Outline: Grand Rapids Bicycle Education Project Crash Analysis

To: Piotr Lewak, PE – Traffic Safety, MDOT

From: Cynthia Hoyle, Mathew Berkow, Kristen Maddox, Alta Planning + Design

Date: December 3, 2014

Re: Potential bicycle education programs for Task 2E review

This memo presents the results of an analysis on bicycle involved crashes in the Grand Rapids region. It uses the most recent ten years for which data are available (2004-2013) to identify trends and answer questions regarding the 'who, what, where, when, why and how' of bicycle crashes. The memo presents a series of figures under each of the category headers. The final report will contain maps illustrating crash trends. The team will append the report upon the maps' completion.

Grand Rapids has one of the worst bicycle-related crash rates in Michigan. Table 1, below, compares the Greater Grand Rapids area data to state averages:

Table 1. Grand Rapids Area Crashes Compared with Michigan Averages

	Grand Region (2008-2012)	City of Grand Rapids (2008-2012)	Michigan Average (2008-2012)
Bike Crashes as Percent of Total Crashes	0.9%	1.2%	0.7%
Percent of Bike Crashes that are Fatal	4.2%	8.2%	2.8%
Percent of Bike Crashes with Incapacitating Injuries	4.0%	1.9%	3.5%

Statistics contained in this report originated from police reports filed through the Michigan Traffic Crash Facts database. Crashes within the study area reflect the national phenomenon of under-reported bicycle crashes. Although the report reflects the most accurate and most up-to-date information available, the dataset can only contain crashes that are reported to the police. The level of underreporting within the study area is

unknown. Studies in other communities reveal that as many as 90% of crashes with injuries on private roadways are unreported.[1]

The results of this analysis will be used to inform the development of messaging campaigns designed to improve bicycle safety. These campaigns will be responsive addressing the trends in bicycle crashes identified in this memo. Key findings are provided below, followed by the detailed analysis.

Key Findings

Below are key findings from the crash analysis that may inform the safety messaging campaign that will be developed as part of this project.

What

- Bicyclists are 7 times more likely than drivers to be injured in a bike-vehicle crash (99% vs 14%).
- Over 96% of crashes involve passenger cars/station wagons, pickups and vans/motorhomes.

Who

- Youth (10-19) and young adults (20-24) are over-represented as bicyclists in crashes, as compared to their share of the general population. Males are over-represented, representing 80% of crashes.
- Driver age patterns are reflective of the general population. Males are slightly over-represented, representing 53.5% of crashes

When

- Crash data indicates a small morning peak period around 7 am and a much longer evening peak period from approximately 3-7 pm. School age children (0-17) make up a relatively larger portion of bicycle crashes occurring during the afternoon peak period, beginning when school lets out in the afternoon.
- Crashes are more common during the warmer summer months, likely reflecting higher ridership during these months.
- Crashes are more common during the week, perhaps indicative of more weekday riding. Roads also carry higher weekday traffic volumes, particularly during peak periods, when many crashes occur.
- 80% of crashes take place during daylight hours. The share of crashes occurring under dark, dusk, or dawn conditions is higher during the winter months when days are shorter.

Where

- Arterial roads (high crash corridors and intersections)
    - Nearly 60% of crashes took place on an arterial roadway (or at an intersection that included an arterial roadway), though arterials represent only 17% of the roadway miles in the region.
    - Approximately half of bicycle crashes on arterial streets take place at traffic signals.
    - Crashes appear to be concentrated on a number of high crash corridors.

[1] The level of underreporting on public roadways and off-road paths is unknown.

- Intersections and turning vehicles
    - Over 60% of bicycle crashes occur within an intersection or are intersection related. Nearly all crashes at intersections took place at or near a signalized or stop controlled intersection.
    - At traffic signals, over 40% of crashes involved a right turning vehicle, approximately 15% involved a left turning vehicle, and 28% involved a vehicle going straight.
    - At stop signs, nearly half of crashes involved a vehicle going straight, followed by left turning and then right turning vehicles.
- Stop signs on local roads
    - Local streets represent over 60% of the roadway miles in the region, but only 26% of crashes.
    - More than half of crashes on local streets took place at stop signs.
- Driveways
    - 17% of bicycle crashes are driveway related.

How

- Right and left turning movements are prominent vehicle actions
    - Twice as many crashes involved right turning vehicles (25% of all crashes) as compared to left turning vehicles (12% of all crashes). Over 35% of crashes involved vehicles traveling straight.
- Very few crashes involve turning bicyclists.
    - The majority of crashes involve the bicyclist going straight, followed by crossing at an intersection (there appears to be overlap in these two categories, as both actions can be found in intersection crash records).

Why

- The bike failed to yield in 20% of reported crashes and disregarded the traffic control in 6.5% of crashes. Approximately 60% of crashes have a recorded hazardous bicycle action of 'none' or 'other'.
- The vehicle failed to yield in nearly 30% of bicycle crashes. The vehicle hazardous action was recorded as 'none' in just over 50% of crashes.

What

Annual trends

Table 2, below, illustrates the number of bicycle involved crashes over the previous 10 years from which data are available (2004-2013).

- Grand Rapids has experience approximately 95 reported bicycle crashes per year, followed by Wyoming at nearly 30 per year and Kentwood at approximately 15 per year.
- Over the 10 year period, there were 958 crashes in Grand Rapids and 648 crashes in the other cities in the region.

Given the small sample size of crashes in the smaller cities, the analysis in the following sections sometimes presents trends as two figures, one for Grand Rapids and the other for All Other Cities in the region.

Table 2 – Summary of Bike Crashes in the Grand Rapids Region (2004-2103)

YEAR	Grand Rapids	Wyoming	Kentwood	East Grand Rapids	Grandville	Plainfield Township	Walker	Grand Rapids Township	Alpine Township	All Other Cities Total
2004	116	38	12	3	3	5	3	2	1	67
2005	91	25	11	5	2	6	4	2	-	55
2006	92	24	16	4	1	2	5	-	2	54
2007	88	26	19	6	5	6	3	1	-	66
2008	99	37	13	9	8	6	5	3	1	82
2009	112	21	10	5	7	4	4	3	-	54
2010	89	31	15	7	2	-	5	1	1	62
2011	96	35	13	8	8	3	5	-	-	72
2012	93	18	27	8	6	7	7	2	1	76
2013	85	27	17	4	6	3	5	1	1	64
10 Year Total	**961**	**282**	**152**	**59**	**48**	**42**	**46**	**15**	**7**	**652**
Ave. crashes per year	**96**	**28**	**15**	**6**	**5**	**5**	**5**	**2**	**1**	**65**
Population (2010 Census)	188,040	72,125	48,707	10,694	15,378	30,195	23,537	16,661	13,336	
Annual crashes /10k population	5.1	3.9	3.1	5.5	3.1	1.5	2.0	1.1	0.9	

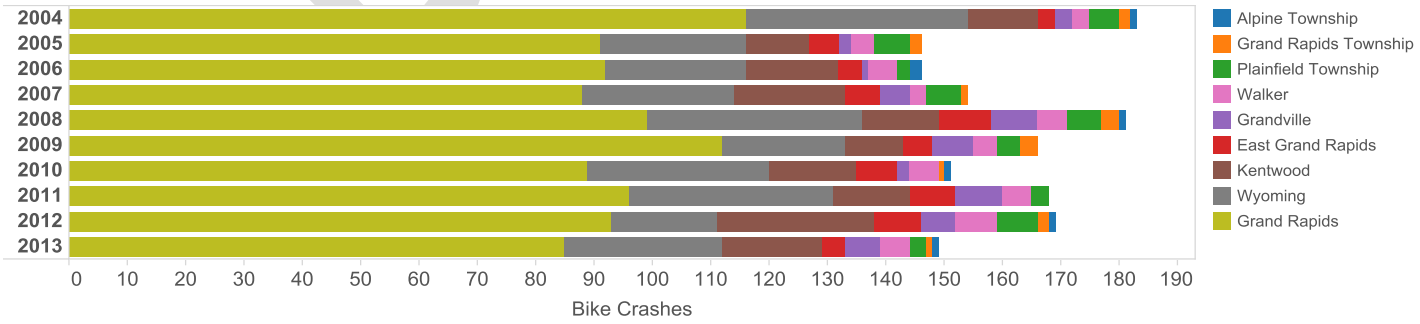


Figure 1 – Number of Bike Crashes by City (2004-2013)

Ridership Information: Statewide and Local Data

Understanding the number of bicyclists in a given place helps give meaning to crash statistics. The information helps interpret the relative risk of bicycle crashes. Previous efforts have attempted to understand Grand Rapids' level of bicycle ridership.[2] There is significantly less information available for surrounding communities. Census data for "means to work" for the City of Grand Rapids from 2006-2013 shows an average 0.9% mode share for bicycling.[3] The total number of riders counted during annual bicycle counts within Grand Rapids has increased by 60% from 2011 to 2013. Additionally, 56% of adult respondents to the 2013 MDOT Household Survey on Bicycling reported having ridden a bicycle within the past year. Continuing to collect ridership estimates over time across the city and region will add more certainty to available exposure and risk data.

Injury Severity

Michigan's bicyclist fatality rate is 13th highest in the nation, just one rank shy from placing in the top 25% of states with the highest rate of bicycling deaths per 10,000 bicycling commuters.[4] In Michigan in 2013, 37.8% of bicyclists involved in crashes experienced non-incapacitating injuries. A bit more than one in ten sustained incapacitating injuries (11.1%) and 1.8% were killed. Almost half (49.3%) had possible injuries.[5]

Figure 2 identifies the injury severity of the study area bicyclist involved in the crash, while Figure 33 identifies the injury severity of the study area driver. Not surprisingly, bicyclists are much more likely to sustain an injury.

- Only 14% of all bicyclists walked away with no injury, as compared to 99% of drivers[6].
- Over the 10 years, bicycle crashes resulted in 11 reported bicycle fatalities and 0 driver fatalities.
- No information is available about bicyclists' helmet use at the time of the crash.

[2] Greater Grand Rapids Bicycle Coalition, Bicycle Traffic Counts and Cyclist Surveys, 2011-2014; Community and Economic Benefits of Bicycling in Michigan, MDOT, 2014; US Bureau of the Census, American Community Survey

[3] http://www.census.gov/acs/www/

[4] Alliance for Biking & Walking, 2014 Benchmarking Report, pg. 79.

[5] http://publications.michigantrafficcrashfacts.org/2013/2013Bicycles.pdf

[6] These figures exclude crash records where this field was labeled 'uncoded and errors'

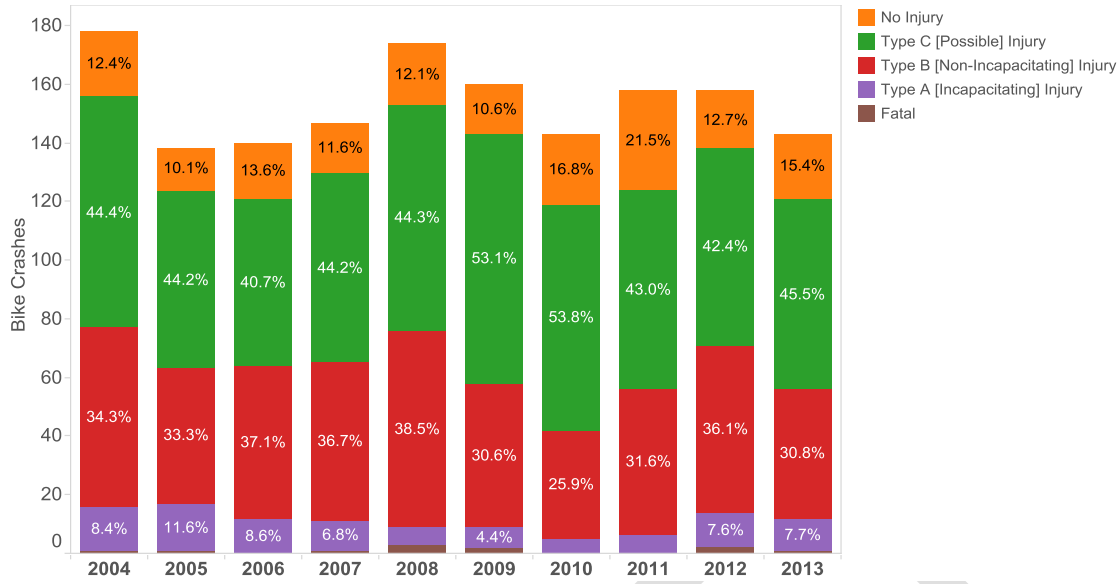


Figure 2 – Severity of Injury to Bicyclist[7]

