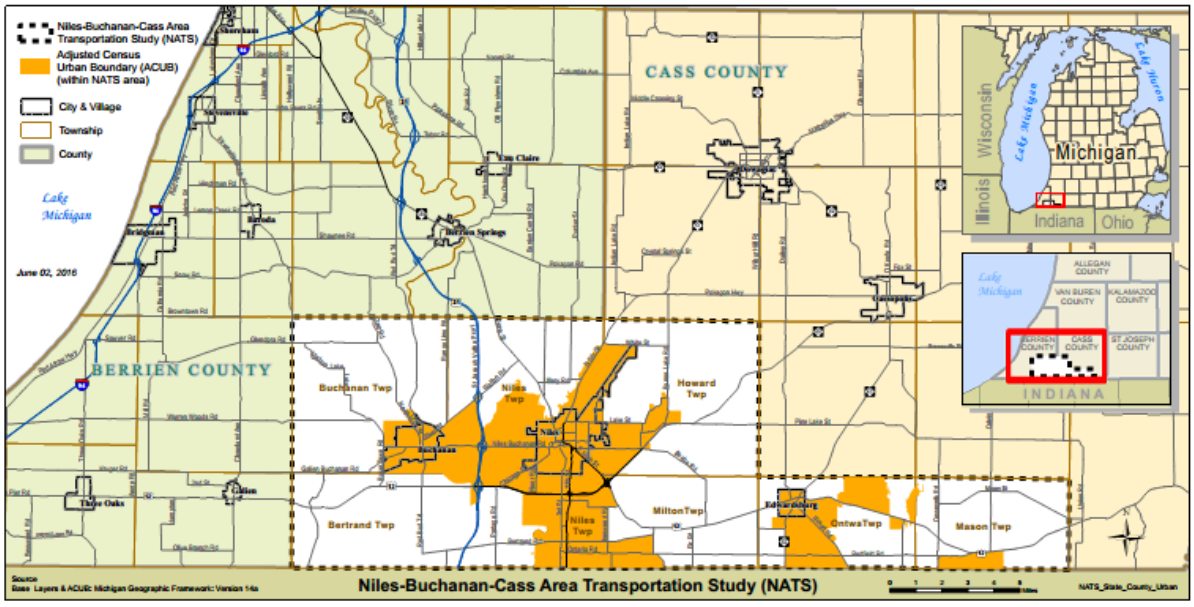
2006-2015 Traffic Safety Report

For The Niles Buchanan Cass Area Transportation Study



Prepared by the
Southwest Michigan Planning Commission
376 W. Main St., Suite 130
Benton Harbor, Michigan 49022
(269) 925-1137

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INTRODUCTION

The auto industry has made steady improvements in vehicle safety over the last few decades which may have contributed to an all-time low of 32,675 people killed crashes in 2014. Unfortunately, the impacts of crashes on the road remain significant. During that same year motor vehicle crashes were the leading cause of death for individuals 11 years old and for age group 16-24 years old. Just one year later, in 2015 the National Highway Traffic Safety Administration (NHTSA) reported that more than 35,092 people were killed and 2.44 million were injured in crashes on the nation's roadways, making it the deadliest year on the road since 2008.

The consequences of traffic crashes are felt not only by those directly involved but also by family members, friends, and coworkers who must deal with a devastating loss or find resources to cope with disabling injuries. Beyond the pain and suffering of victims and their friends and relatives, these crashes are a significant economic burden to the U.S. The U.S. Department of Transportation's most recent estimate of the annual economic cost of crashes was $242 billion dollars.

Years of experience with safety projects and strategies have shown that benefits far outweigh the resources consumed. The most critical safety benefit is a decrease in the number of fatalities and serious injuries. Consideration of safety during the transportation planning process is important to improving transportation safety, because it is far better to create designs which minimize crashes than to try to redesign areas which have already had crashes. Safety performance measures are key to ensuring that safety issues are considered and addressed throughout the transportation planning process. In 2016 the Federal Highway Administration (FHWA) published new Safety performance measures as a part of its national safety program. This programs calls for state and regional targets to help reduce traffic related deaths and injuries, including for the first time, those people walking and bicycling.

The Safety performance measure final rule established five performance measures utilizing five-year moving averages:

1. Number of Fatalities
2. Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)
3. Number of Serious Injuries
4. Rate of Serious Injuries
5. Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries.

