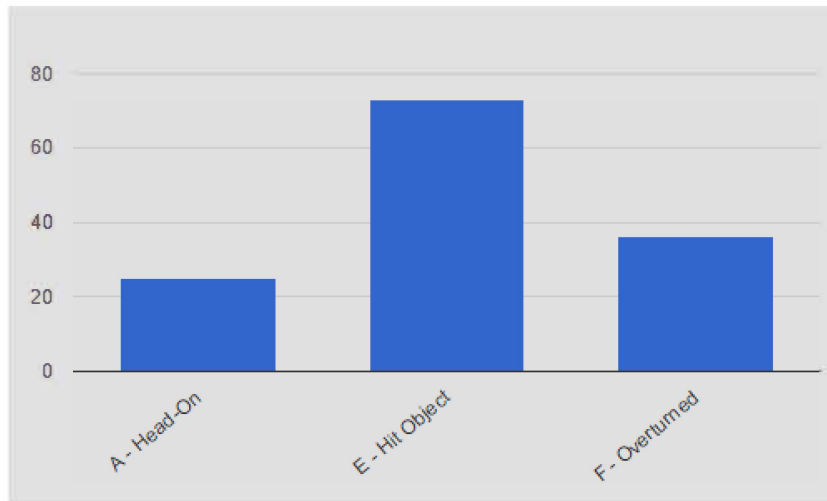
134 fatal or severe road departure collisions (head on, hit object and overturned collision factors) from 2011 to 2015 in all of Tuolumne County

Tuolumne County Summary Statistics



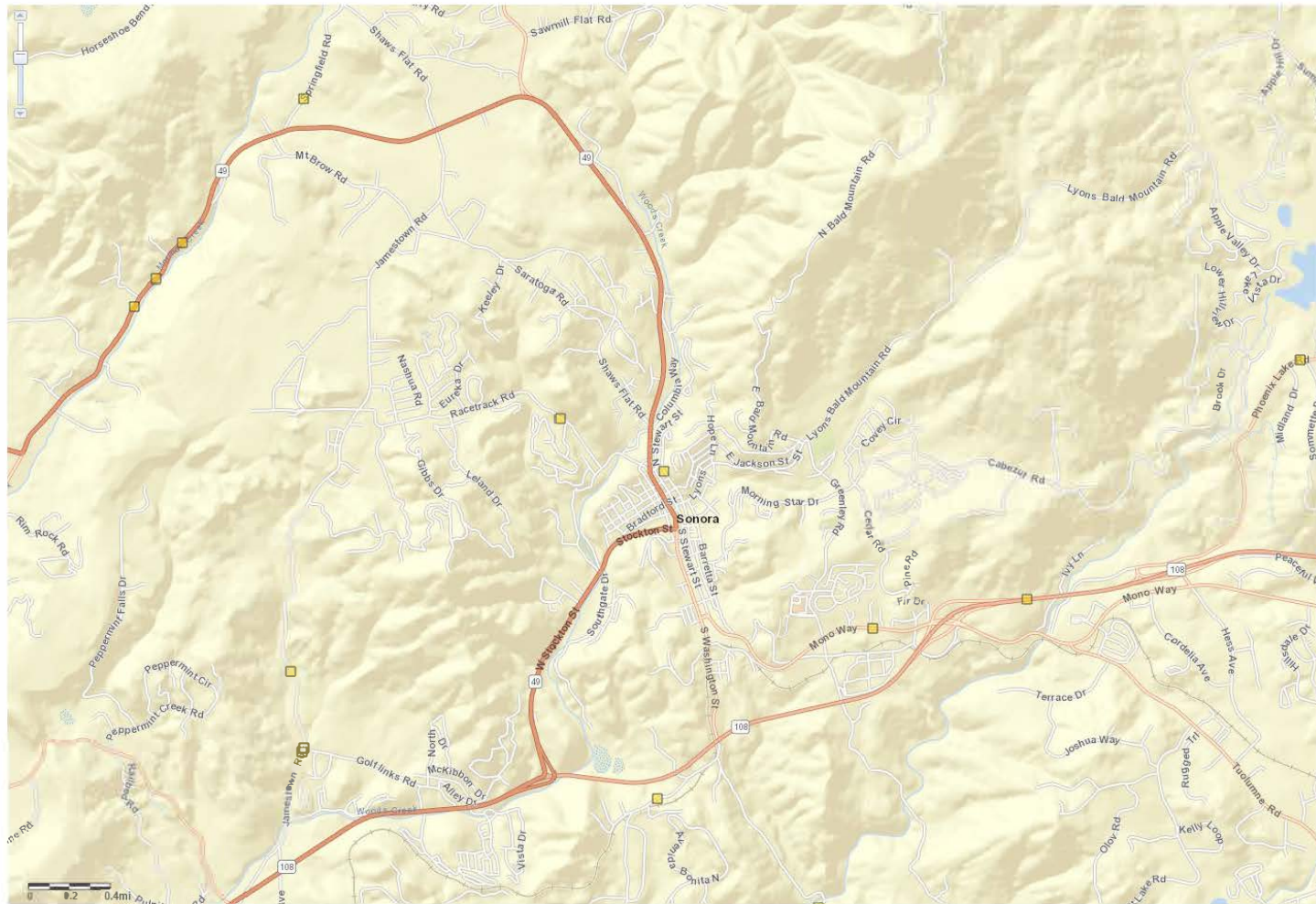
- Summary statistics for 134 collisions.

Primary Collision Factor	Collisions	Percentage
Improper Turning	50	37.3%
Driving or Bicycling Under the Influence of Alcohol or Drug	41	30.6%
Unsafe Speed	21	15.7%
Wrong Side of Road	19	14.2%
Other Than Driver (or Pedestrian)	2	1.5%
Unsafe Starting or Backing	1	0.7%



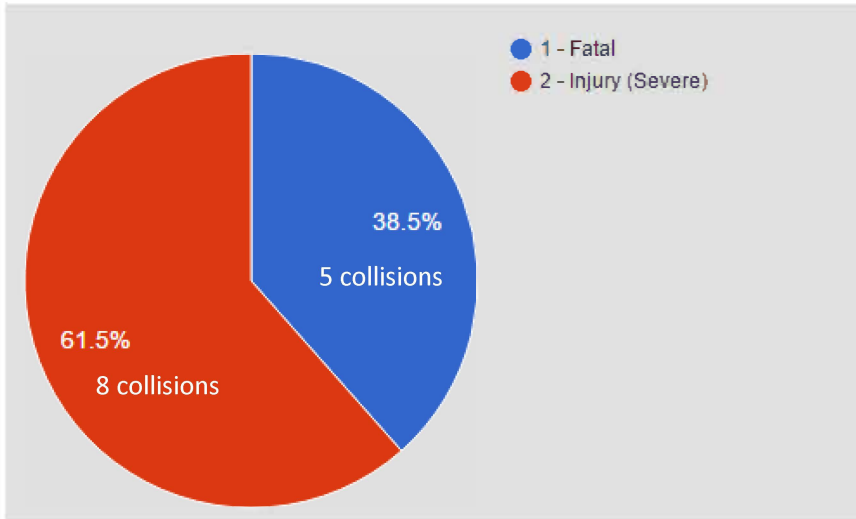
Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	70	52.2%
Non-Collision	34	25.4%
Other Motor Vehicle	24	17.9%
Other Object	5	3.7%
Bicycle	1	0.7%

Tuolumne County, greater Sonora area Road Departure collisions from 2011-2015



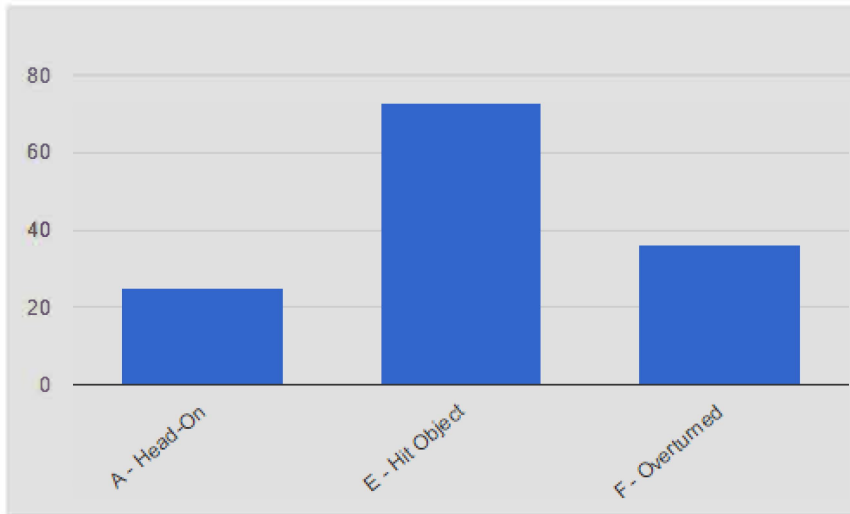
13 fatal or severe road departure collisions (head on, hit object and overturned collision factors) from 2011 to 2015 in Sonora City

Tuolumne County greater Sonora area



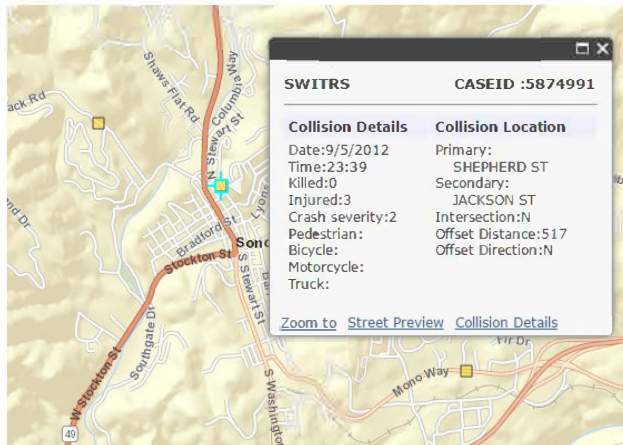
- 13 collisions

Primary Collision Factor	Collisions	Percentage
Driving or Bicycling Under the Influence of Alcohol or Drug	6	46.2%
Wrong Side of Road	3	23.1%
Improper Turning	3	23.1%
Unsafe Speed	1	7.7%