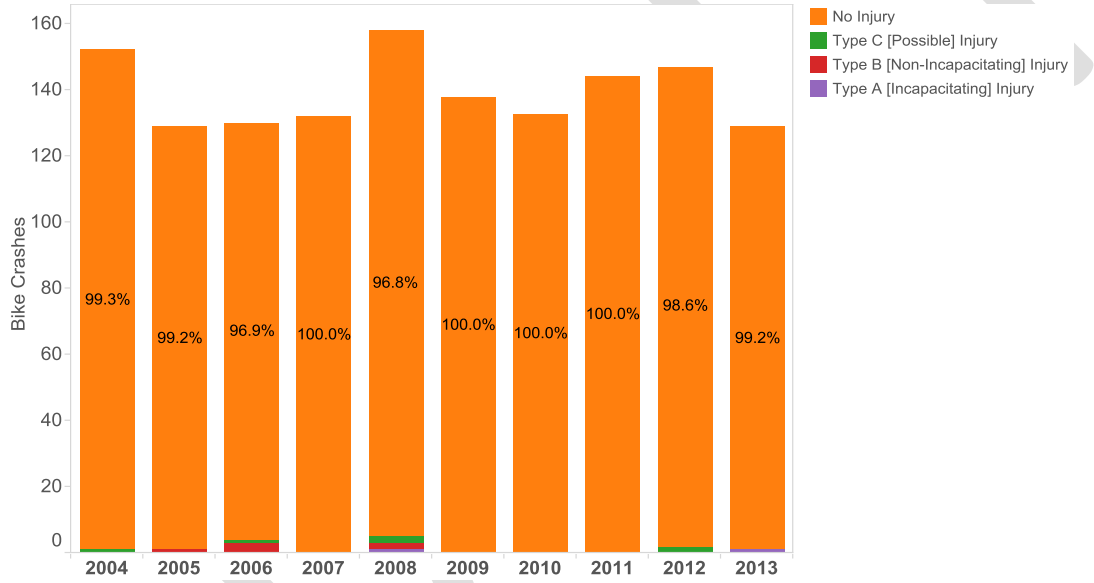


Figure 3 – Severity of Injury to Driver

[7] To enhance readability, fatal crashes are not labeled on the graph. Fatal crash percentages are as follows: 0.5% in 2004; 08.% in 2005; 0.0% in 2006; 0.7% in 2007; 0.7 in 2008; 1.3% in 2009; 0.0% in 2010; 0.0% in 2011; 1.2% in 2012; 0.6% in 2013.

Motor vehicle type

Passenger vehicles make up approximately 80% of the vehicles involved in crashes with bicycles, followed by pickup trucks at 8-10% and vans/motorhomes at approximately 7.5%. Trends are similar in Grand Rapids and the Other Cities. Note that in Figure 4 below, the word 'cycle' refers to a motorcycle rather than a bicycle.

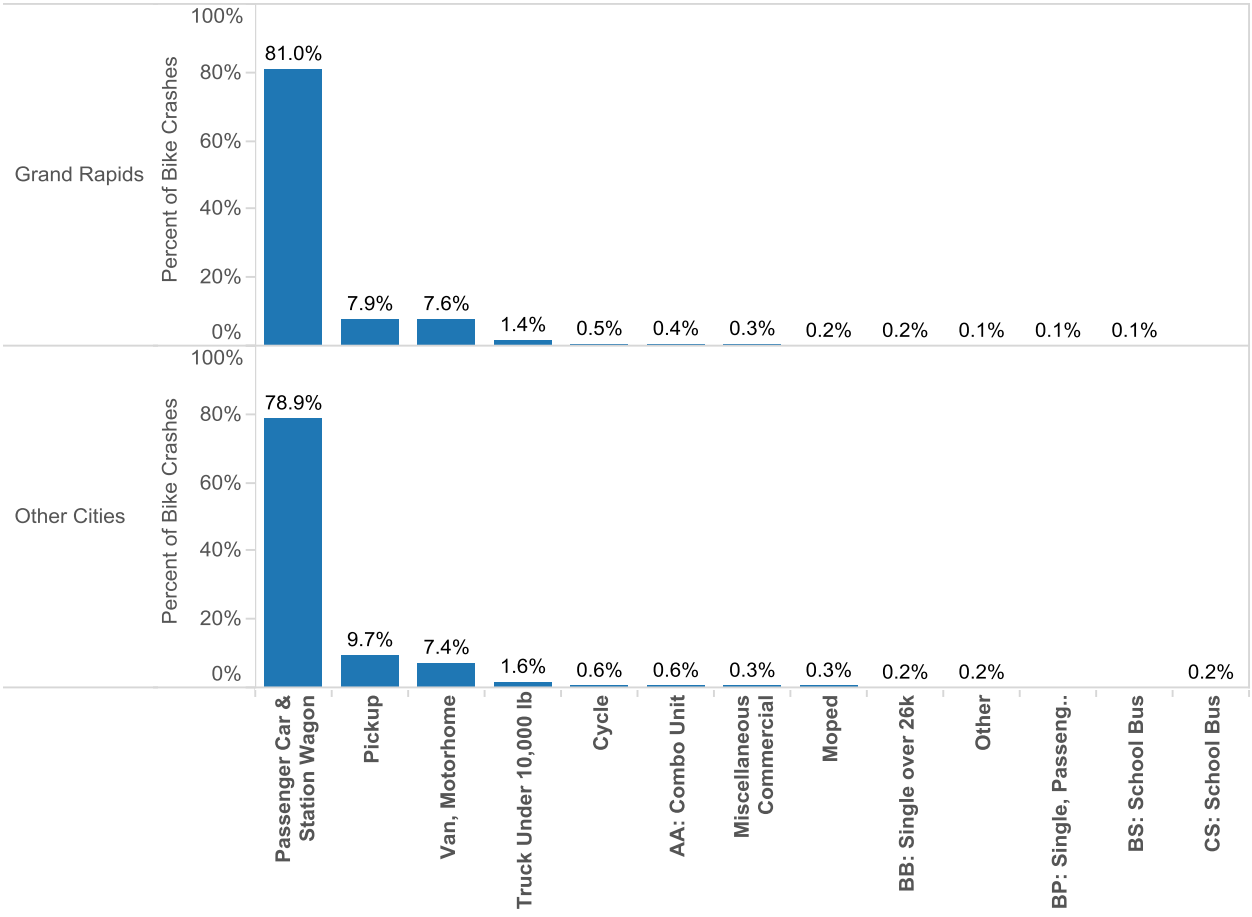


Figure 4 – Type of Vehicle Involved in Crashes with Bicycles

Who

Bicyclists Age and Gender

Youth are prominent in the bicycle crash data. Over 50% of bicycle crashes involve people 24 years old or younger. Figure 5 illustrates the age distribution of bicyclists involved in crashes with the age distribution of the overall population of the region. **People in the 10-24 age range are over-represented in the crash data as compared to their relative share of the overall population.**

In 2013, 16-24 year olds made up 4% of people who rode a bicycle at least once within the past year. Grand Rapids area crash data shows that this age group was involved in 33% of the bicycle related crashes within the study area.[8] Children within these communities age 16 and younger represent over 20% of the total number of bicycle crashes within the ten year time period. National data shows that children under 16 represented 39% of all bicycle trips between 2009 and 2011, whereas they represented 11% of bicyclist fatalities within the same period.

National trends point to disproportionately high rates of older adults involved in transportation collisions. Adults age 65 and older took 7% of bicycle trips from 2009-2011, yet 12% of the fatal injuries occurred in people 65 and older.[9] Grand Rapids data did not find a disproportionately high share of senior citizens involved in bicycle crashes.

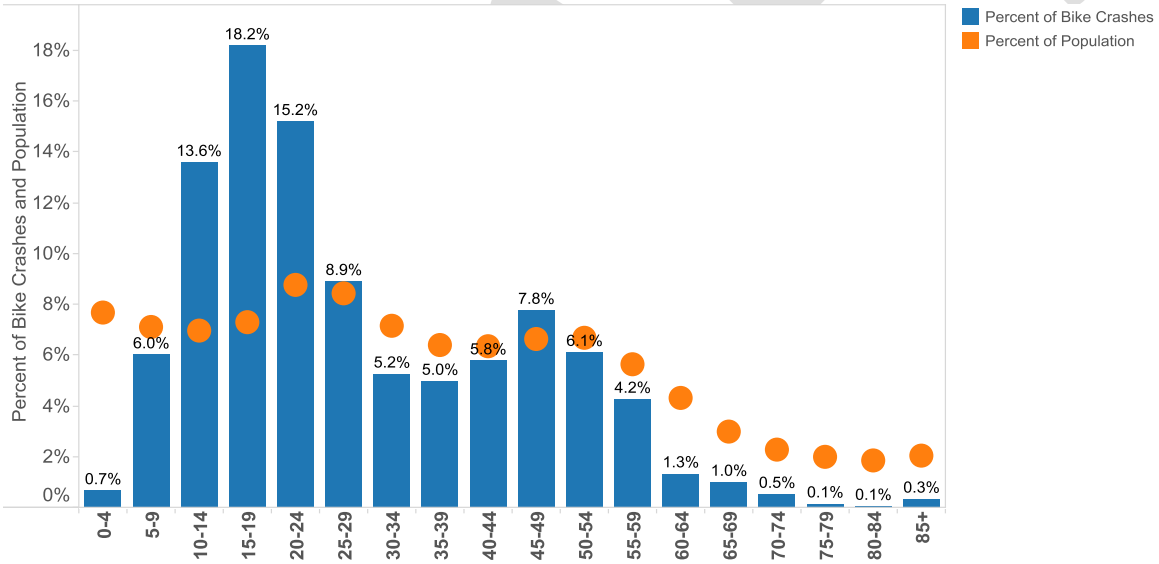


Figure 5 – Age of Bicyclists as Compared to Share of the General Population

Age patterns as well as gender breakdown of bicyclists involved in crashes are similar between Grand Rapids and the Other Cities. **Male bicyclists are over-represented in the data, representing 80% of crashes**. Surprisingly, the male prominence in crashes holds true even among youth involved in crashes.

[8] MDOT, Grand Rapids Case Study—Community and Economic Benefits of Bicycling, pg. 16. Note: One must remember the crash data represents data collection over ten years, versus one year of data for bicycle ridership.
[9] Ibid, pg. 78. Please note that this statistic only measures bicycle commuting trips.

Also noteworthy, the gender split continues on a statewide level: male bicyclists were involved in crashes 80% of the state's 2013 crashes.[10]

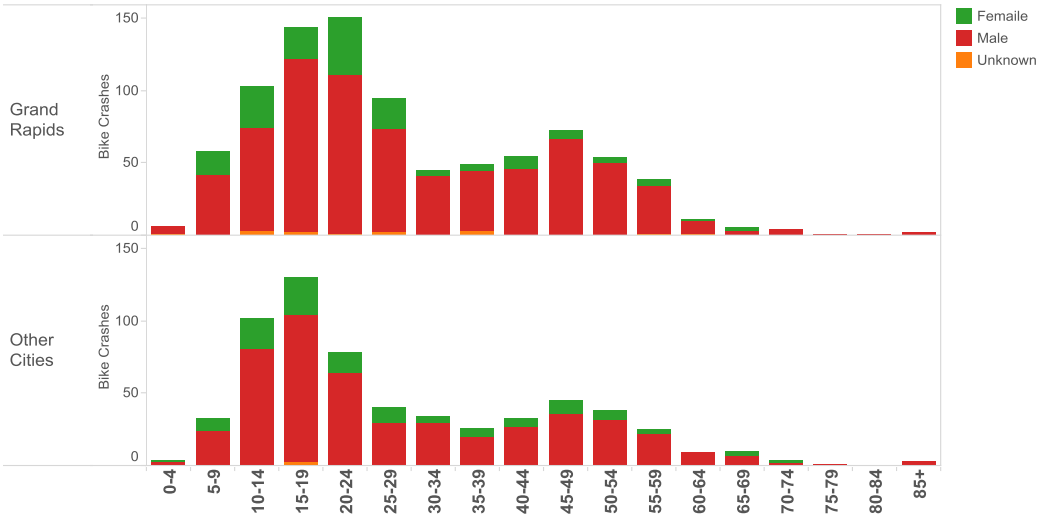


Figure 6 – Age and Gender of Bicyclists

Drivers Age and Gender

The age distribution of drivers involved in bicycle crashes matches the age distribution of the overall driving age population. Young drivers in the 15-19 range are appear underrepresented in crashes, though this is likely due to the break points of the Census data with includes 15 year olds, who are not of driving age.