The Michigan Department of Transportation and the Niles-Buchanan-Cass Area Transportation Study (NATS) are now required to use the above performance measures as the primary mechanism to prioritize investments and demonstrate progress toward goals in statewide and metropolitan long-range transportation plans. In practice this means that while the total number of crashes and property damage are important factors, there is no requirement from FHWA to track that data. Even if the total number of crashes were to increase, if the number of fatalities and serious injuries were to fall then it is considered a success according to the performance measures. This does not mean that NATS cannot or should not consider total crashes, or property damage, but that the FHWA does not require it.

This report focuses on safety in the NATS planning area. The first step in safety planning is assessing where the NATS Metropolitan Planning Organization stands in relation to the performance measures. This report will give baseline data for the safety performance measures and assess the trends in safety. The report will also identify the locations within NATS where crashes occurred. The purpose is to provide analysis of how much NATS will need to improve to meet upcoming performance targets. These targets are metrics the state of Michigan will set and need to meet for each performance measure. By determining locations, it will also help better target any safety improvements. The report will not examine the specific causes of crashes. Determining the causes of a crash is difficult since every crash can have multiple contributing factors. Unfortunately, while we know a lot about where and when

crashes are occurring it is difficult to pinpoint exact causes. Because exact causes of crashes are not identified, this report is not making any specific recommendations to improve safety

Ten years of data (2006-2015) were used to analyze the baseline and trends in safety. Unlike some Metropolitan Planning Organization (MPO) programs which are only concerned with roads that receive federal funding, this report includes crash data on all roads regardless of ownership or federal aid status.

The data was derived from U-D 10 reports from local and state law enforcement agencies. The U-D 10 report is used by law enforcement agencies to record the details of a crash scene including if there was a serious injury or a fatality. A serious injury, coded as an "A" in the U-D 10 report, is defined as: *"Any injury, other than fatal, that prevents the injured person from walking, driving, or normally continuing the activities which he or she was capable of performing prior to the motor vehicle traffic crash. Includes: severe lacerations, broken or distorted limbs, skull fracture, crushed chest, internal injuries, unconscious when taken from the crash scene, unable to leave crash scene without assistance."* Fatal crashes are coded as "K" on the U-D report. Serious crashes are considered crashes which lead to a fatality or serious injury and are often referred to as K&A crashes because of their UD-10 codes. For the full explanation of UD-10 categories see Appendix A. This data is made available to the Michigan Department of Transportation on an annual basis and online at www.MichiganCrashFacts.org..

OVERVIEW OF CRASHES IN THE NATS PLANNING AREA 2005-2016

In the NATS planning areas, over the ten-year period from 2006-2015 there were a total of 15,262 crashes, which led to 88 fatalities and 396 serious injuries (Table 1). The total for all crashes, includes every traffic related crash, fatality or serious injury involving drivers, pedestrians, and bicyclists.

Table 1. Annual Crashes, Fatalities, & Serious Injuries- NATS Planning Area

Year	Total Crashes	Fatalities	Serious Injuries
2006	1,611	8	56
2007	1,777	9	59
2008	1,816	6	66
2009	1,555	6	34
2010	1,479	6	38
2011	1,313	14	34
2012	1,329	14	30
2013	1,379	9	21
2014	1,538	6	32
2015	1,465	10	26
Total	15,262	88	396

During the 10-year period, the highest number of crashes was reported in 2008 with 1,816 crashes while 2011 had the lowest number of crashes with 1,313 reported. This is high variability with a difference of 27 percent between the highest and lowest years. In comparison to all crashes, serious and fatal crashes are relatively rare events, with only 2.6 percent of all crashes in the NATS area resulting in a fatality or serious injury. In comparison statewide between 2006-2015, 2.4 percent of all crashes were serious. This means that crashes within NATS are about equally as likely to be serious as crashes in the state of Michigan as a whole.

Table 2. Five-Year Moving Average for Crashes, Fatalities, & Serious Injuries

Year	Total Crashes	Fatalities	Serious Injuries
2011	1588	8.2	46.2
2012	1498	9.2	40.4
2013	1411	9.8	31.4
2014	1408	9.8	31.0
2015	1405	10.6	28.6

Due to the high annual variability in traffic crashes, it is likely that any one year could have a much higher or lower number of crashes than the typical year. A 5-year moving average normalizes crash data over a longer period than one year to account for annual anomalies that

can skew analyses. Furthermore, the moving average smooths the data to more easily see the overall trends in variable data. The 5-year moving averages for total crashes, fatalities, and serious injuries are shown in Table 2. The moving averages constitute the typical crashes per year and is a baseline to be used to assess the effectiveness of safety improvements. While there is high annual variability in total crashes, the 5-year moving average indicates a slight trend toward fewer crashes (Figure 1).