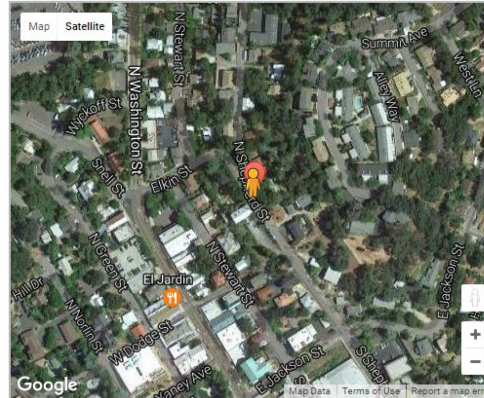


Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	5	38.5%
Other Motor Vehicle	4	30.8%
Non-Collision	2	15.4%
Other Object	2	15.4%

Tuolumne County Sonora City



Collision Details: Case ID 5874991



County	TUOLUMNE	City	SONORA
Date (Y-M-D)	2012-09-05	Time	23:39
Nearby Intersection	SHEPHERD ST & JACKSON ST		
Coordinate Location	37.9870660576, -120.38327252		
State Highway	N	Route	Postmile
Injured Victims	3	Fatalities	0
Alcohol	YES	Weather	Cloudy
Primary Collision Factor	Driving or Bicycling Under the Influence of Alcohol or Drug		
		Involved with	Fixed Object

Example of road departure collision in Sonora

Street View



Topics

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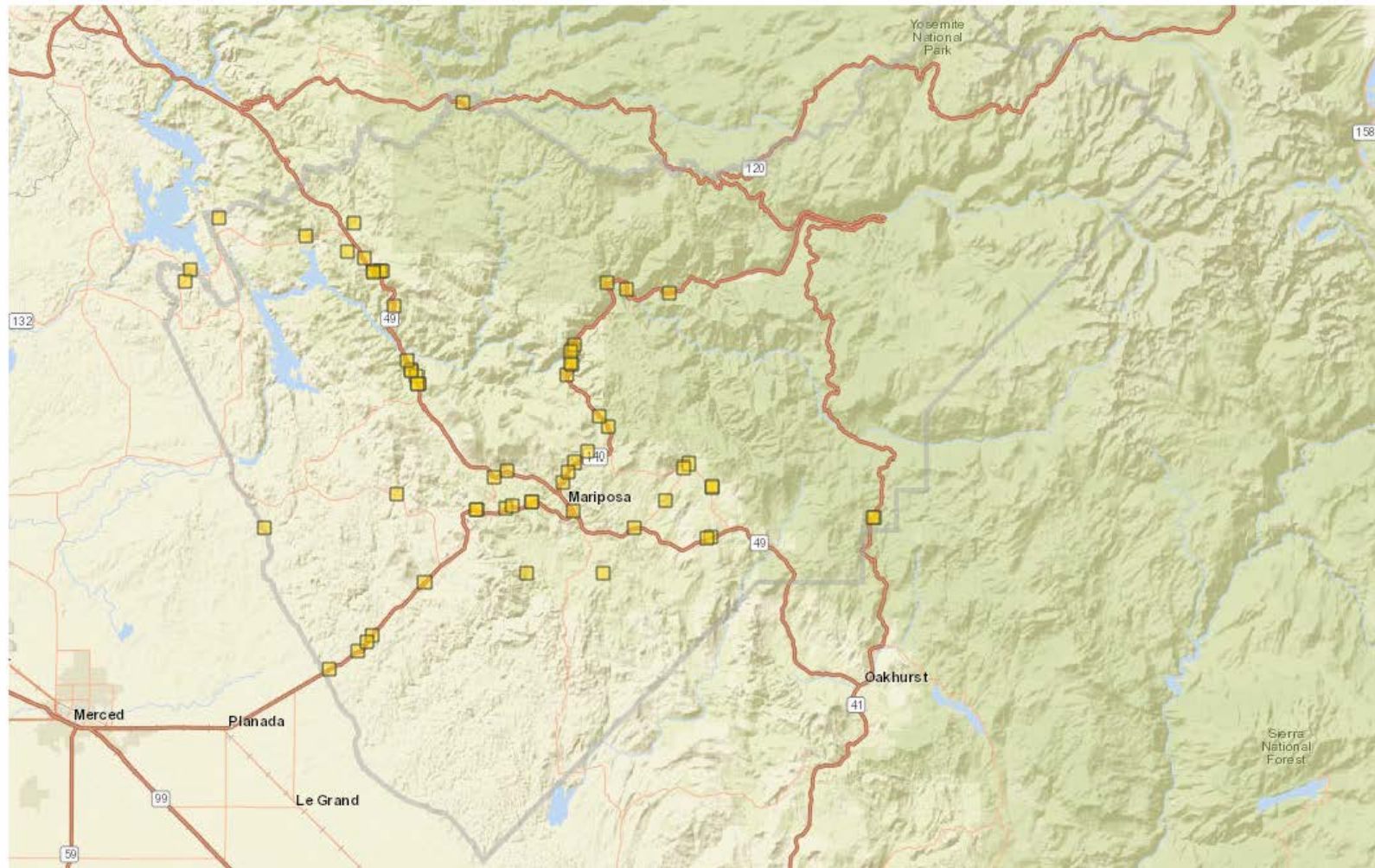
C. Potential Countermeasures

D. Overview

E. Summary

F. Questions / Contact Information

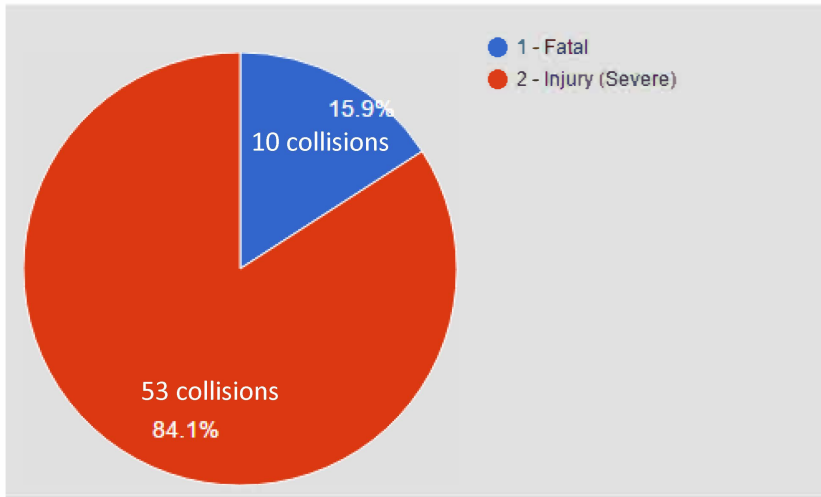
Mariposa County Road Departure collisions from 2011-2015



Note: Only 63 of 73 collisions geo-coded.

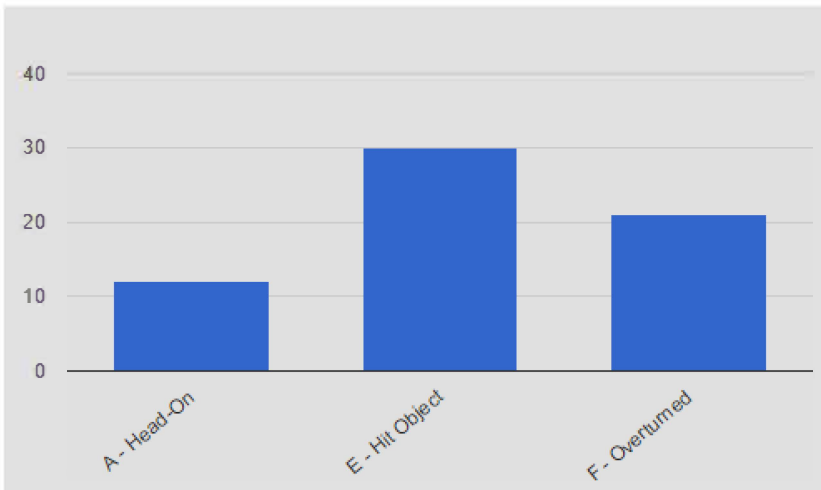
63 fatal or severe road departure collisions (head on, hit object and overturned collision factors) from 2011 to 2015