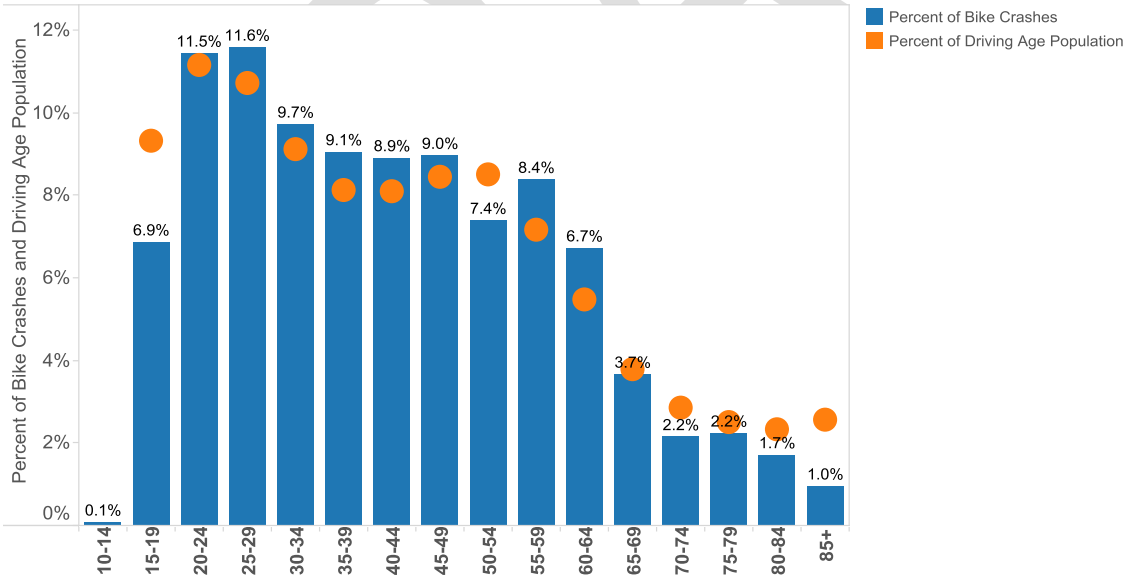


Figure 7 - Age of Drivers as Compared to the Population of the Driving Age Population

[10] This figure does not include the 37 crashes that were not assigned a gender. Males were involved in 1494 crashes, females 371.

Males are slightly over-represented as drivers, representing 53.5% of crashes. Patterns in driver age are similar between Grand Rapids and the Other Cities.

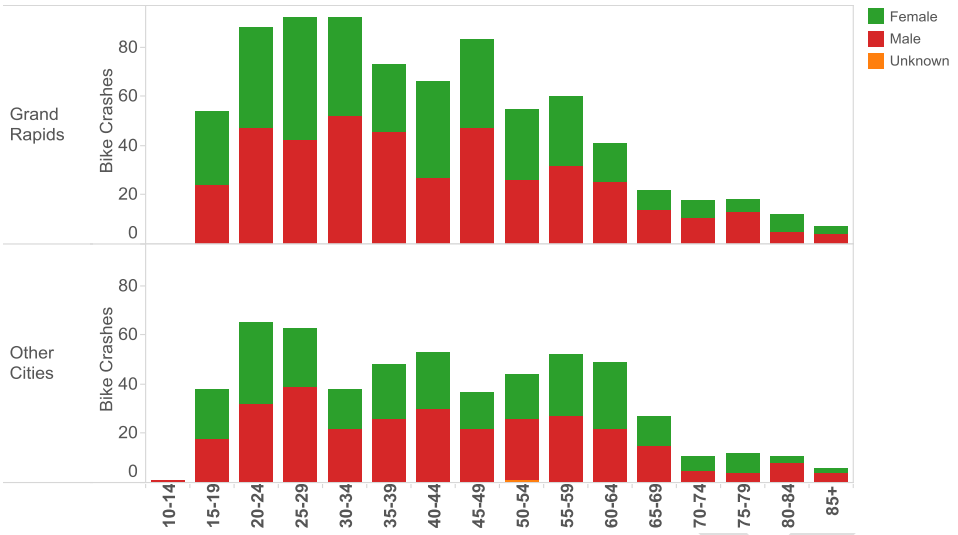


Figure 8 – Age and Gender of Drivers

When

Time of Day

Crash trends by time of day are similar in Grand Rapids and the Other Cities, with a smaller morning peak period around 7 am and a much longer evening peak period from approximately 3-7 pm (Figure 9).

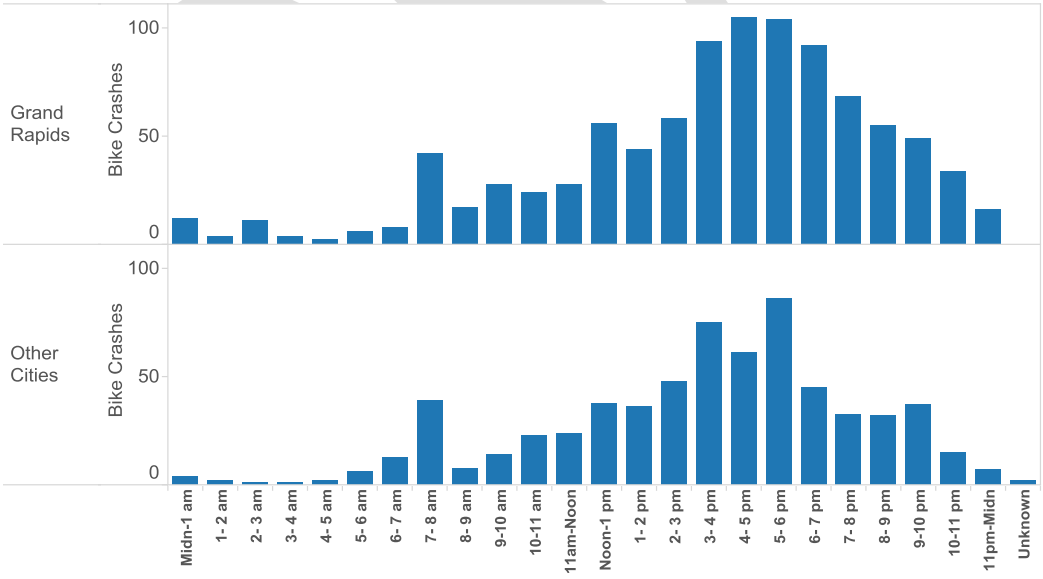


Figure 9 – Time of Day

School age children make up a relatively larger portion of the bicycle crashes occurring during the afternoon peak period, beginning when school lets out in the afternoon (Figure 10).

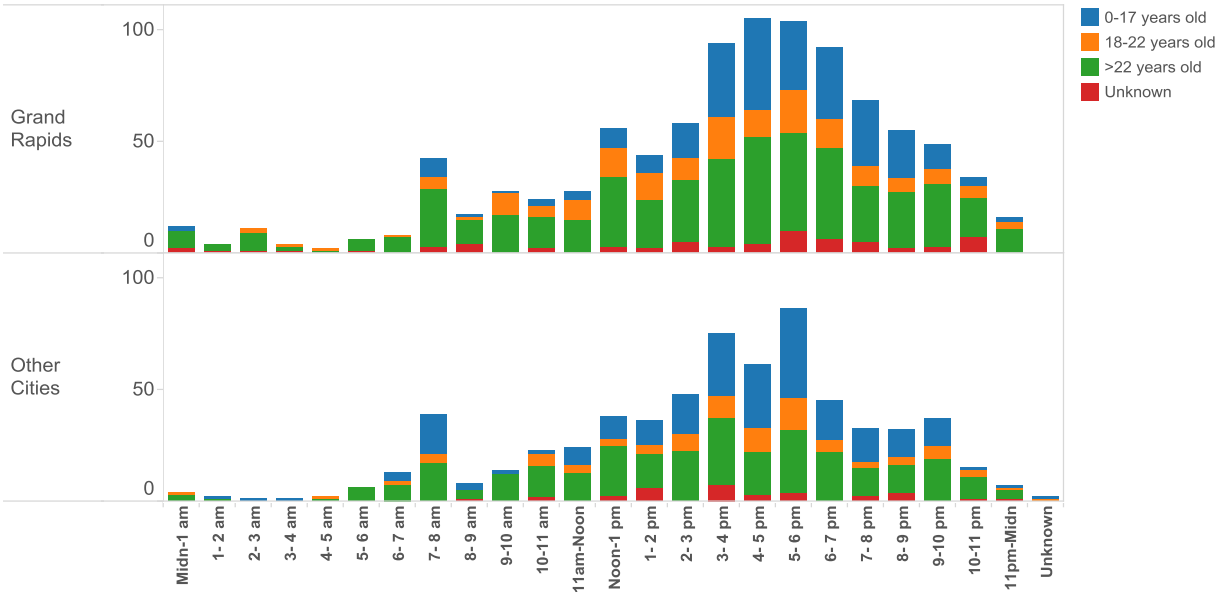


Figure 10 – Time of Day, by Age of Bicyclist

Month of Year

Crashes by month of year likely reflect general bike ridership patterns, with the highest share of crashes found in the summer months of June, July and August and relatively fewer crashes in the colder, winter months.

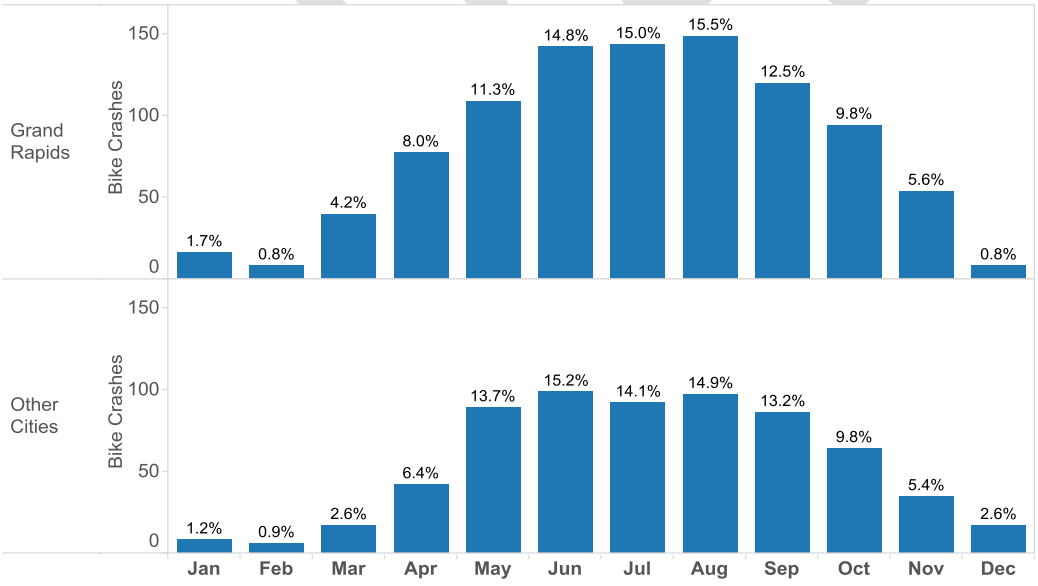


Figure 11 – Bike Crashes by Month of Year

Day of Week

The crash data indicates that crashes are more likely to occur during the week, perhaps indicative of general ridership patterns in the region. Weekdays are also when the roads are carrying higher volumes of motor vehicles, particularly during the peak periods when many bike crashes take place.