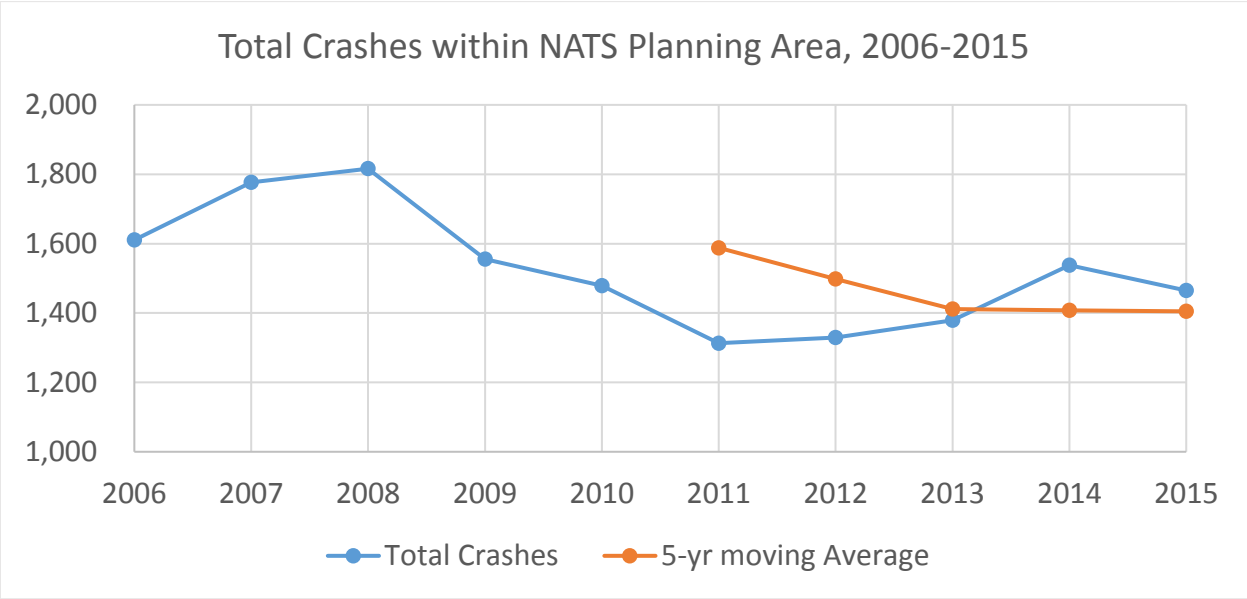


Figure 1. Annual Total Crashes & Five-Year Moving Average - NATS Planning Area

There is also high variability in fatalities per year, with a high of 14 fatalities in 2011 and 2012 and a low of 6 fatalities in 2008, 2009, 2010, and 2014 (Figure 2). The 5-year moving average of fatalities indicates a possible downward trend. With such a slight trend and only 10 years of data, it is not possible to definitively tell if this is a significant trend or not. Serious injuries also show large variation per year, going from a high of 66 serious injuries in 2008 down a low of 21 serious injuries in 2013. However, the five year moving average indicates a clear downward trend in serious injuries.