Mariposa County Summary Statistics



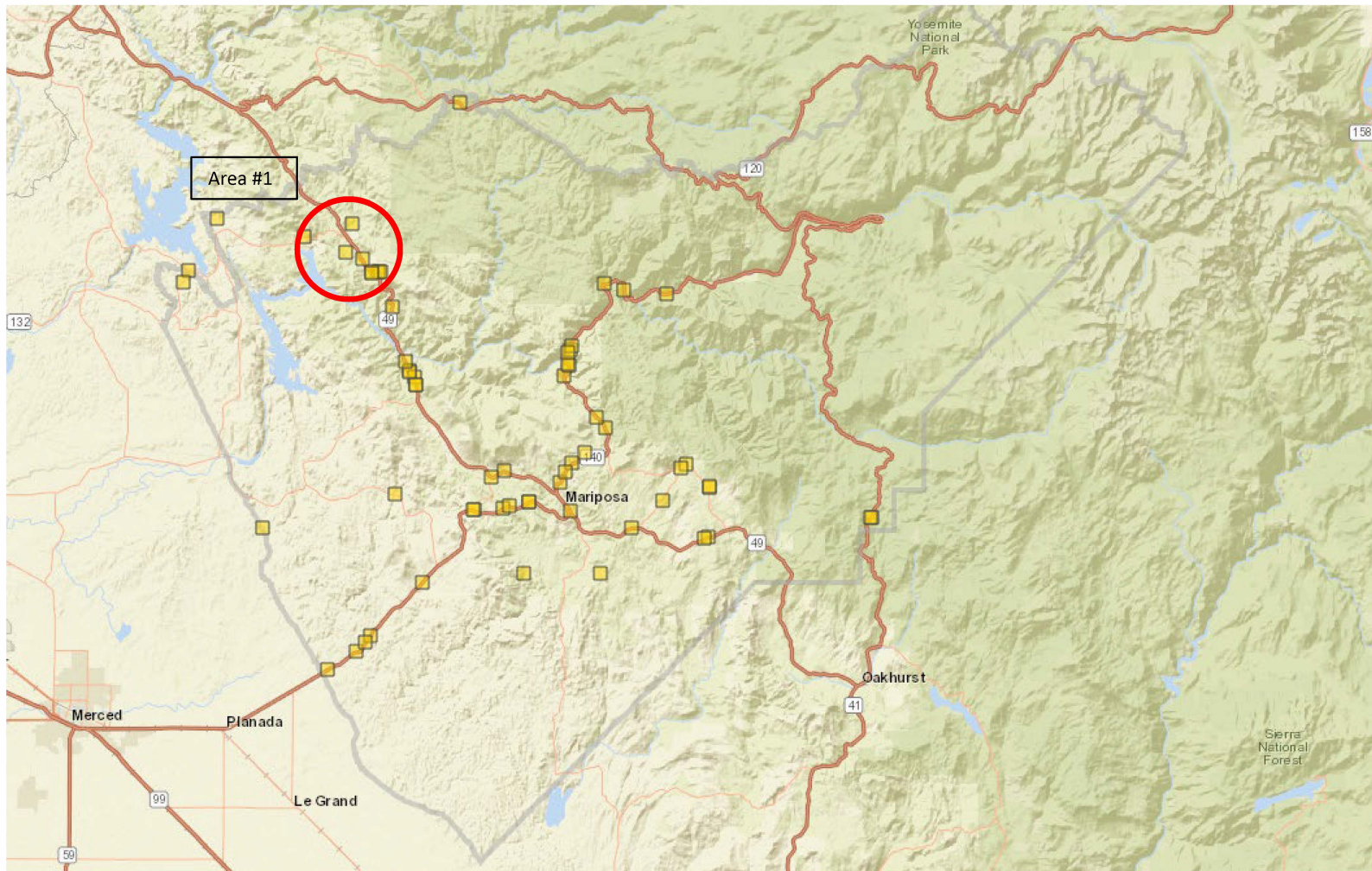
- Summary statistics for 63 collisions

Primary Collision Factor	Collisions	Percentage
Improper Turning	21	33.3%
Unsafe Speed	18	28.6%
Driving or Bicycling Under the Influence of Alcohol or Drug	11	17.5%
Wrong Side of Road	7	11.1%
Automobile Right of Way	2	3.2%
Other Than Driver (or Pedestrian)	2	3.2%
Improper Passing	1	1.6%
Other Equipment	1	1.6%

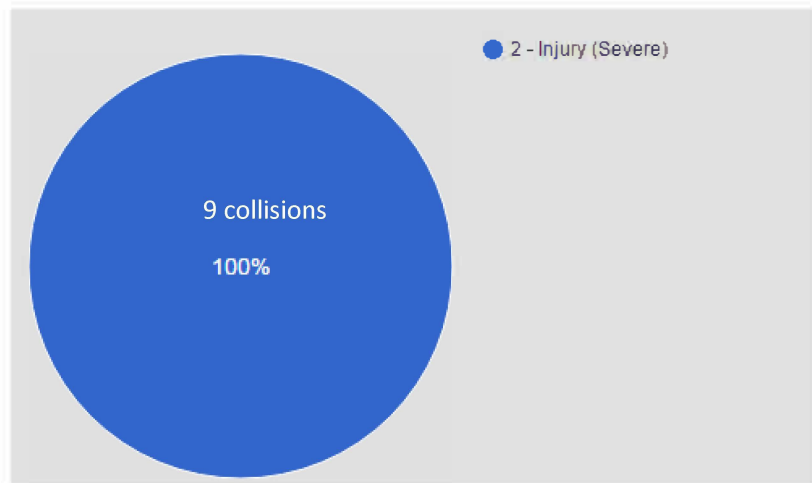


Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	31	49.2%
Non-Collision	20	31.7%
Other Motor Vehicle	11	17.5%
Bicycle	1	1.6%

Mariposa County: Focus Area

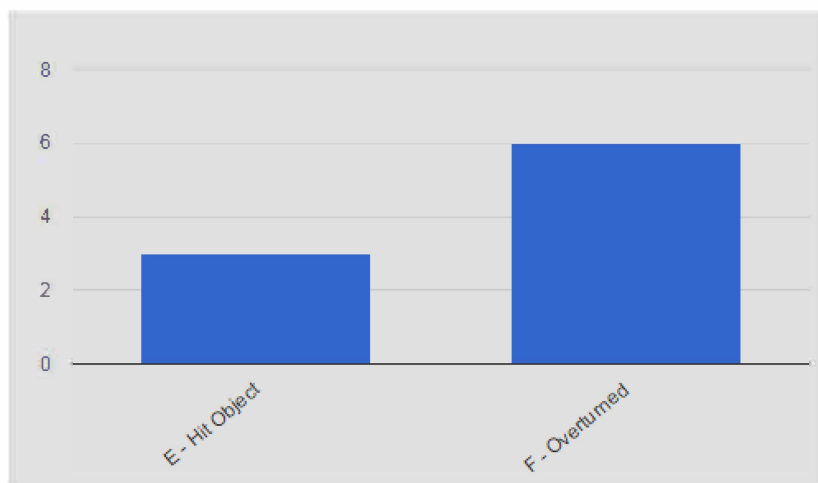


Mariposa County Focus Area



- Summary statistics for 9 collisions.

Primary Collision Factor	Collisions	Percentage
Improper Turning	5	55.6%
Unsafe Speed	4	44.4%



Motor Vehicle Involved With	Collisions	Percentage
Non-Collision	6	66.7%
Fixed Object	3	33.3%

Mariposa County: Focus area

(1 of 3)

SWITRS

CASEID :5205892

Collision Details

Collision Location

Date:6/2/2011

Time:09:35

Killed:0

Injured:3

Crash severity:2

Pedestrian:

Bicycle:

Motorcycle:Y

Truck:

Primary:

RT 49

Secondary:

SCHILLING RD

Intersection:N

Offset Distance:9504

Offset Direction:N

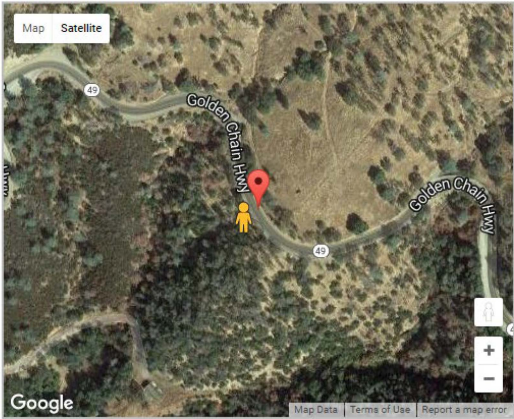
[Zoom to](#)

[Street Preview](#)

[Collision Details](#)



Collision Details: Case ID 5205892



County	MARIPOSA	City	UNINCORPORATED
Date (Y-M-D)	2011-06-02	Time	09:35
Nearby Intersection	RT 49 & SCHILLING RD		
Coordinate Location	37.6776892845, -120.161563588		
State Highway	Y	Route	49N Postmile 41.1
Injured Victims	3	Fatalities	0
Alcohol	NO	Weather	Clear
Primary Collision Factor	Improper Turning	Involved with	Non-Collision