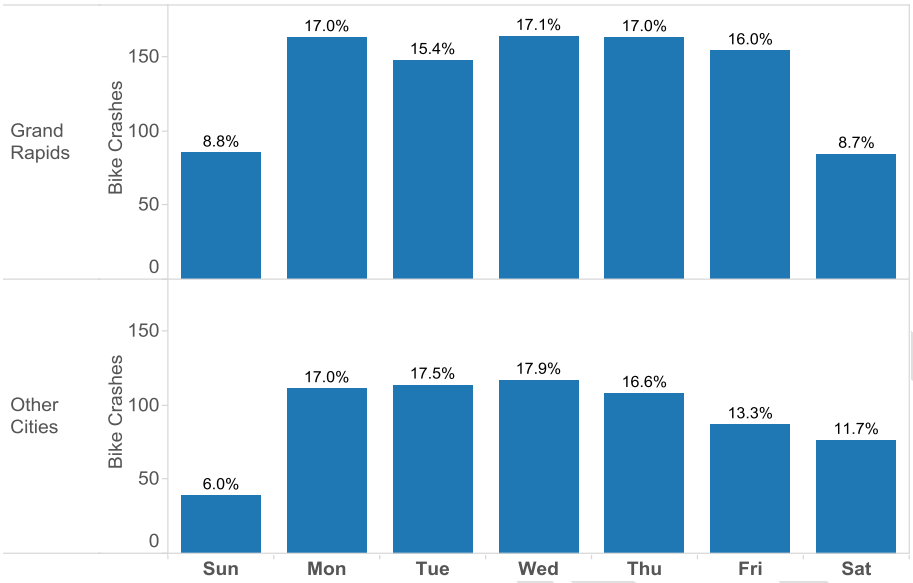


Figure 12 – Bike Crashes by Day of Week

Daylight

Nearly 80% of crashes occur in the daylight hours, likely reflective of the fact that ridership is highest in the summer months when days are longer. Approximately 20% of crashes take place in dark, dusk or dawn conditions. According the data, may crashes occur in locations where street lights are present, which likely reflects the fact that a large number of crashes take place on major roadways and at signalized intersections.

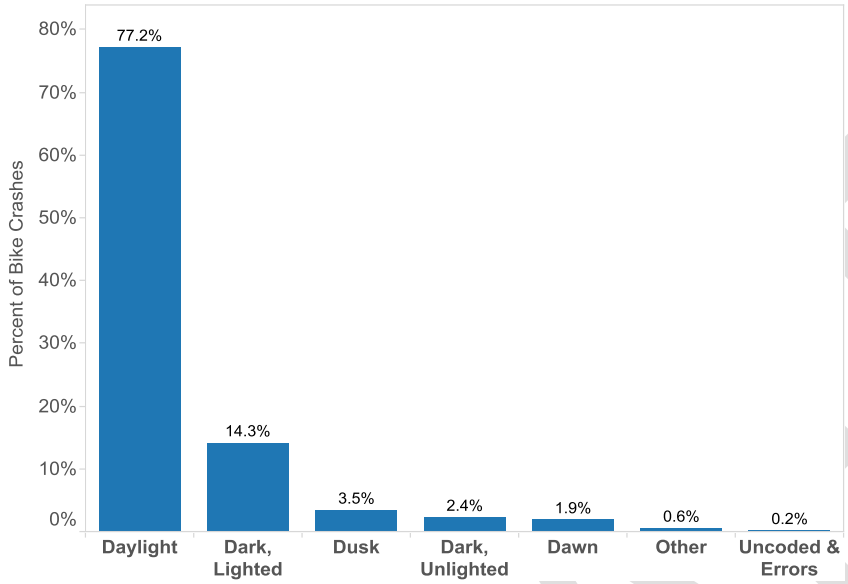


Figure 13 – Crashes by Presence of Daylight

Figure 14 below indicates that crashes are more likely to occur under dark, dusk or dawn conditions during the winter months when days are shorter. These months may be good times to remind bicyclists to be visible.

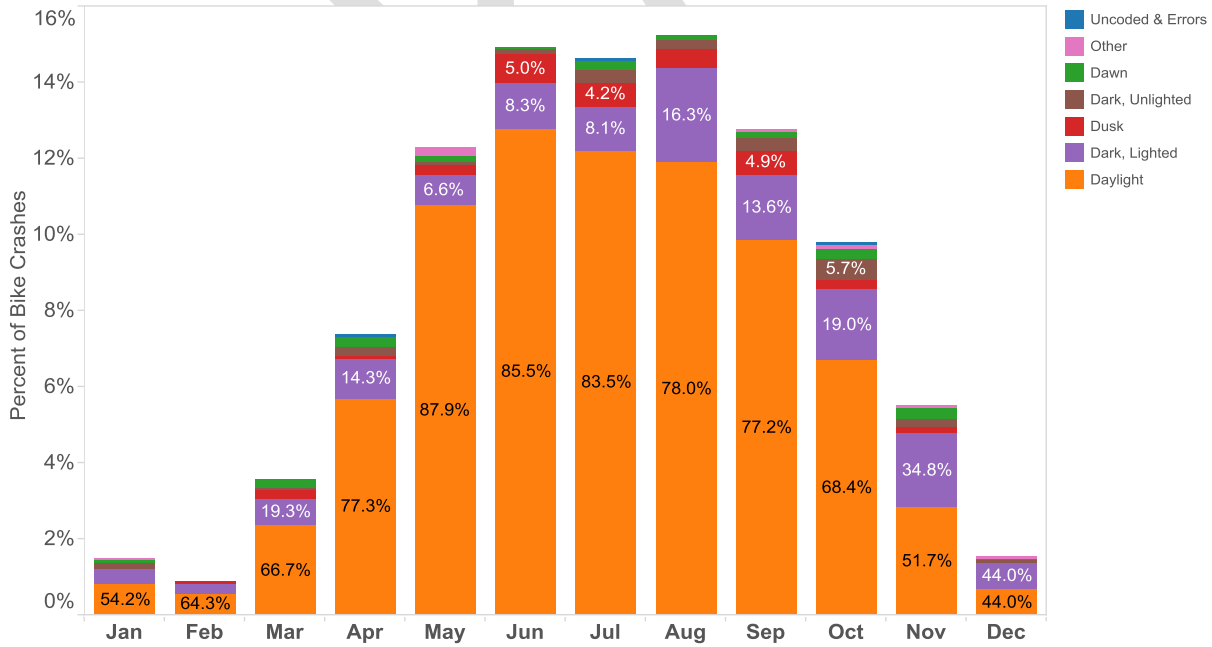


Figure 14 – Daylight by Month

Where

Roadway Functional Class

Of the 29 fatal crashes in 2013 involving bicyclists across Michigan, 27 occurred on Michigan roadways. Figure 15 identifies the number of crashes on different types of roadways within the study area. It includes both segment and intersection crashes[11].

Table 3 compares the share of crashes on each roadway type with amount of roadway miles for each classification (centerline miles rather than lane miles).

- **Nearly 60% of crashes took place on an arterial roadway (or at an intersection that included an arterial roadway), though arterials represent only 17% of the roadway miles in the region.**
- 26% of crashes took place on local streets (or at the intersection of two local streets), which represent over 60% of roadway miles in the region.

Arterials are commonly over-represented in the study area-specific crash data, since arterials are streets that carry relatively higher volumes of traffic and tend to contain destinations people of all modes wish to access. Given the higher risk to bicyclists traveling on arterial streets, high crash arterial corridors (identified in Table 4 later in the memo) may be optimal locations for bicycle safety messaging campaigns aimed at all roadway users.

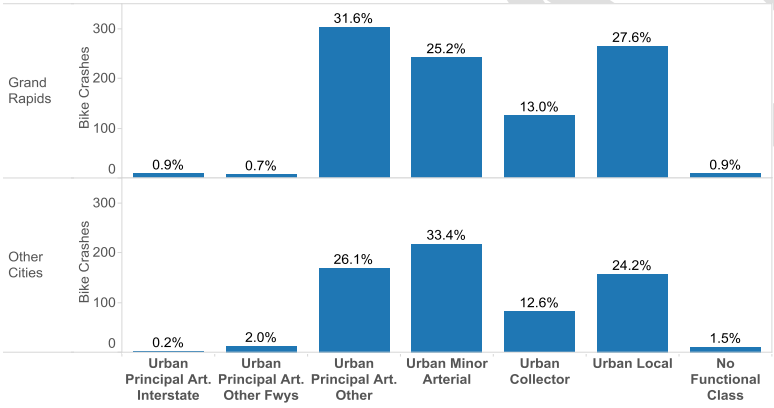


Figure 15 – Roadway Functional Class

Table 3 – Crashes by Functional Class as Compared to Roadway Miles

Functional Class	Percent of Crashes	Roadway Miles	Percent of Roadway Miles
Interstate/Freeway	1.8%	279	7.4%
Arterial	57.9%	638	17.1%
Collector	12.8%	533	14.2%
Local	26.2%	2,294	61.3%

[11] When a crash takes place at the intersection of two streets, the functional class of the higher order street recorded in the Functional Class field in the data.

No functional Class[12]	1.2%		
Total	100%	3,744	100%

Type of Area

Intersections appear to be the most dangerous places for bicyclists. Overall, the average throughout the study area—Grand Rapids combined with the other cities—is nearly 62% of bicycle crashes occur within an intersection or are intersection related. Nearly 17% occur on a straight roadway, while another **17% are driveway related**. Approximately 2% occur at entrance/exit ramps.

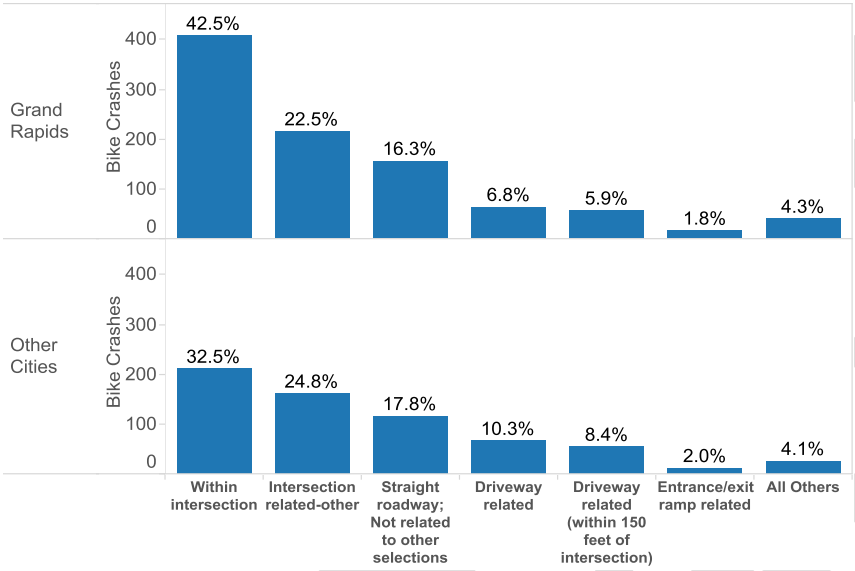


Figure 16 – Area Type

Area by Traffic Control

Figure 17 combines the two intersection and two driveway classifications to provide a streamlined view of crash locations by type of traffic control present. **Nearly all of the 60% of crashes occurring at intersections take place at or near a signalized intersection or stop controlled intersection.** As expected, there is typically no traffic control present for crashes occurring on a straight roadway or for driveway related crashes.

[12] 654 miles of roadway classified as 'unknown' in the roadway file and are not included in the mileage calculation.