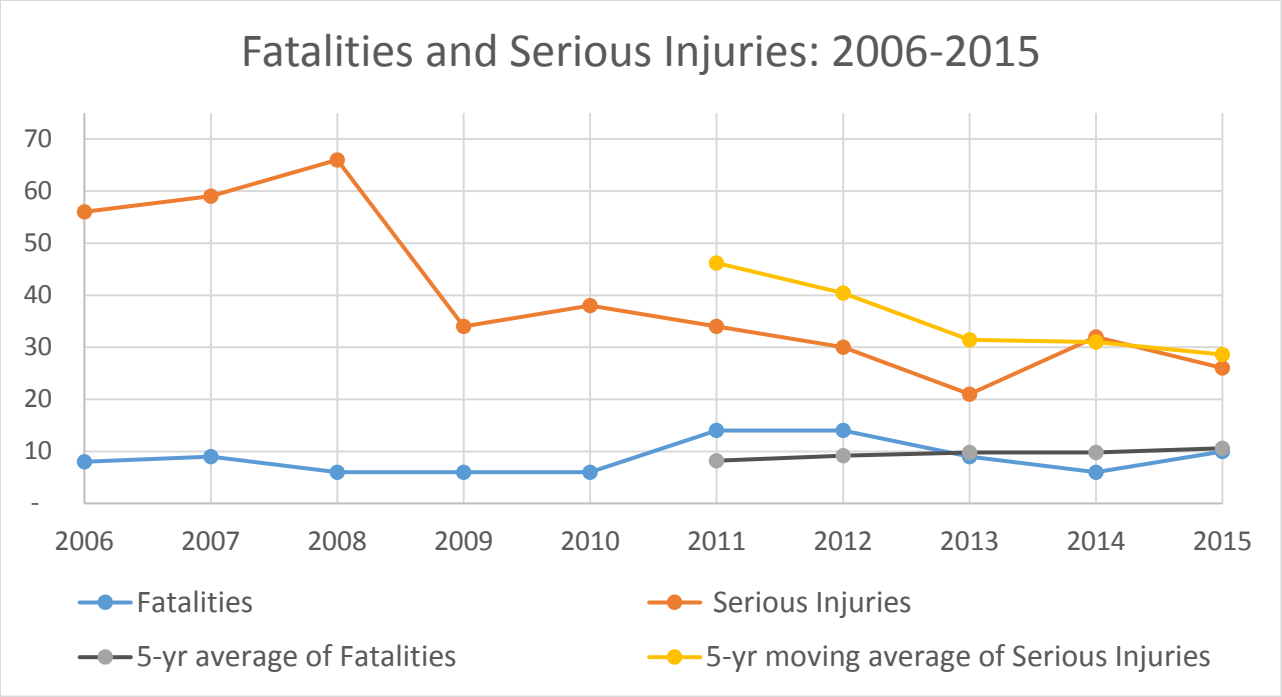


Figure 2. Annual Fatalities & Serious Injuries with 5-year Moving Average - NATS Planning Area

To further assess trends within the NATS area it is helpful to compare the local trends to the statewide trends. The trend in fatalities within NATS area is not correlated to the statewide fatality trends (Figure 3).

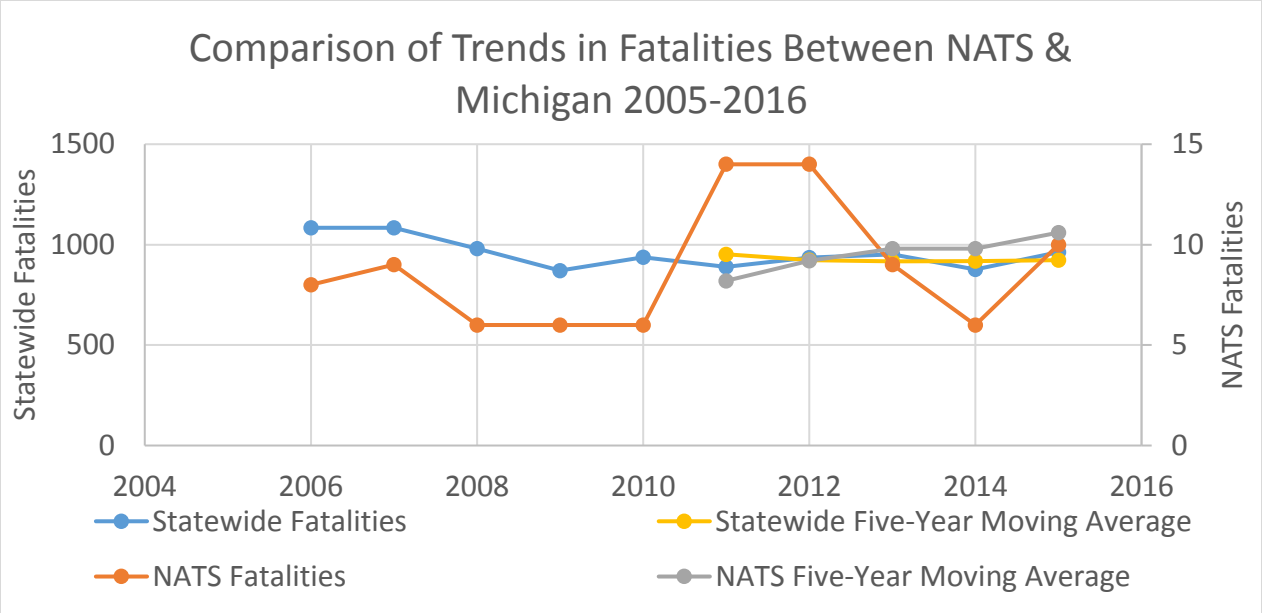


Figure 3. Comparison Between NATS and Statewide Trends in Fatalities

Unlike the trends in fatalities, there is a relationship between the trends in serious injuries between NATS and Michigan. Both the state and NATS show a downward trend in serious injuries.