Example in Area 1

Street View



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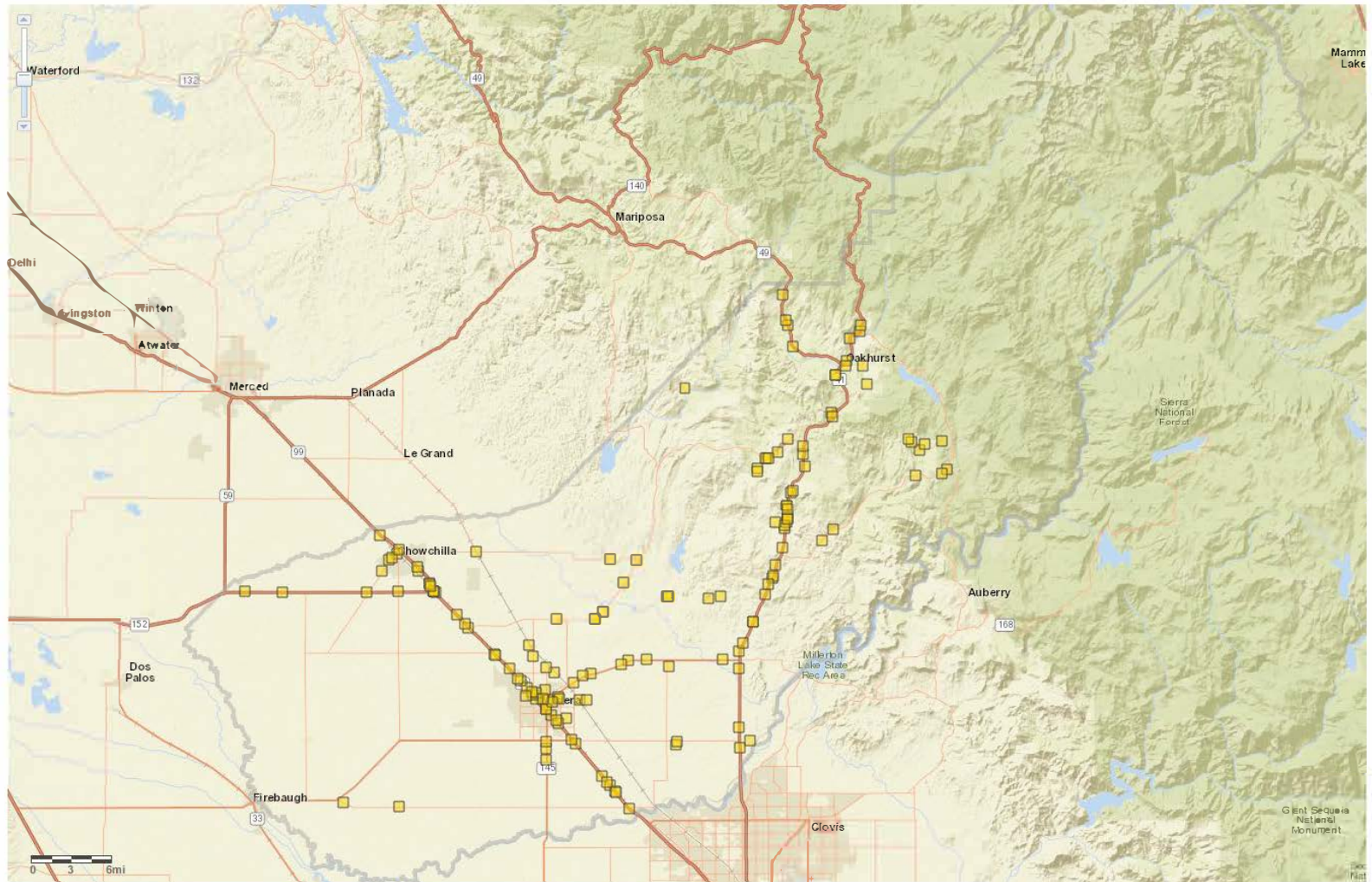
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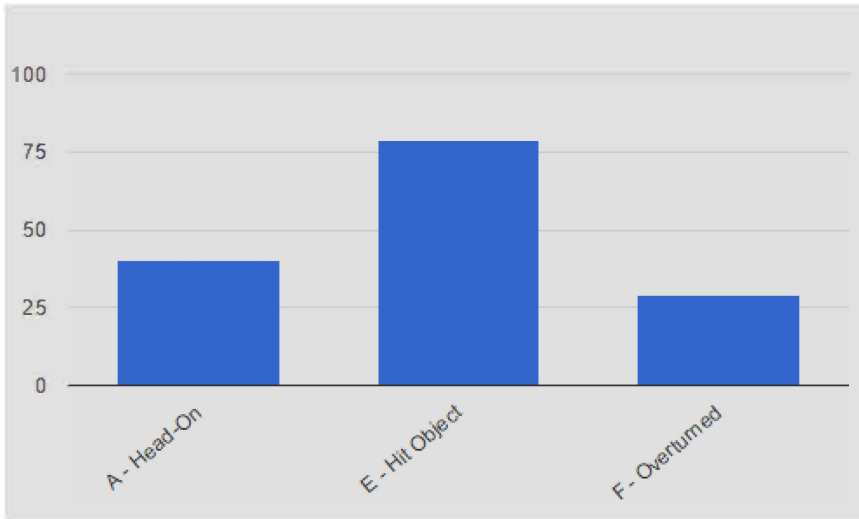
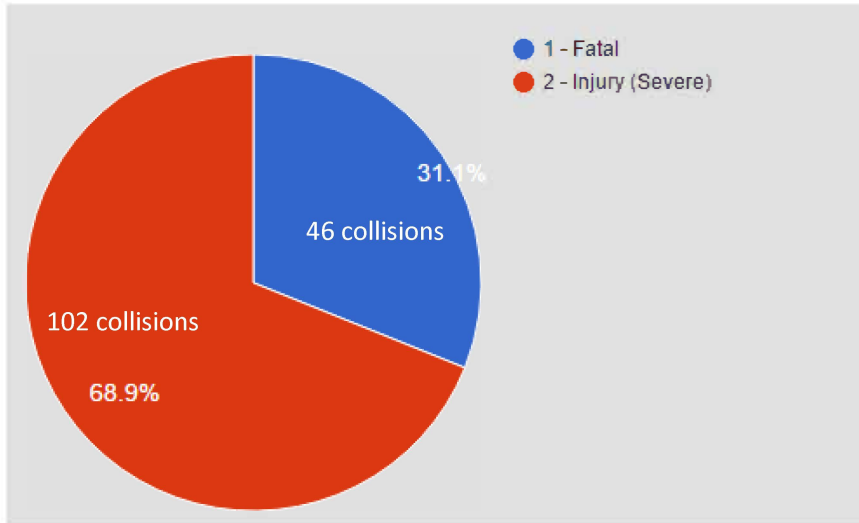
F. Questions / Contact Information

Madera County Road Departure collisions from 2011-2015



148 fatal or severe road departure collisions (head on, hit object and overturned collision factors) from 2011 to 2015

Madera County Summary Statistics

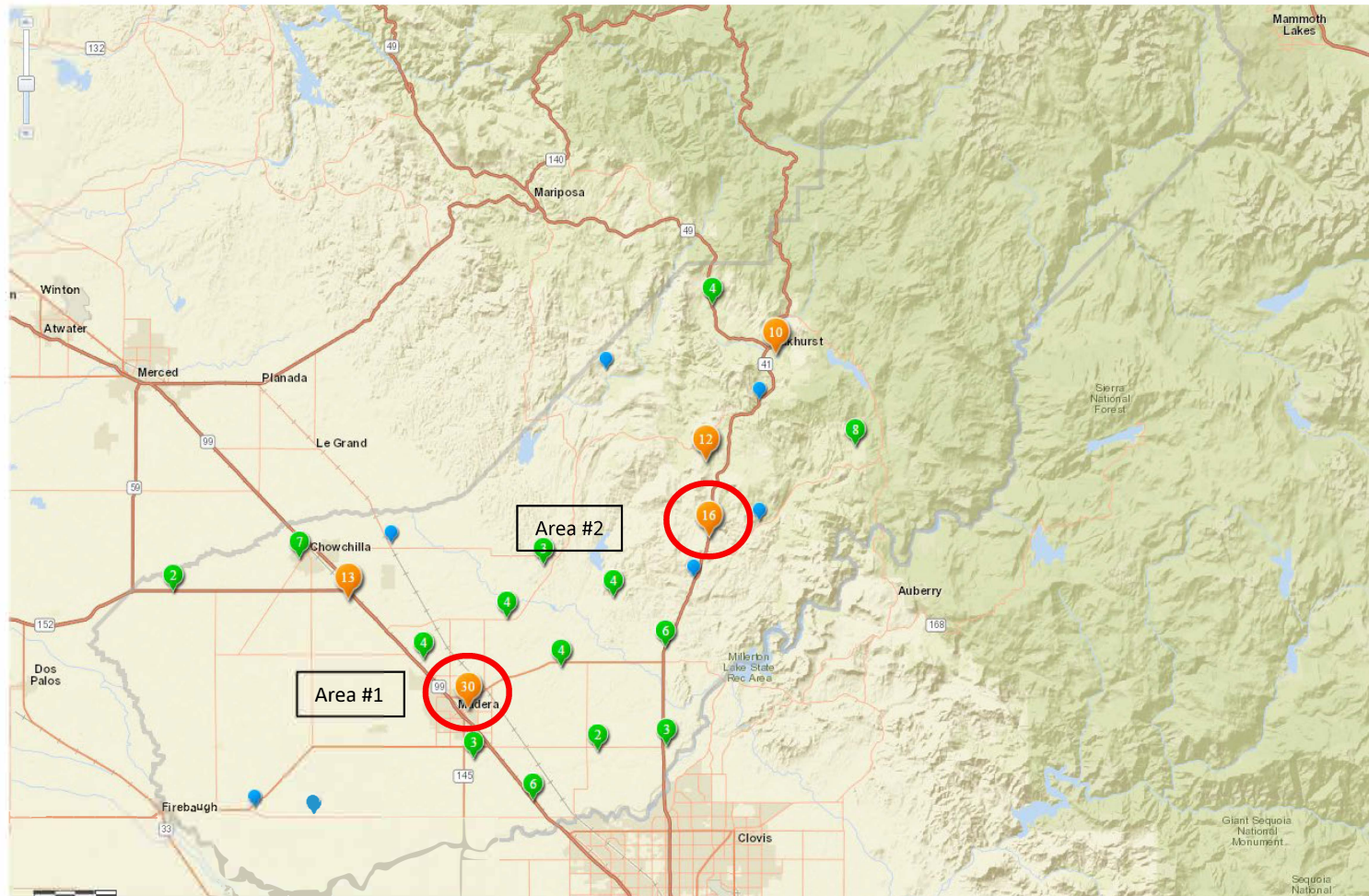


- Summary statistics for 148 collisions

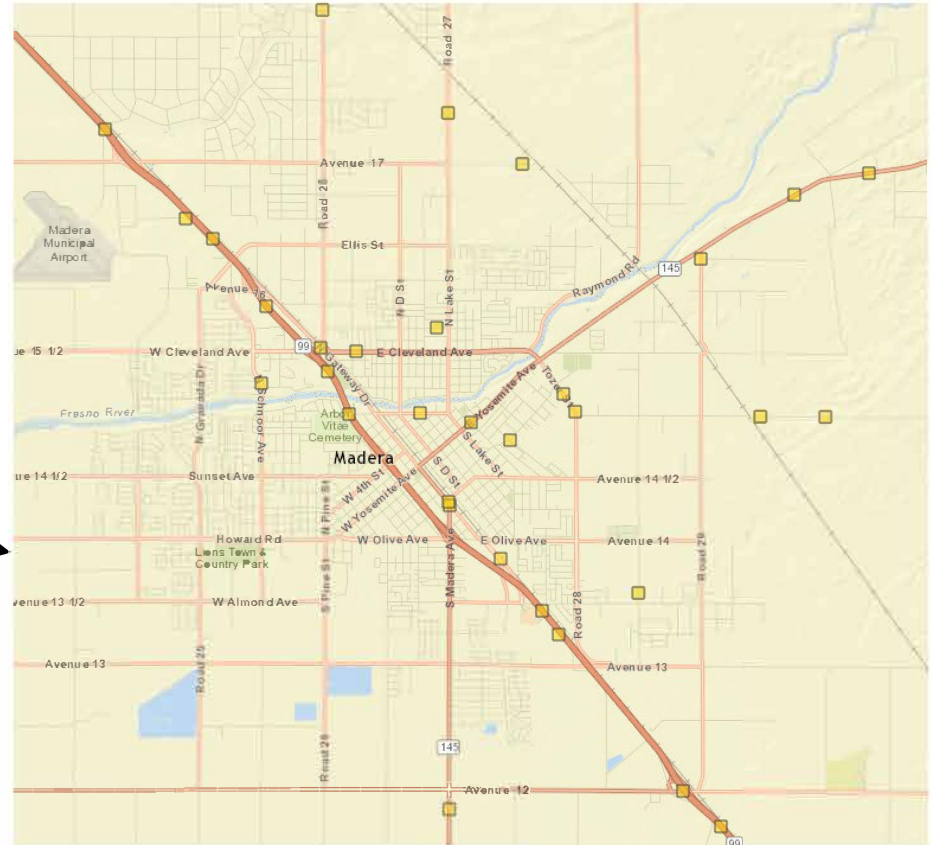
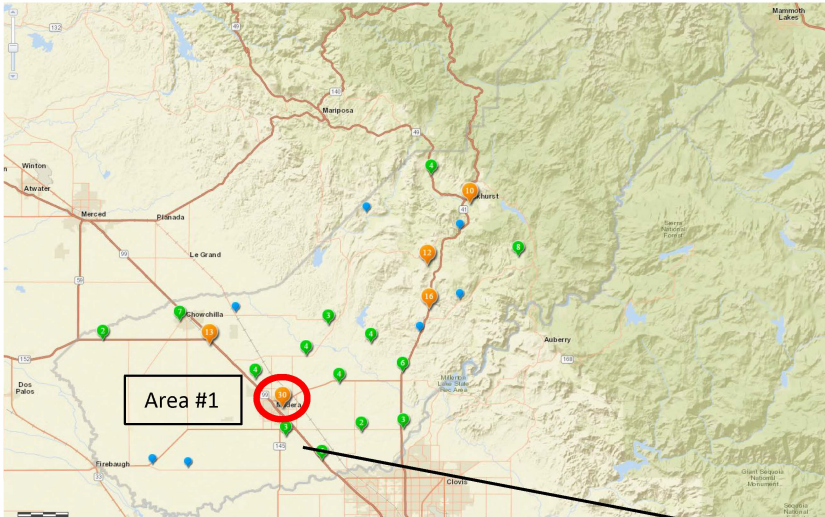
Primary Collision Factor	Collisions	Percentage
Driving or Bicycling Under the Influence of Alcohol or Drug	54	36.5%
Improper Turning	46	31.1%
Wrong Side of Road	21	14.2%
Unsafe Speed	13	8.8%
Other Than Driver (or Pedestrian)	4	2.7%
Automobile Right of Way	3	2%
Unsafe Lane Change	2	1.4%
Unknown	1	0.7%
Improper Passing	1	0.7%
Pedestrian Violation	1	0.7%
Traffic Signals and Signs	1	0.7%
Other Improper Driving	1	0.7%

Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	76	51.4%
Other Motor Vehicle	38	25.7%
Non-Collision	26	17.6%
Other Object	6	4.1%
Pedestrian	1	0.7%
Bicycle	1	0.7%

Madera County: Focus Areas

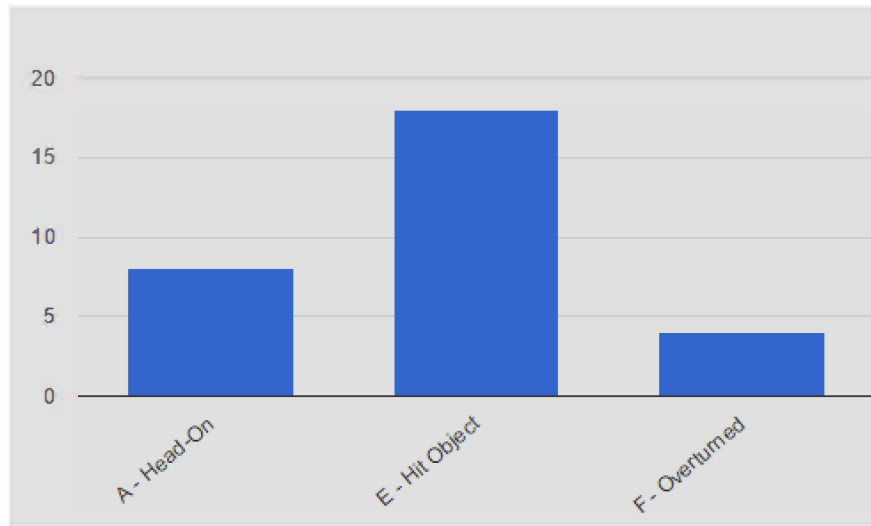
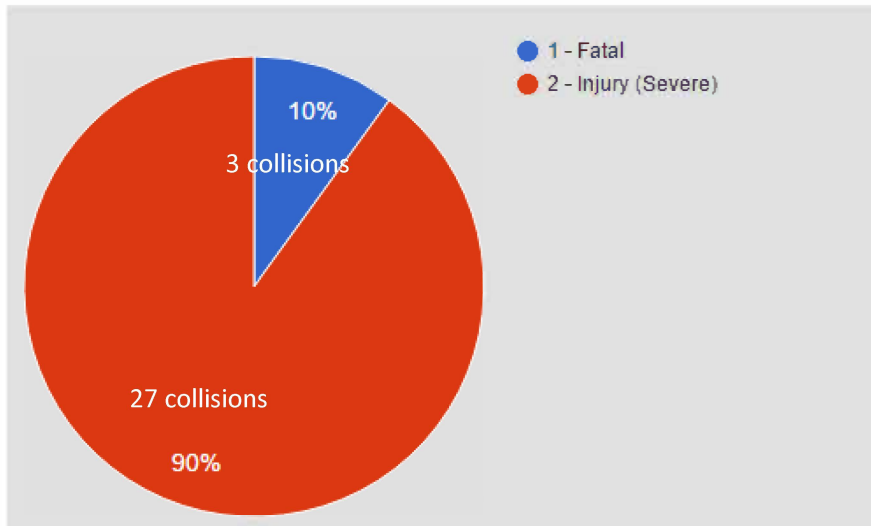


Madera County: Focus Area #1



- 30 collisions in focus area

Madera County: Focus area #1 Summary Statistics

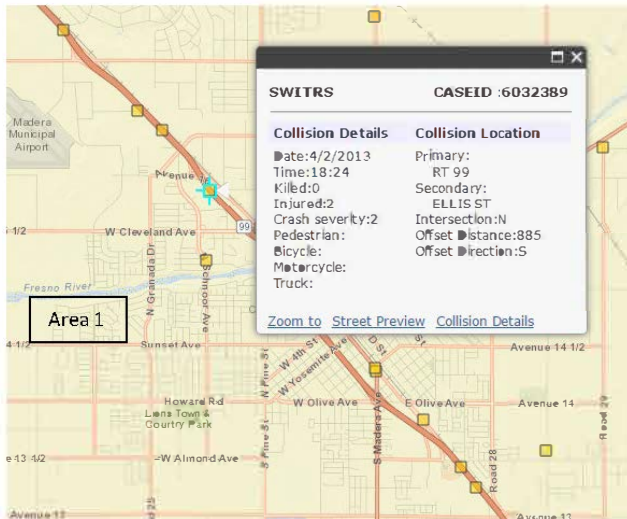


- 30 collisions in focus area

Primary Collision Factor	Collisions	Percentage
Driving or Bicycling Under the Influence of Alcohol or Drug	13	43.3%
Improper Turning	6	20%
Unsafe Speed	4	13.3%
Wrong Side of Road	2	6.7%
Automobile Right of Way	2	6.7%
Unsafe Lane Change	1	3.3%
Pedestrian Violation	1	3.3%
Traffic Signals and Signs	1	3.3%

Motor Vehicle Involved With	Collisions	Percentage
Fixed Object	18	60%
Other Motor Vehicle	5	16.7%
Non-Collision	3	10%
Other Object	2	6.7%
Pedestrian	1	3.3%
Bicycle	1	3.3%

Madera County: Focus area #1



Example in Area 1

Collision Details: Case ID 6032389

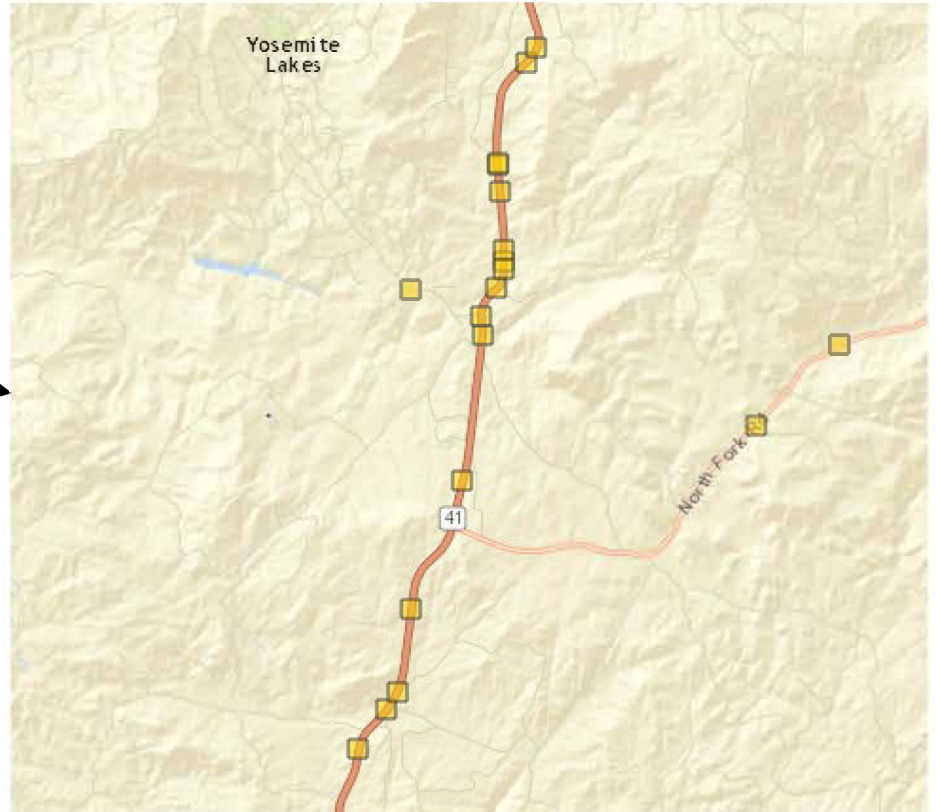
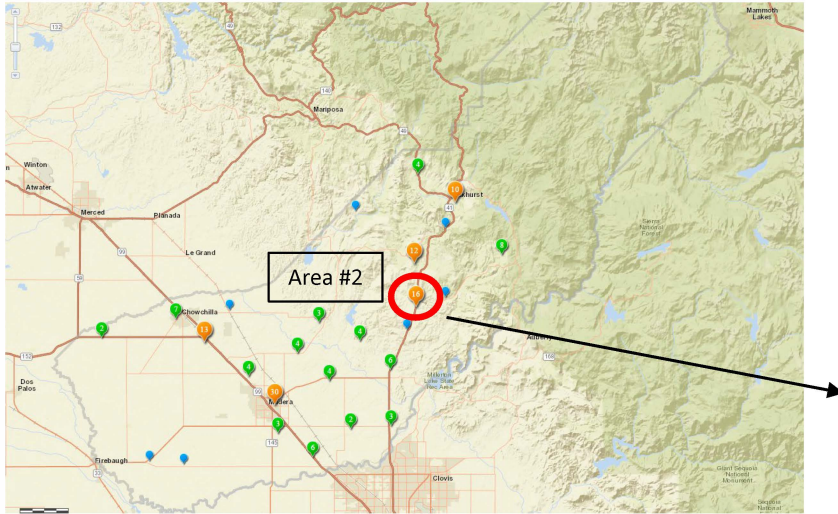