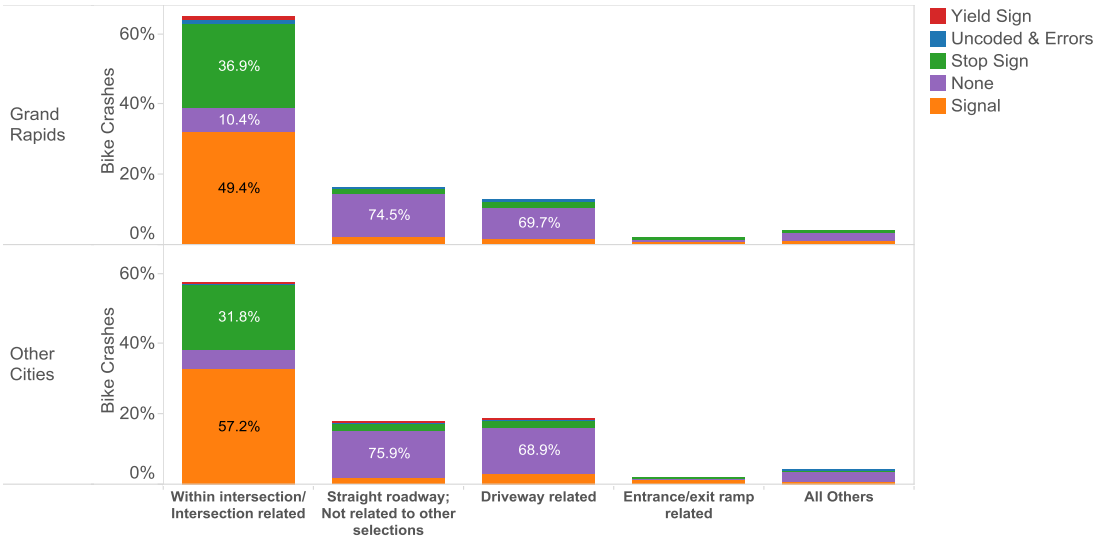


Figure 17 – Area Type by Traffic Control

Functional Class by Traffic Control

Approximately half of bicycle crashes on arterial streets take place at traffic signals. On collector streets, 45% of crashes take place at traffic signals. **More than half of crashes on local streets take place at stop signs.**

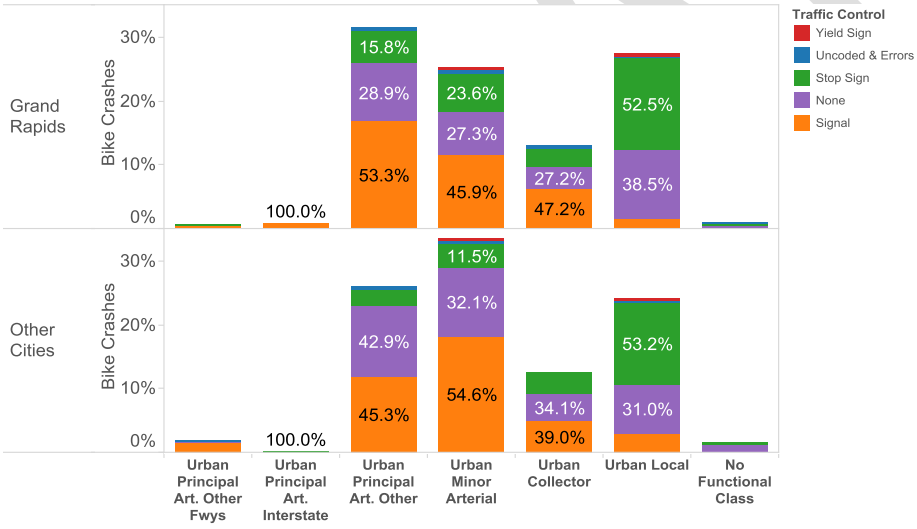


Figure 18 – Functional Class by Traffic Control

Traffic Control by Vehicle Preceding Action

Over 40% of crashes at traffic signals involved a right turning vehicle and approximately 15% involved a left turning vehicle and 28% involved a vehicle going straight.

Nearly half of crashes at stop signs involved a vehicle going straight, followed by left turning and then right turning vehicles.

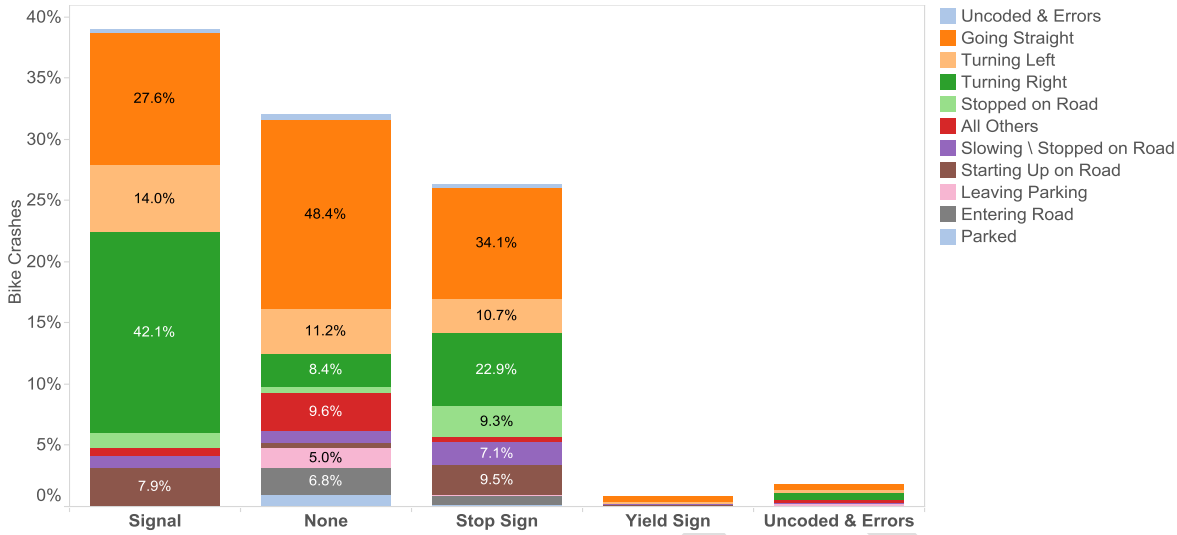


Figure 19 – Traffic Control by Vehicle Preceding Action

High Crash Streets

The streets with the most bicycle crashes over the ten year study period are identified in Table 4. It includes both segment and intersection crashes.[13] As expected, most of the highest crash streets are located in Grand Rapids, the largest city in the region. Streets with more than ten crashes are also located in Wyoming, Kentwood and East Grand Rapids. Overall, **the 20 streets in this table account for nearly 40% of the bicycle crashes in the region**.

Table 4 – Streets with the Most Crashes in the Grand Rapids Region

Street	Grand Rapids	Wyoming	Walker	Kentwood	Grandville	East Grand Rapids	Plainfield Township	Grand Rapids Township	Alpine Township	Total
Division	50	18		8	1					77
Fulton	51							1		52
Leonard	49		3							52
44th	6	18		14	6					44
28th	13	23		2	3					41
Kalamazoo	21			12						33
Burton	28	1		3						32
Eastern	21			9						30
36th	1	26			2					29
Lake	16					12				28
Wealthy	19					8				27
Clyde Park	5	20								25
Hall	17					7				24
Michigan	22									22
Plainfield	14						7			21
Lafayette	20									20
Alpine	9		8						2	19
Cherry	19									19
Fuller	19									19
L. Michigan	16		3							19
Top 20 Subtotal	416	106	14	48	12	27	7	1	2	633
All Others	545	176	32	105	36	32	35	14	5	980
Total	**961**	**282**	**46**	**153**	**48**	**59**	**42**	**15**	**7**	**1,613**
% Crashes on top 20 streets	**43%**	**38%**	**30%**	**31%**	**25%**	**46%**	**17%**	**7%**	**29%**	**39%**

[13] When a crash takes place at the intersection of two streets, the name of the street with the higher functional class is recorded in in the data.

How

Bicyclist Preceding Actions

The **majority of crashes involve the bicyclists going straight, followed by crossing at an intersection**. As indicated in the following section, there appears to be some overlap in these two categories, as both of these actions can be found in intersection crash records. **A smaller number of crashes involve the bicyclist entering the road or crossing mid-block**. Very few crashes involve turning bicyclists.

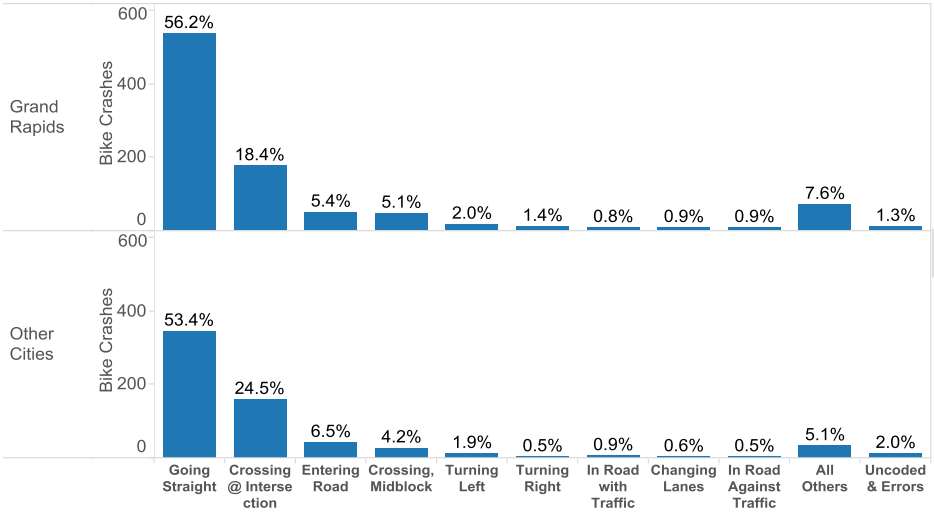


Figure 20 – Bicyclist Previous Action

The study area data suggests that a crash that involved a bicyclist traveling straight through an intersection could have been coded as either of these top two categories from Figure 20 above. Figure 21 below provides greater detail on how the bicycle action varies by location. More than ½ of crashes in which a bicyclist was going straight occurred within an intersection or were intersection related. On a statewide scale, 51.9% of bicyclists killed in Michigan in 2013 were riding straight ahead prior to the crash.[14] It is unclear how many crashes involve a bicyclist hit by an opening car door. Future access to this information would assist in developing crash countermeasures.

Sidewalk riding rates are largely unknown. Five crashes (0.5%) are coded as "not in road". There are 21 coded "other" and eight marked 'unknown". Crashes in which the rider was entering the roadway (49 events) may also have involved sidewalk riding, however the actual number is not known.

[14] http://publications.michigantrafficcrashfacts.org/2013/2013Bicycles.pdf

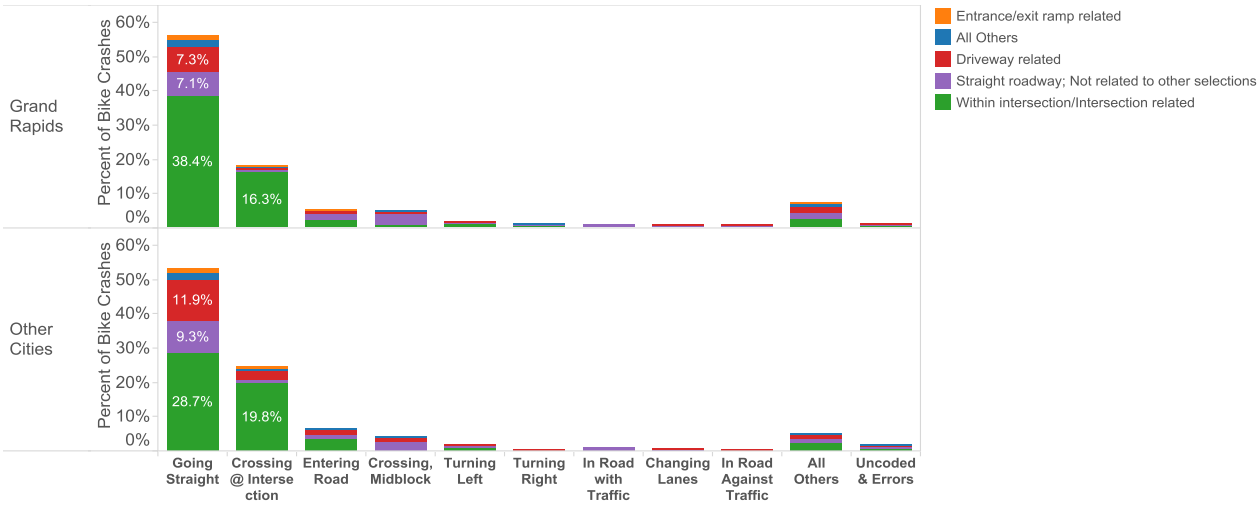


Figure 21 – Bicyclist Previous Action by Area

Driver Preceding Actions

For drivers involved in bicycle crashes, going straight is also the most common action, though less common than for bicyclists. Right and left turning movements are prominent vehicle actions. **Twice as many crashes involve right turning vehicles as compared to left turning vehicles.**