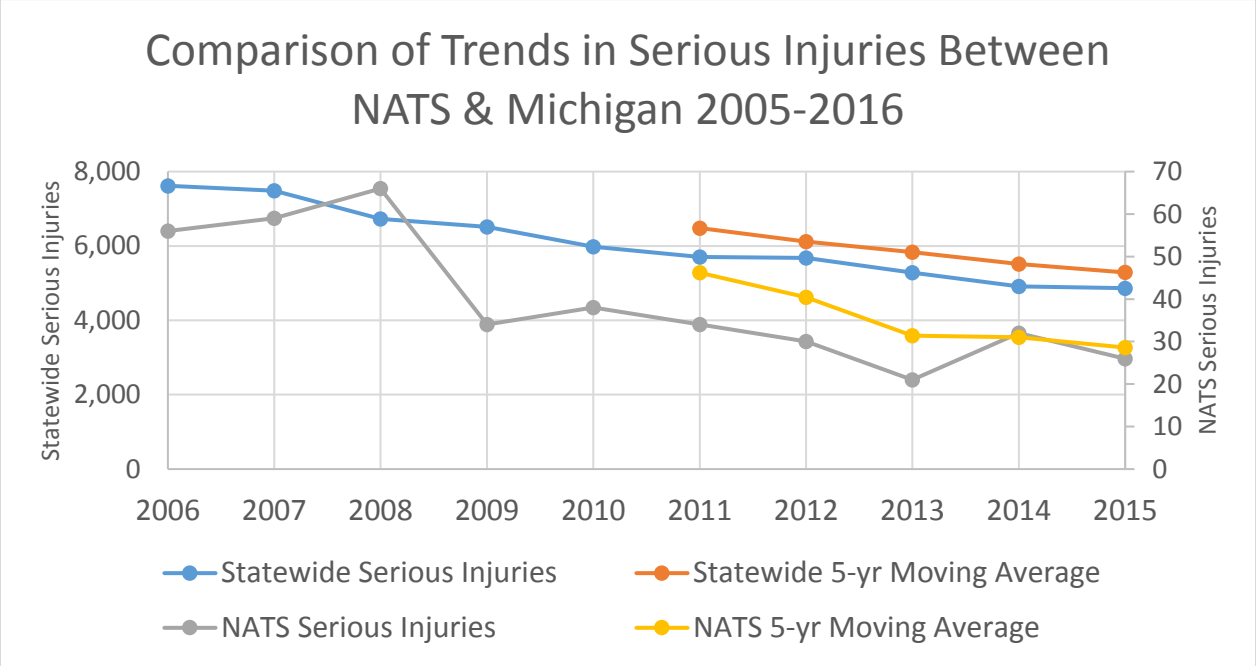


Figure 4. Comparison Between NATS and Statewide Trends in Serious Injuries

NON MOTORIZED CRASH ANALYSIS

Non-motorized crashes consist of a crash which involves a pedestrian or bicycle. Between 2006-2015 out of a total of 15,262 crashes, there were a total of 321 non-motorized crashes; 186 of which involved a pedestrian and 135 of which involved bicyclists (Table 3).

Table 3. Annual Pedestrian & Bicycle Crashes

Year	Total Crashes	Pedestrian	Bicyclist	Total Non-Motorized Crashes
2006	1,611	14	12	26
2007	1,777	14	11	25
2008	1,816	13	8	21
2009	1,555	8	14	22
2010	1,479	10	9	19
2011	1,313	10	6	16
2012	1,329	9	9	18
2013	1,379	10	9	19
2014	1,538	11	9	20
2015	1,465	14	7	21
Total	15,262	113	94	207

Over the 10-year period, 5 pedestrians and 2 bicyclists were killed. Over the same period, 21 pedestrians and 6 bicyclists received serious injuries (Table 4). On average 3.4 percent of non-motorized crashes resulted in a fatality and 13.0 percent resulted in a serious injury; this is compared to a fatality rate for automobile accidents of about 0.5 percent and a serious injury rate of about 2 percent. This indicates how much more vulnerable pedestrians and bicyclists are to injury when struck by an automobile. Out of the 88 total fatalities, 7 were pedestrians or bicyclists. This means that while the total number of non-motorized crashes may seem low, the number and likelihood of fatalities in non-motorized crashes is significant.