County	MADERA	City	MADERA
Date (Y-M-D)	2013-04-02	Time	18.24
Nearby Intersection	RT 99 & ELLIS ST		
Coordinate Location	36.977629, -120.082606		
State Highway	Y	Route	99S Postmile 12.68
Injured Victims	2	Fatalities	0
Alcohol	N	Weather	Clear
Primary Collision Factor	Improper Turning	Involved with	Non-Collision

Street View

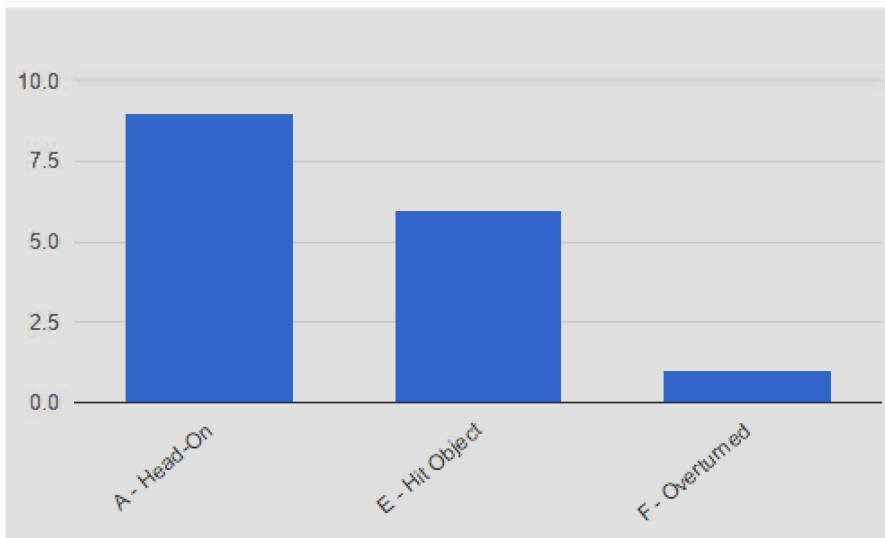
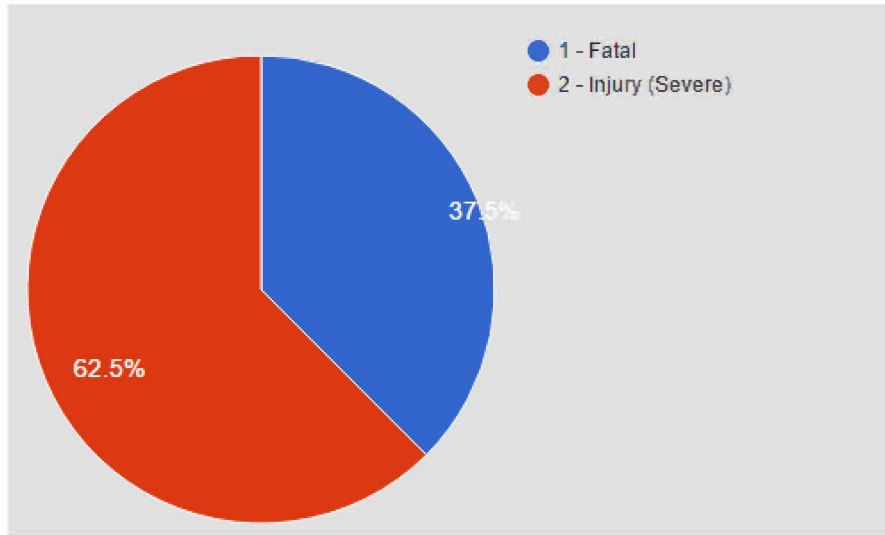


Madera County: Focus Area #2



- 16 collisions in focus area

Madera County: Focus area #2 Summary Statistics

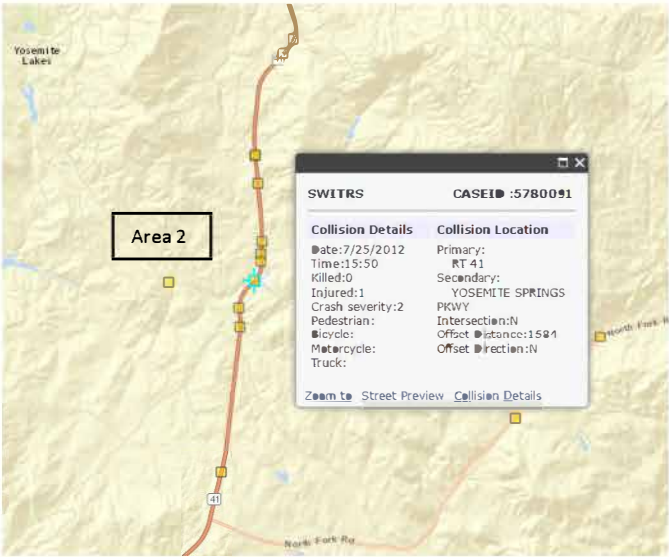


- 16 collisions in focus area

Primary Collision Factor	Collisions	Percentage
Driving or Bicycling Under the Influence of Alcohol or Drug	7	43.8%
Wrong Side of Road	4	25%
Improper Turning	4	25%
Unsafe Speed	1	6.3%

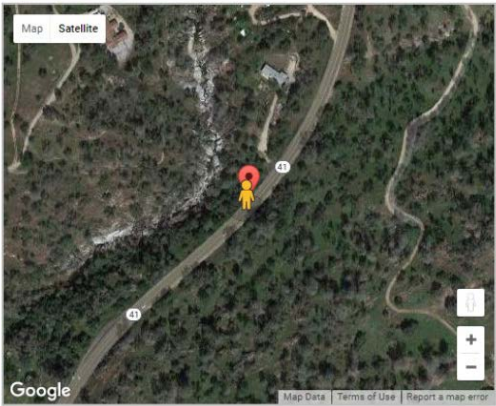
Motor Vehicle Involved With	Collisions	Percentage
Other Motor Vehicle	9	56.3%
Fixed Object	6	37.5%
Non-Collision	1	6.3%

Madera County: Focus area #2



Example in Area 2

Collision Details: CaseID 5780091



County	MADERA	City	UNINCORPORATED
Date (Y-M-D)	2012-07-25	Time	15:50
Nearby Intersection	RT 41 & YOSEMITE SPRINGS PKWY		
Coordinate Location	37.158846968, -119.728888233		
State Highway	Y	Route	41N Postmile 20.32
Injured Victims	1	Fatalities	0
Alcohol	NO	Weather	Clear
Primary Collision Factor	Improper Turning	Involved with	Fixed Object

Street View



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Type of countermeasures applied to listed counties

County	CLRS	ELRS	SRS	ADL	HFS	GR	TR	UP	EEA	EES	II	CMB	3E	Total
State Overall	536	2053	3252	1170	179	76	345	21	209	95	120	25	3	8084
Amador	13	26	21	2	1		5				1			69
Calaveras	15	66	43	6	2		15				2			149
Madera	6	15	37	16			8	1	1		2			86
Tuolumne	13	32	17	6			9			2	3			82

Number of countermeasures implemented by county

County	Urban	Rural	Total Number of Implementation
State Overall	969	6337	7306
Amador		67	67
Calaveras		138	138
Madera	3	79	82
Tuolumne		73	73