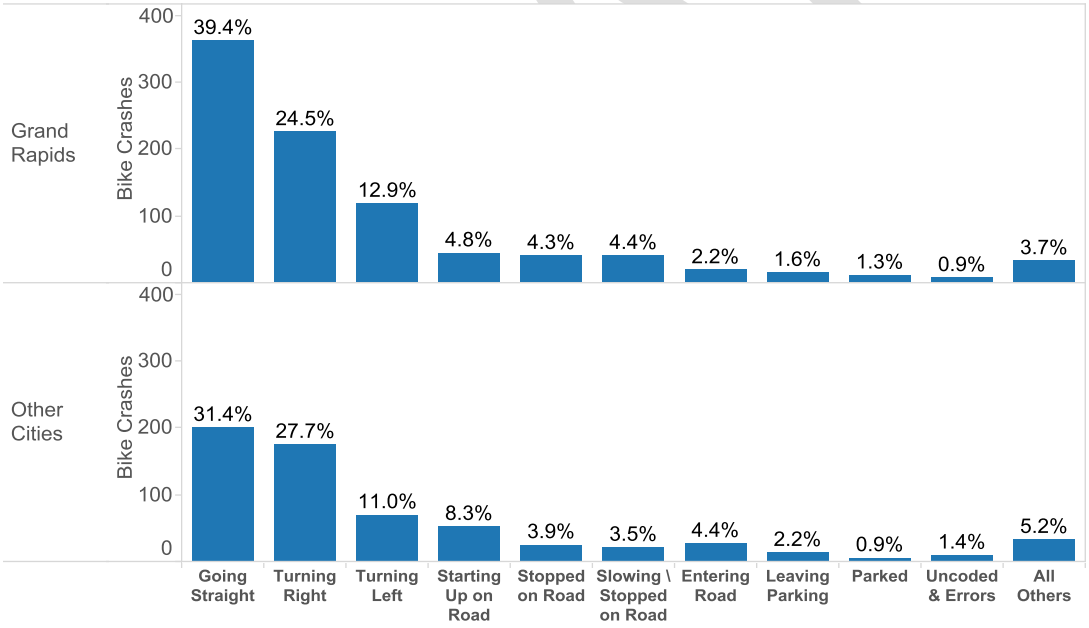


Figure 22 – Driver Preceding Action

Figure 23 illustrates that as expected, the majority of crashes involving right and left turning vehicles take place within intersections or are intersection related. Crashes involving vehicles traveling straight most often occur at intersections (since intersections are the most common crash location), followed by along straight

roadways, and driveways. It is unclear how "dooring" crashes are coded within the study area communities. Without knowledge about these crashes' coding, it is unsure how many occur within the study area.

Figure 23 – Driver Preceding Action by Area

Combined Bicycle and Vehicle Previous Actions

Trends in the combined actions of vehicles and bicycles are similar between Grand Rapids and the Other Cities. There are a variety of bicycle actions when the vehicle was going straight (more than 35% of crashes). **Crashes with right turning vehicles accounts for more than 25% of crashes** and typically involves a bicycle traveling straight or crossing at an intersection (these two codes can describe the same movement). **Crashes with left turning vehicles account for another 12% of crashes.**

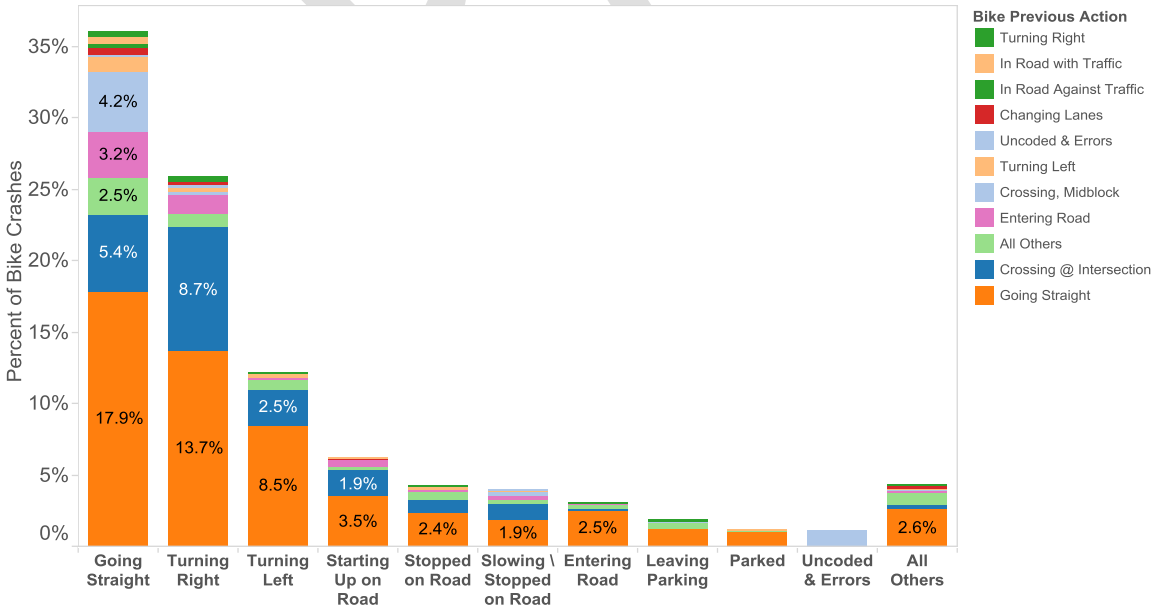


Figure 24 – Vehicle Previous Action and Bicycle Previous Action

Why

Bike Hazardous Action

The bike failed to yield in 20% of reported crashes. The bike disregarded the traffic control in 6.5% of crashes. While approximately 60% of crashes in Grand Rapids and the Other Cities have a recorded hazardous bicycle action of none or other, the Other Cities were more likely to code the action as 'none'. Twenty seven percent (27%) of bicyclists involved in fatal crashes had been drinking.

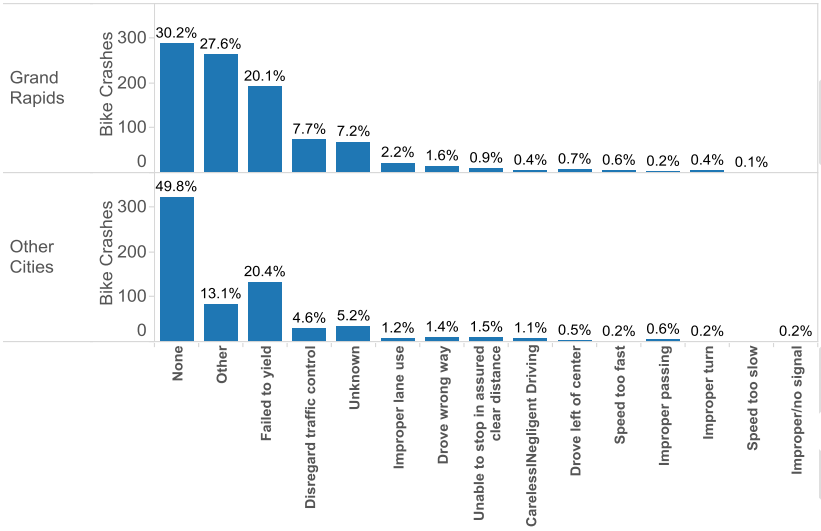


Figure 25 – Bike Hazardous Action

Vehicle Hazardous Action

The vehicle failed to yield in nearly 30% of bicycle crashes (25% of Grand Rapids and 35% of the Other Cities). The vehicle hazardous action was recorded as none in just over 50% of crashes. No other hazardous action category accounted for more than 2% of crashes. Twenty seven percent (27%) of drivers involved in fatal bicycle crashes had been drinking.

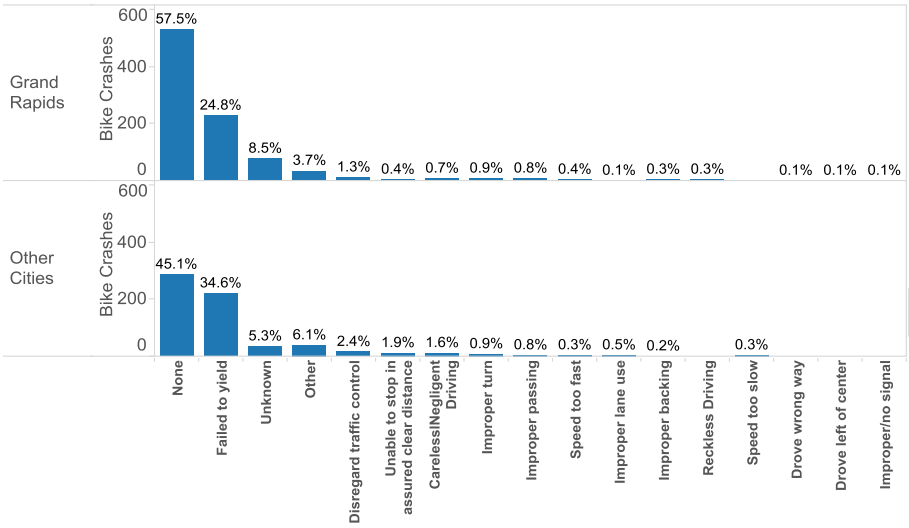
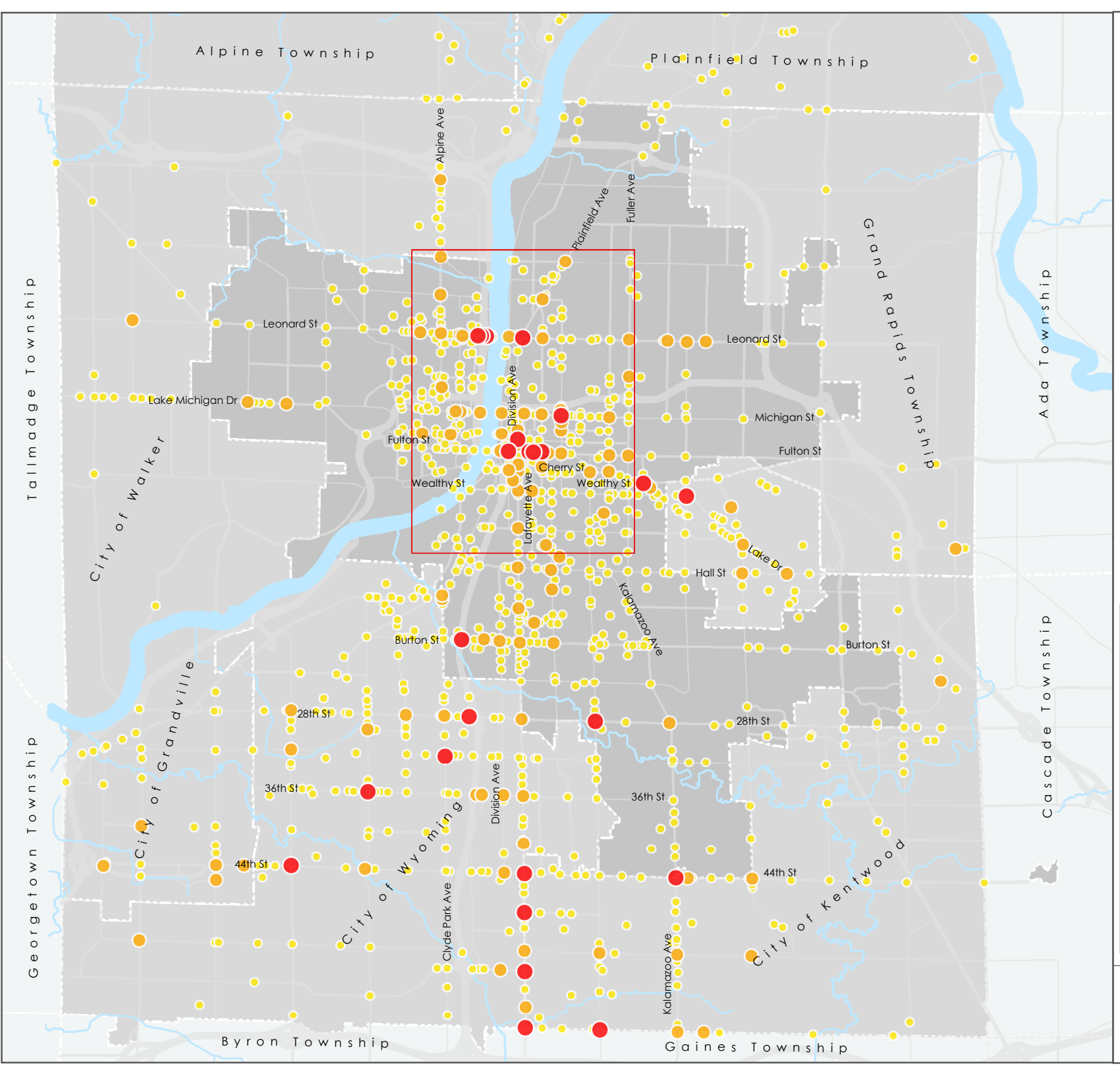


Figure 26 – Vehicle Hazardous Action

The following pages contain maps to illustrate the frequency and severity of crashes within the study area.



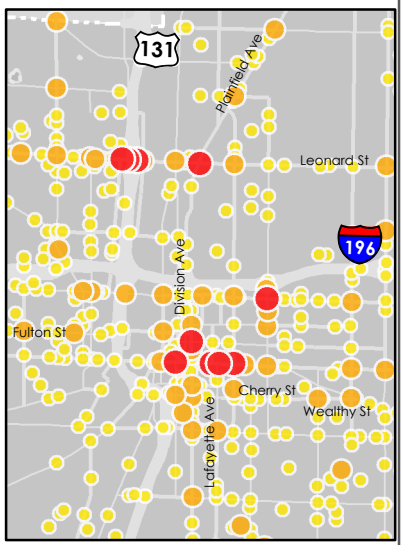
City of Grand Rapids Bicycle Crashes According to Frequency: 2004 - 2013

Grand Rapids Bicycle Safety Education Project

Crash Frequency

- 1 - 2 crashes
- 3 - 5 crashes
- 6 - 12 crashes

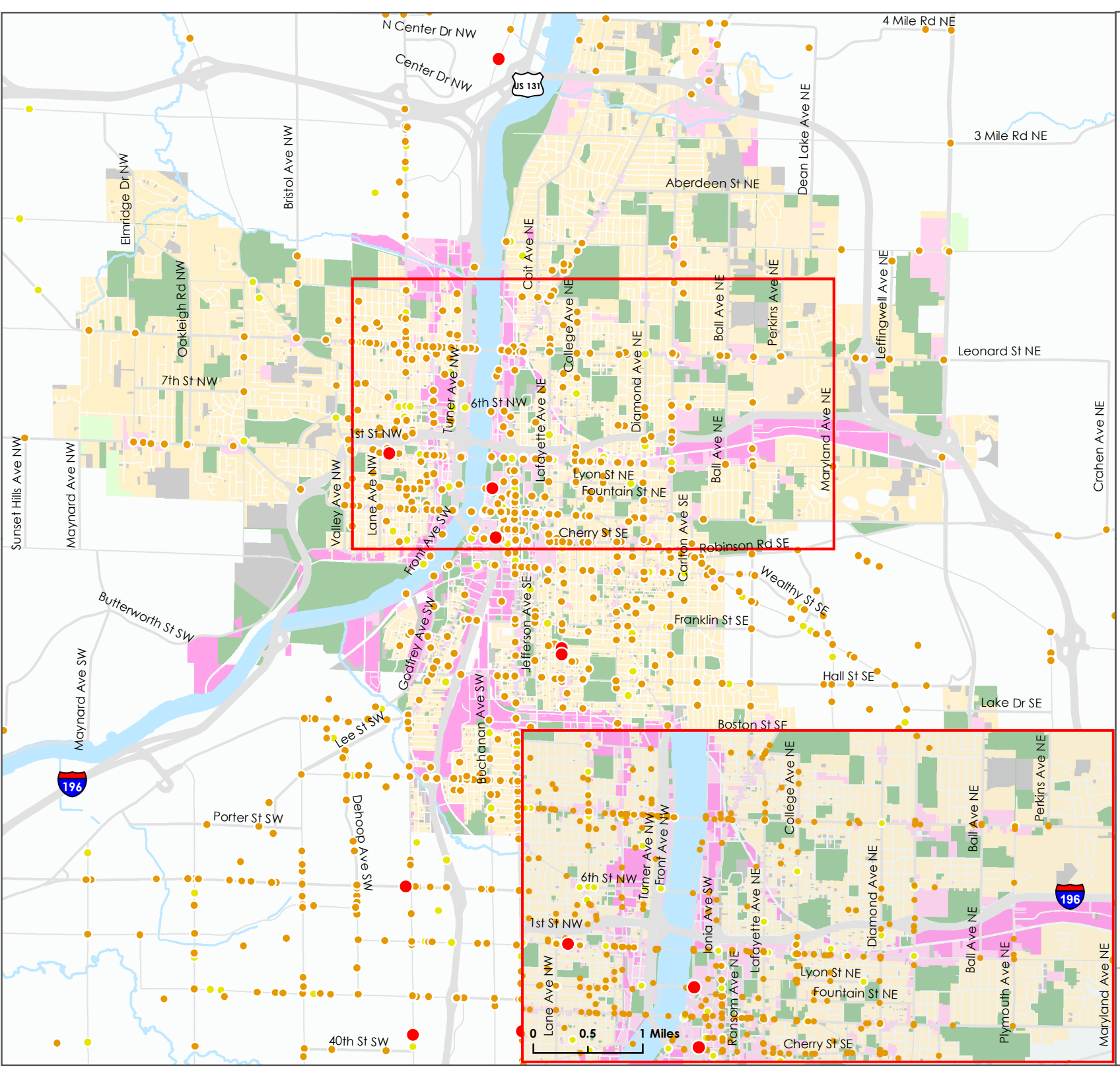
- Neighboring Jurisdictions
- City of Grand Rapids
- Outside of Study Area



0 0.5 1 Miles

Data obtained from MDOT, City of Grand Rapids, GVMC
Map created October 2014

alta PLANNING + DESIGN



City of Grand Rapids Bicycle Crashes According to Land Use: 2004 - 2013

Grand Rapids Bicycle Safety Education Project

Bicycle Crashes

- Crash resulting in fatal injury
- Crash resulting in injury
- Crash without reported injuries

Land Use Type - City of Grand Rapids

- Agricultural
- Commercial, Offices, Medical Facilities, Parking Lots
- Industrial
- Vacant Lot
- Residential
- Parks

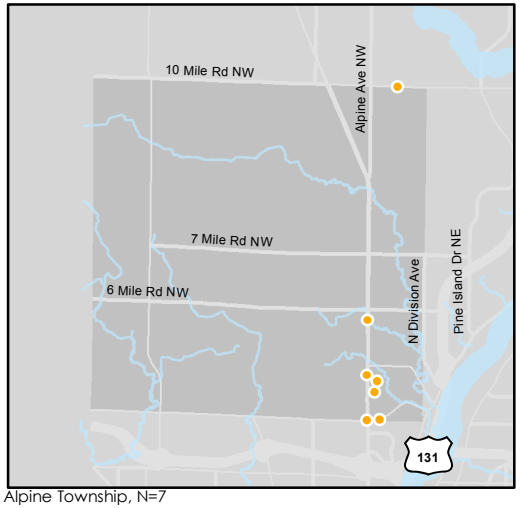
Rivers or Streams

- River or Stream

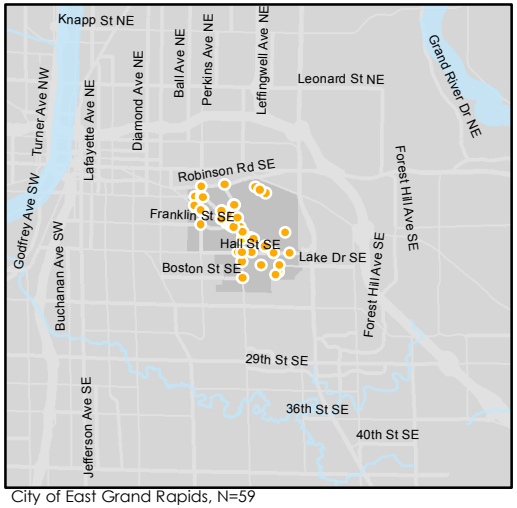
0 0.25 0.5 Miles

Data obtained from MDOT, City of Grand Rapids, GVMC
Map created October 2014

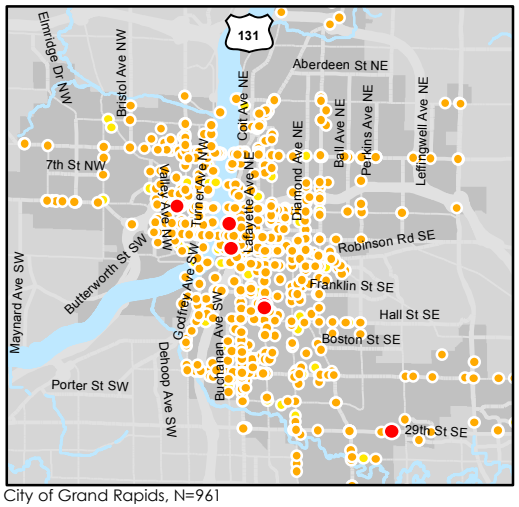
alta PLANNING + DESIGN



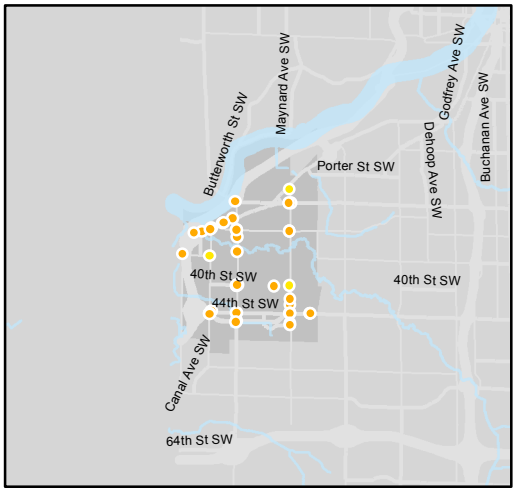
Alpine Township, N=7
Annual crashes per 10k population = 0.9



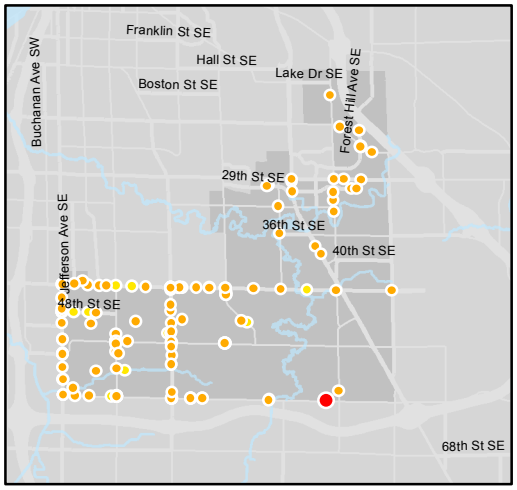
City of East Grand Rapids, N=59
Annual crashes per 10k population= 5.5



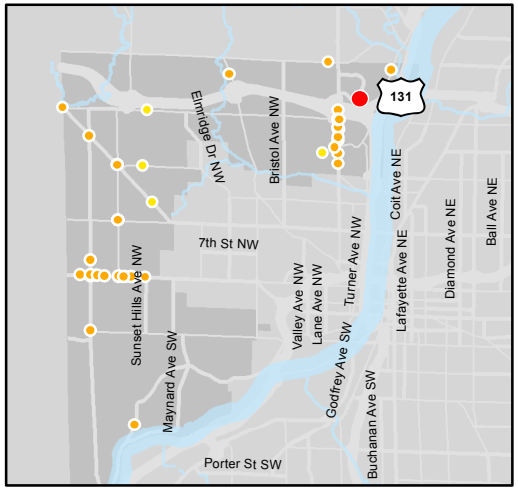
City of Grand Rapids, N=961
Annual crashes per 10k population= 5.1



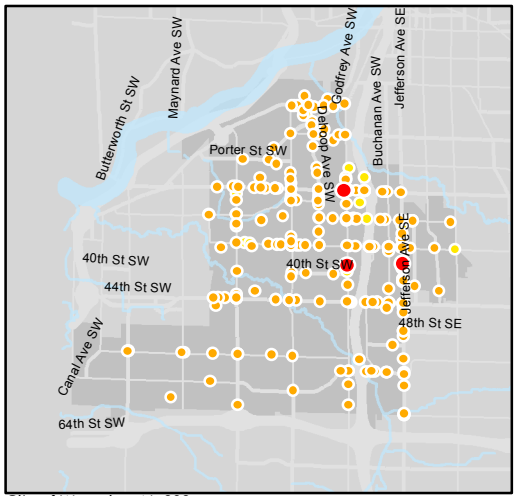
City of Grandville, N=48
Annual crashes per 10k population= 3.1