Countermeasure Name Abbreviation

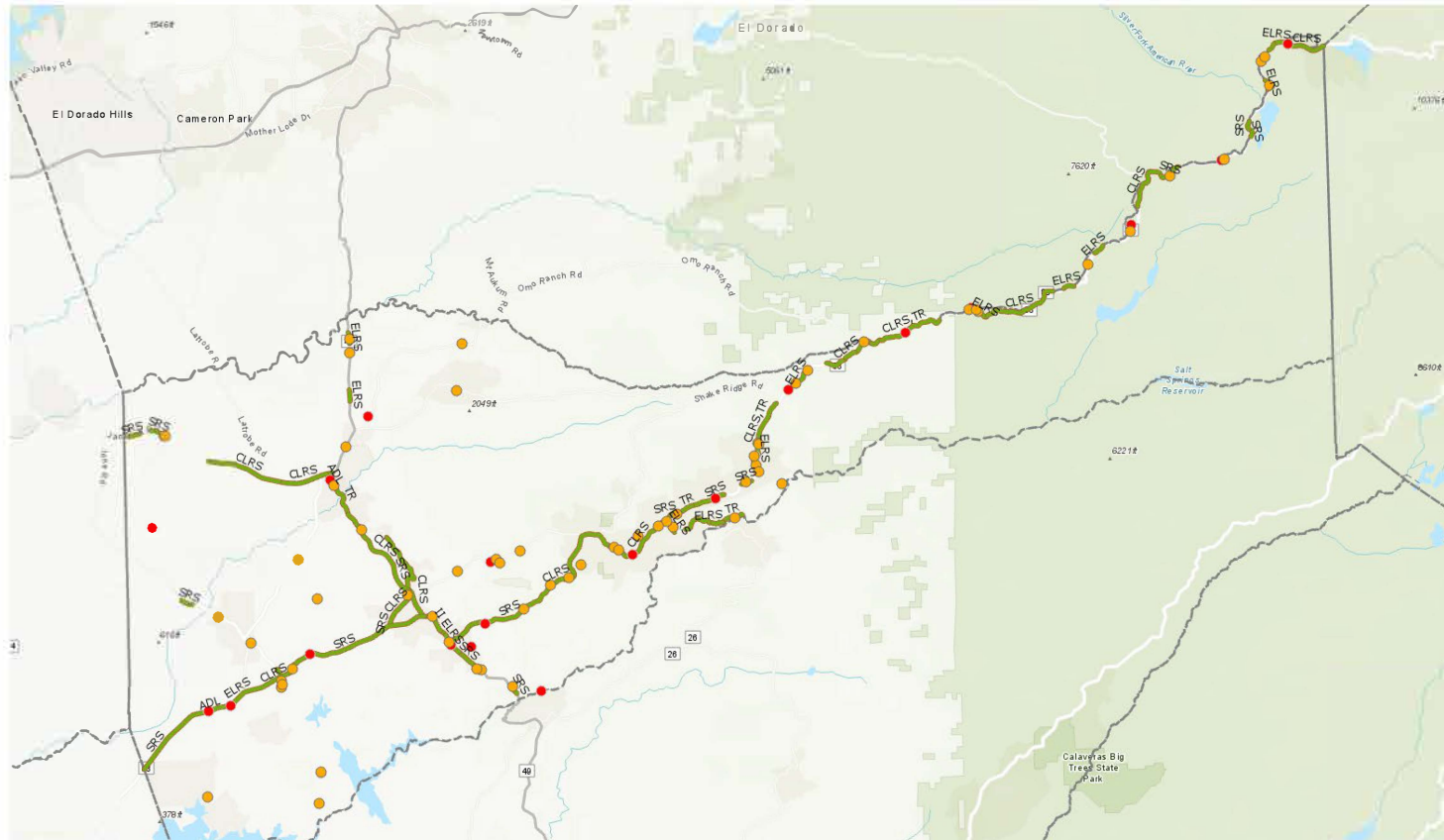
Countermeasure Name	Abbreviation
Centerline Rumble Strips	CLRS
Edge Line Rumble Stripes	ELRS
Shoulder Rumble Strips	SRS
Alignment Delineation, Lighting	ADL
High Friction Surfaces	HFS
Guardrail Relocation/Safety Enhancements	GR
Tree Removal/Safety Enhancements	TR
Utility Pole Relocation/Safety Enhancements	UP
Enforcement and Education - Alcohol-related	EEA
Enforcement and Education - Speeding-related	EES
Infrastructure Improvements - Speeding-related	II
Install Cable Median Barrier	CMB
3-E Corridor Improvements	3E

*** Note**

Number of Implementation does not match with the sum of number of countermeasure by type because one implementation could have multiple countermeasure type.

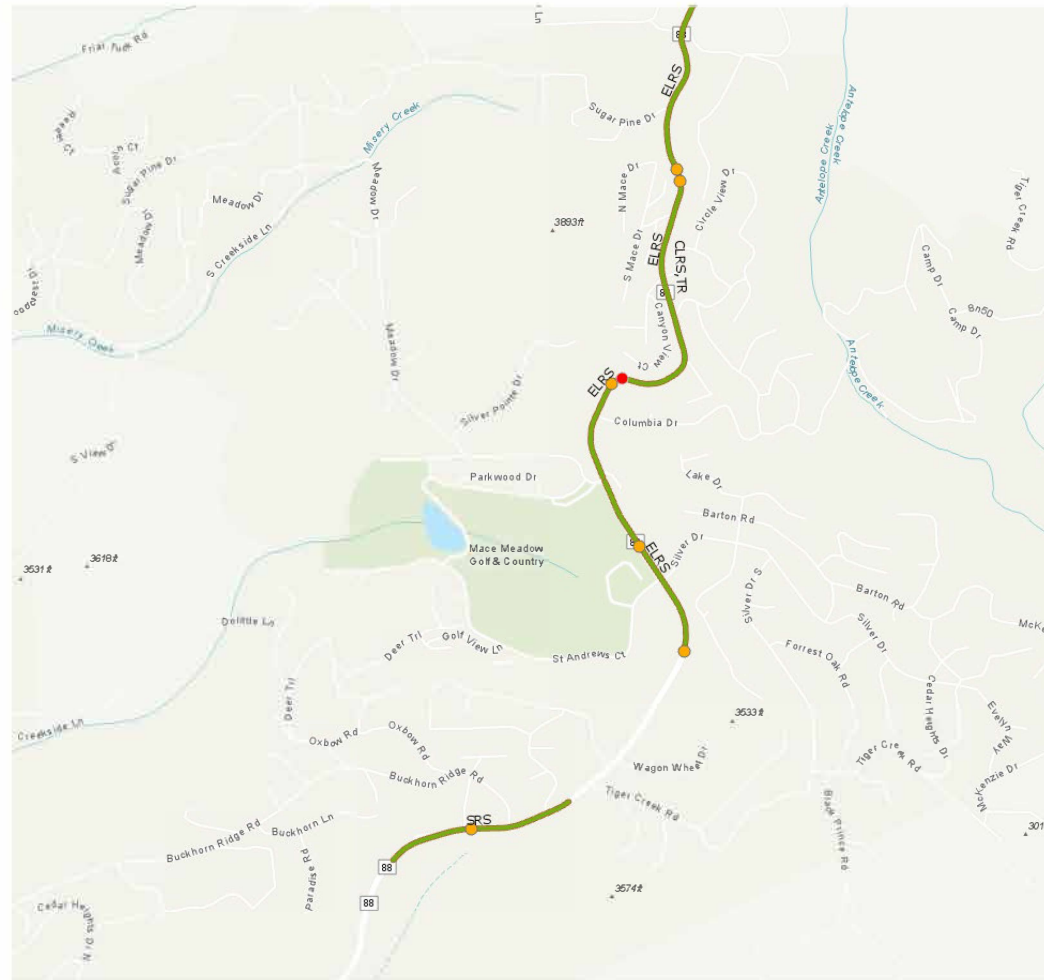
Amador County Road
Departure Collisions
from 2011 – 2015
and SAIC
recommended
countermeasures
(entire county)

- Crash Type: Head on, Hit Object, and Overturned
- Crash Severity: Fatal (Red) and Severe Injury (Orange)



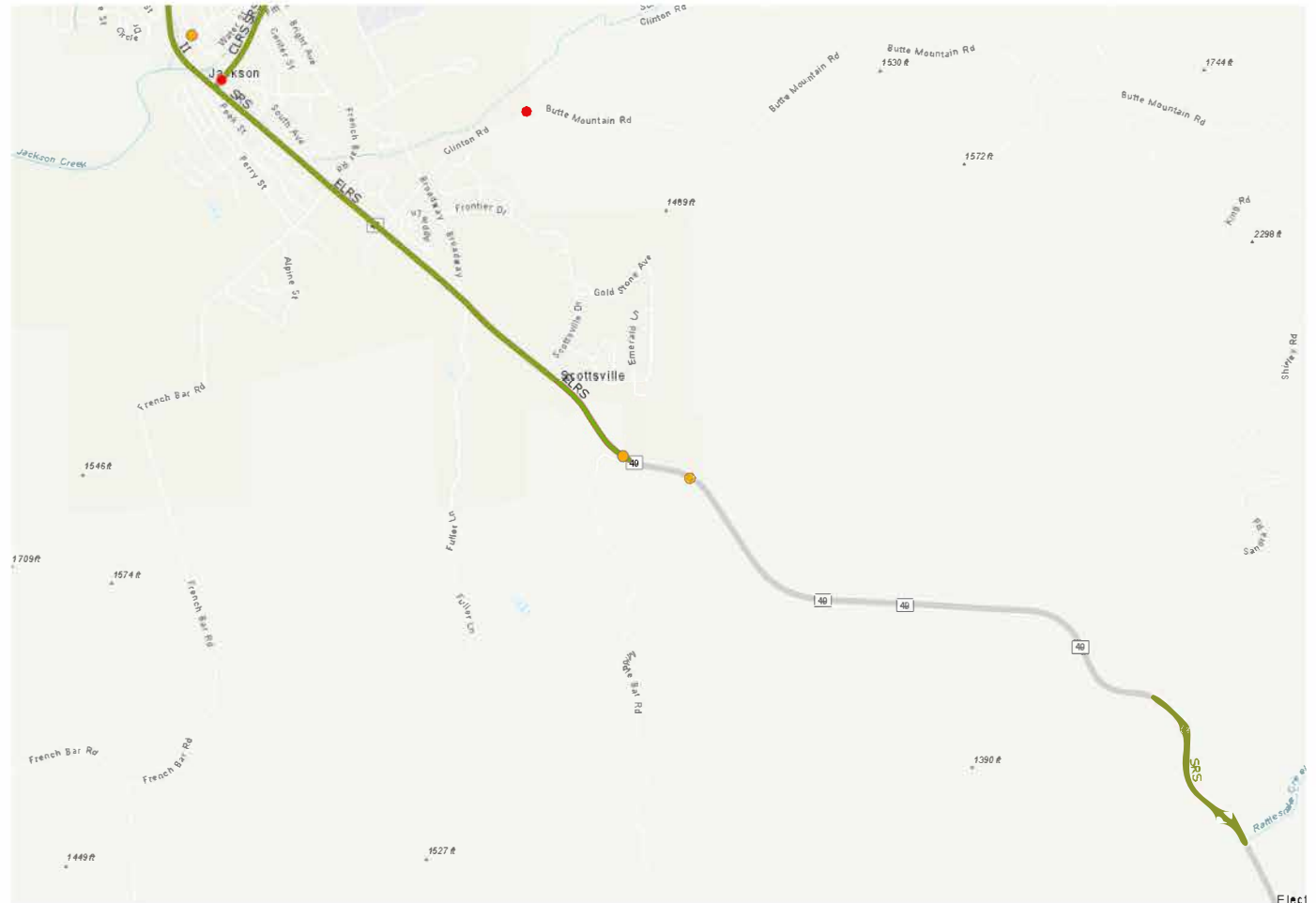
Amador County Road
Departure Collisions
from 2011 – 2015
and SAIC
recommended
countermeasures
(section of HW 88)