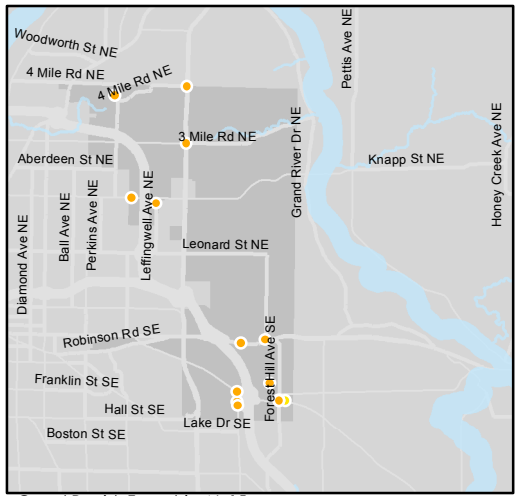
City of Kentwood, N=153
Annual crashes per 10k population= 3.1



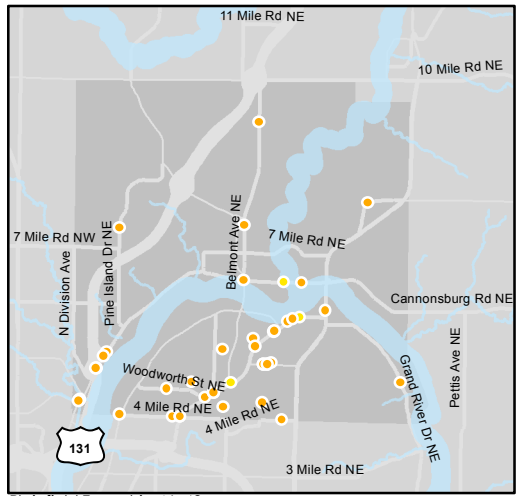
City of Walker, N=46
Annual crashes per 10k population= 2.0



City of Wyoming, N=282
Annual crashes per 10k population= 3.9



Grand Rapids Township, N=15
Annual crashes per 10k population= 1.1



Plainfield Township, N=42
Annual crashes per 10k population= 1.5

Bicycle Crash Severity in the Greater Grand Rapids Area: 2004 - 2013

Grand Rapids Bicycle Safety Education Project

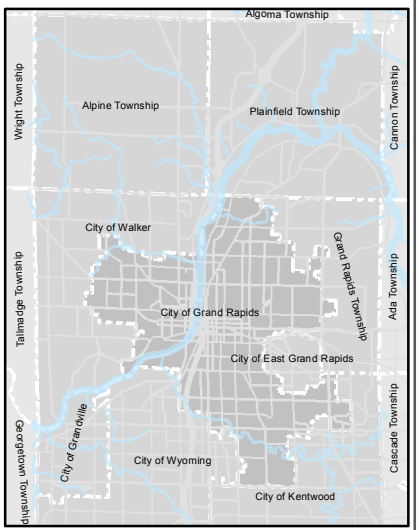
Bicycle Crashes

- Crash resulting in fatal injury
- Crash resulting in injury
- Crash without reported injury

Street Typologies

- US or State Roadway
- Collector or Arterial
- River or stream

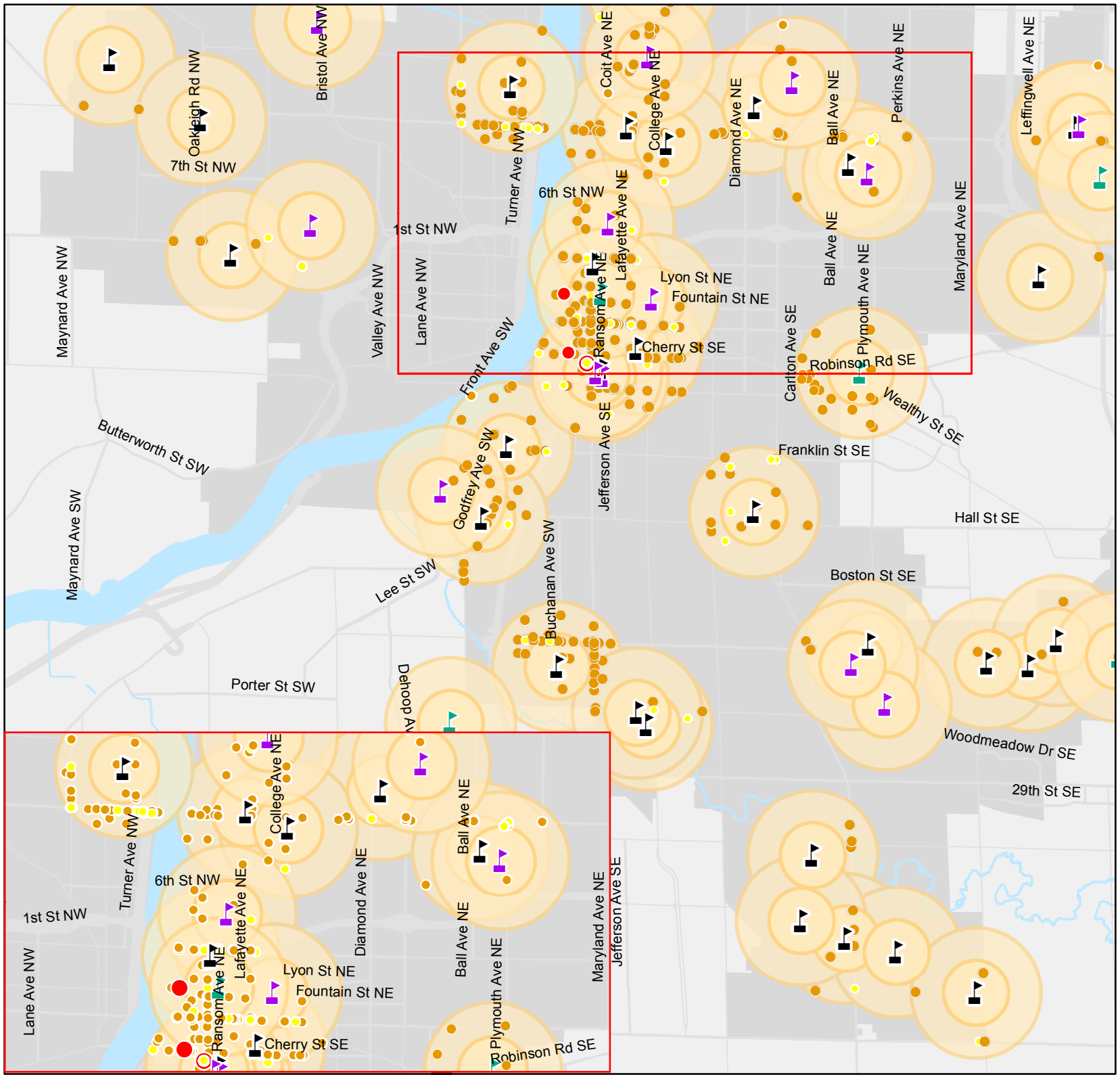
Total crashes in the Greater Grand Rapids area from 2004-2013= 1613



0 0.5 1 2 Miles

Data obtained from MDOT, City of Grand Rapids, GVMC
Map created October 2014

alta PLANNING + DESIGN



Severity of Bicycle Crashes within 1/4 Mile and 1/2 Mile of Grand Rapids Schools

Grand Rapids Bicycle Safety Education Project

Bicycle Crashes

- Crash resulting in fatal injury
- Crash resulting in injury
- Crash without reported injuries
- Elementary and Middle Schools
- High Schools
- Colleges and Universities
- 1/4 and 1/2 mile school buffer

Street Typologies

- US or State Roadway
- Collector or Arterial

Rivers or Streams

- River or stream

The number of all crashes within the City of Grand Rapids from 2004-2013 totaled 961 crash events.

0 0.25 0.5 Miles

Data obtained from MDOT, City of Grand Rapids, GVMC
Map created October 2014

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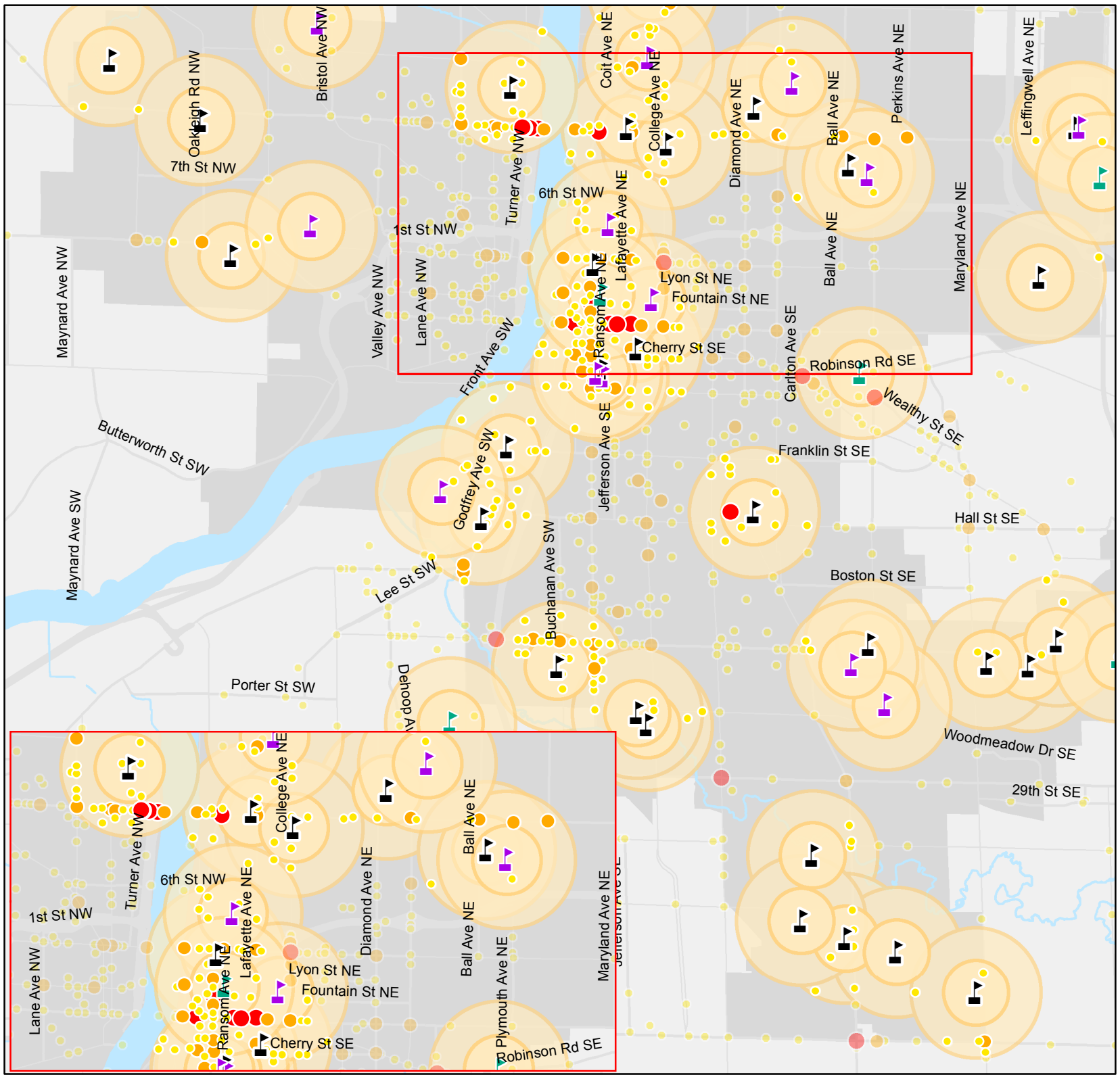

Frequency of Bicycle Crashes within 1/4 Mile and 1/2 Mile of Grand Rapids Schools

Grand Rapids Bicycle Safety Education Project

Bicycle Crashes

- 1 - 2 crashes
- 3 - 5 crashes
- 6 - 11 crashes
- Elementary and Middle Schools
- High Schools
- Colleges and Universities
- 1/4 and 1/2 mile school buffer

Street Typologies

- US or State Roadway
- Collector or Arterial

Rivers or Streams

- River or stream

The number of all crashes within the City of Grand Rapids from 2004-2013 totaled 961 crash events.

0 0.25 0.5 Miles

Data obtained from MDOT, City of Grand Rapids, GVMC
Map created October 2014

alta PLANNING + DESIGN