- Crash Type: Head on, Hit Object, and Overturned
- Crash Severity: Fatal (Red) and Severe Injury (Orange)



Amador County Road
Departure Collisions
from 2011 – 2015
and SAIC
recommended
countermeasures
(section of HW 49)

- Crash Type: Head on, Hit Object, and Overturned
- Crash Severity: Fatal (Red) and Severe Injury (Orange)



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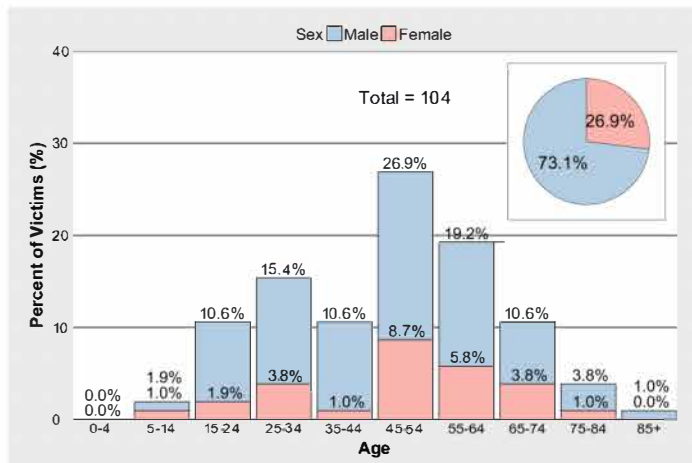
C. Potential Countermeasures

D. Overview

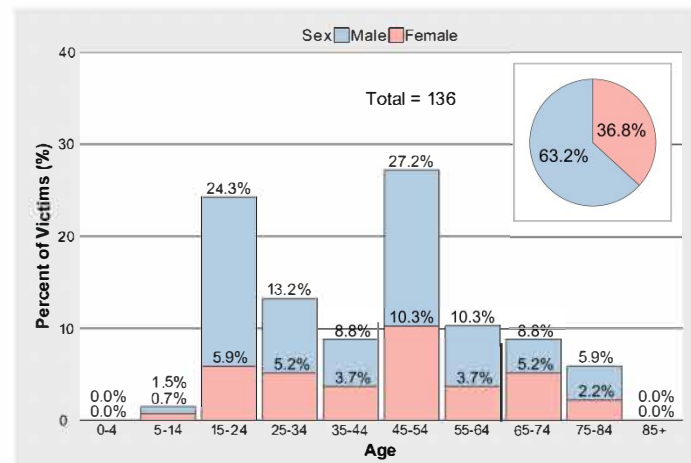
E. Summary

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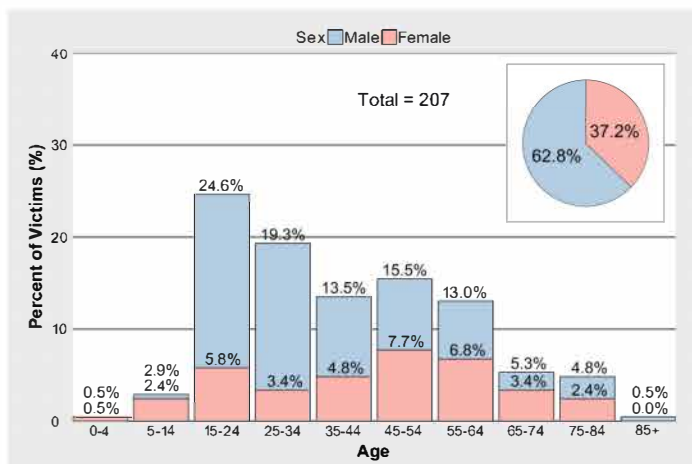
Fatal/Severe Injury Sex and Age Four Counties



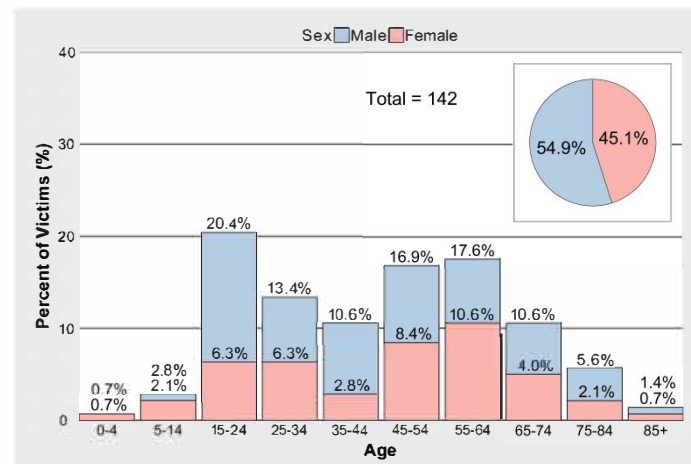
(a) Amador County



(b) Calaveras County

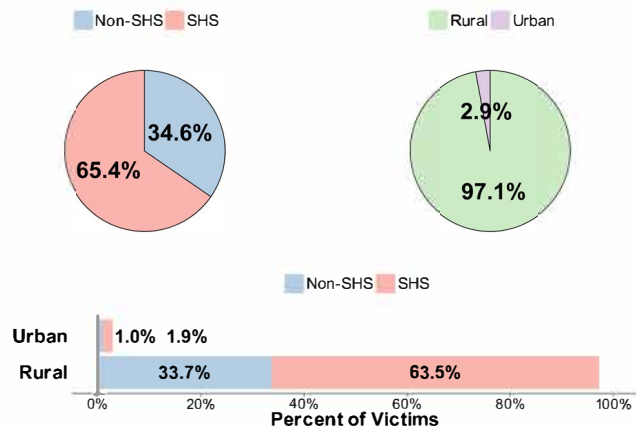


(c) Madera County

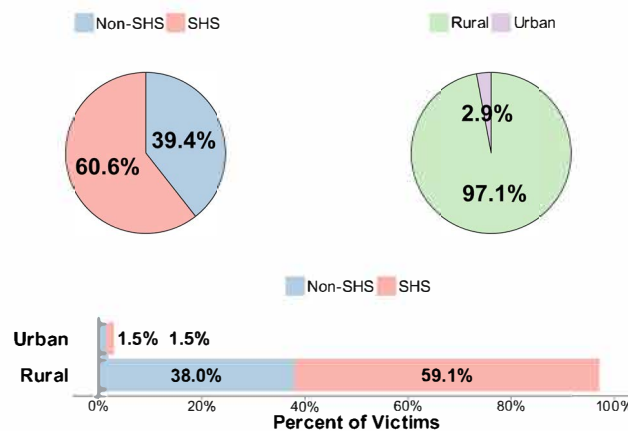


(d) Tuolumne County

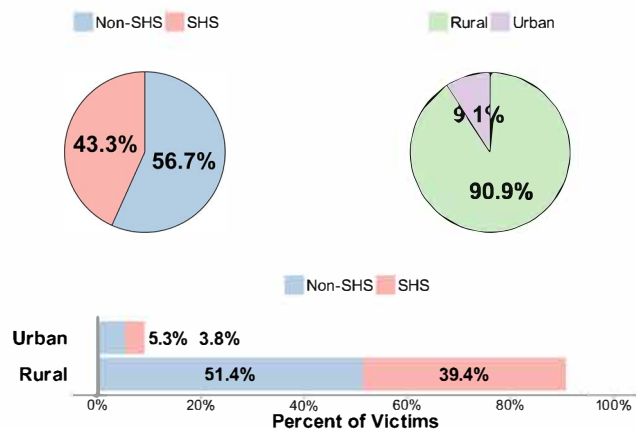
SHS/Non-SHS versus Rural/Urban



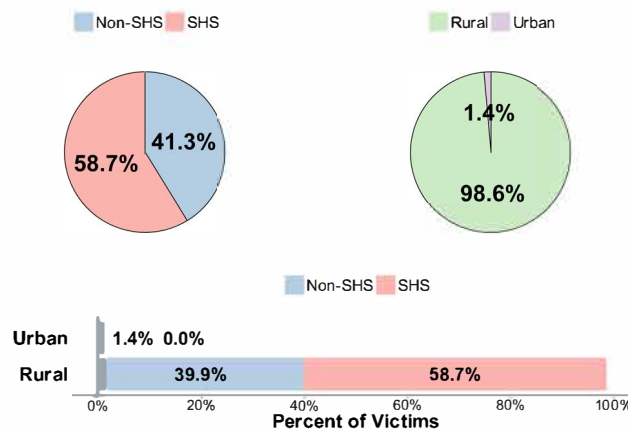
(a) Amador County



(b) Calaveras County



(c) Madera County



(d) Tuolumne County

Road Departure Fatal/Severe Injury Counts by County

Leave Lane FSI Injury Counts by County	Head-On		Run-Off-Road		Leave Lane FSI Injuries Total Count	All FSI Injuries	
	Count	Percentage	Count	Percentage		Count	Leave Lane Against All FSI Injuries
Amador	27	25.96%	77	74.04%	104	177	58.76%
Calaveras	43	31.39%	94	68.61%	137	206	66.50%
Madera	89	42.79%	119	57.21%	208	502	41.43%
Tuolumne	54	37.76%	89	62.24%	143	276	51.81%
Mariposa	19	33.93%	37	66.07%	56	99	56.57%

Major Highways

- Amador (49, 88)
- Calaveras (49, 4, 26)
- Tuolumne (49, 108, 120)
- Mariposa (49, 140)
- Madera (49, 41, 99)

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Summary / Next Steps

Summary:

- HW 49 ties the counties together north-south and has similar characteristics throughout north-south
- Each county has one or more highways with a high density of road departure crashes going east west leading into the Sierra Nevada mountains.
- The eastern part of Madera county has issues similar to the other counties. However, the western part is much different, including highway 99, and a somewhat more urbanized area.

Potential Next Steps:

- i. More detailed analyses of road injuries, and particularly road departure injuries, for individual tribal areas
- ii. Analysis of roadway features where there are higher concentrations of road departure injuries
- iii. Cost-benefit analysis for optimal countermeasure deployment

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Contact Information

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<http://tims.berkeley.edu/>