Table 4. Annual Pedestrian & Bicyclist Fatalities & Serious Injuries

Year	Pedestrian		Bicyclist	
	Fatalities	Serious Injuries	Fatalities	Serious Injuries
2006	0	2	2	1
2007	1	4	0	2
2008	1	7	0	0
2009	0	1	0	1
2010	0	2	0	0
2011	0	0	0	0
2012	2	0	0	2
2013	0	0	0	0
2014	0	3	0	0
2015	1	2	0	0
Total	5	21	2	6

The 5-year moving average for non-motorized fatalities and non-motorized serious injuries is show in Table 5. The safety performance measure asks for the total number of non-motorized fatalities and serious Injuries. The baseline data in Table 5 will be a primary tool for measuring the effectiveness of pedestrian and bicycle safety improvements.

Table 5. Five-Year Moving Average for Non-Motorized Fatalities & Serious Injuries

	Pedestrian		**Bicyclist**		
	Fatalities	Serious Injuries	Fatalities	Serious Injuries	Fatal & Serious
2011	0.4	2.8	0	0.6	3.8
2012	0.5	0.75	0	0.75	3.2
2013	0.4	0.6	0	0.6	1.6
2014	0.5	0.5	0	0.5	1.8
2015	0.6	1	0	0.4	2

As show in Figure 5, both NATS and Michigan as a whole have a slight downward trend in non-motorized fatalities and serious injuries. With such high variability and low sample size in NATS it is not possible to tell if this was actually statistically significant.

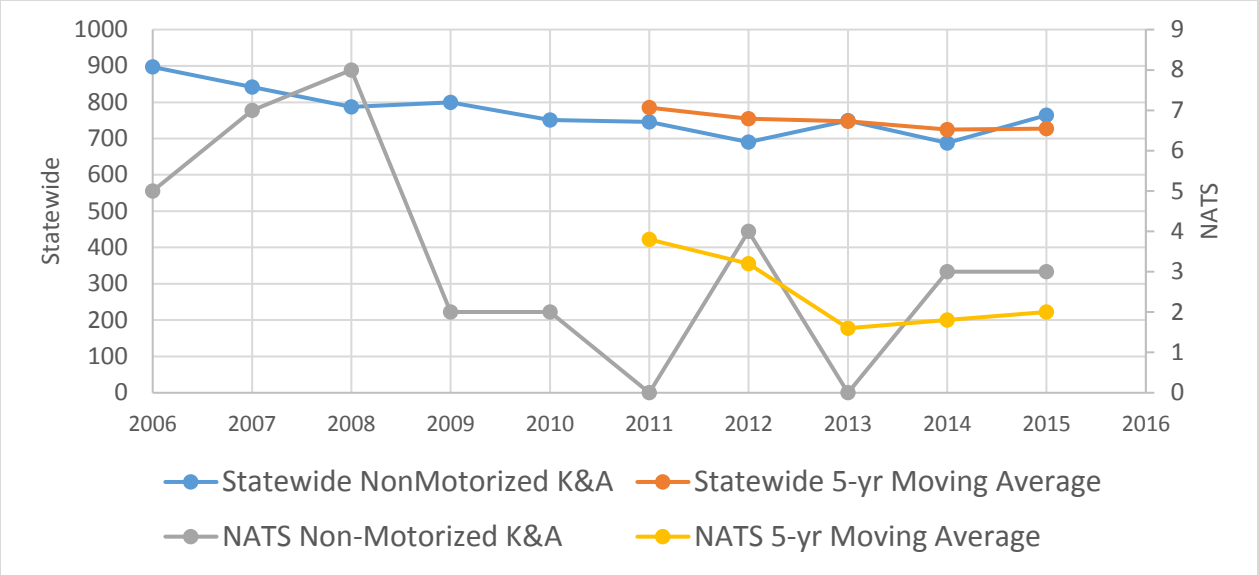
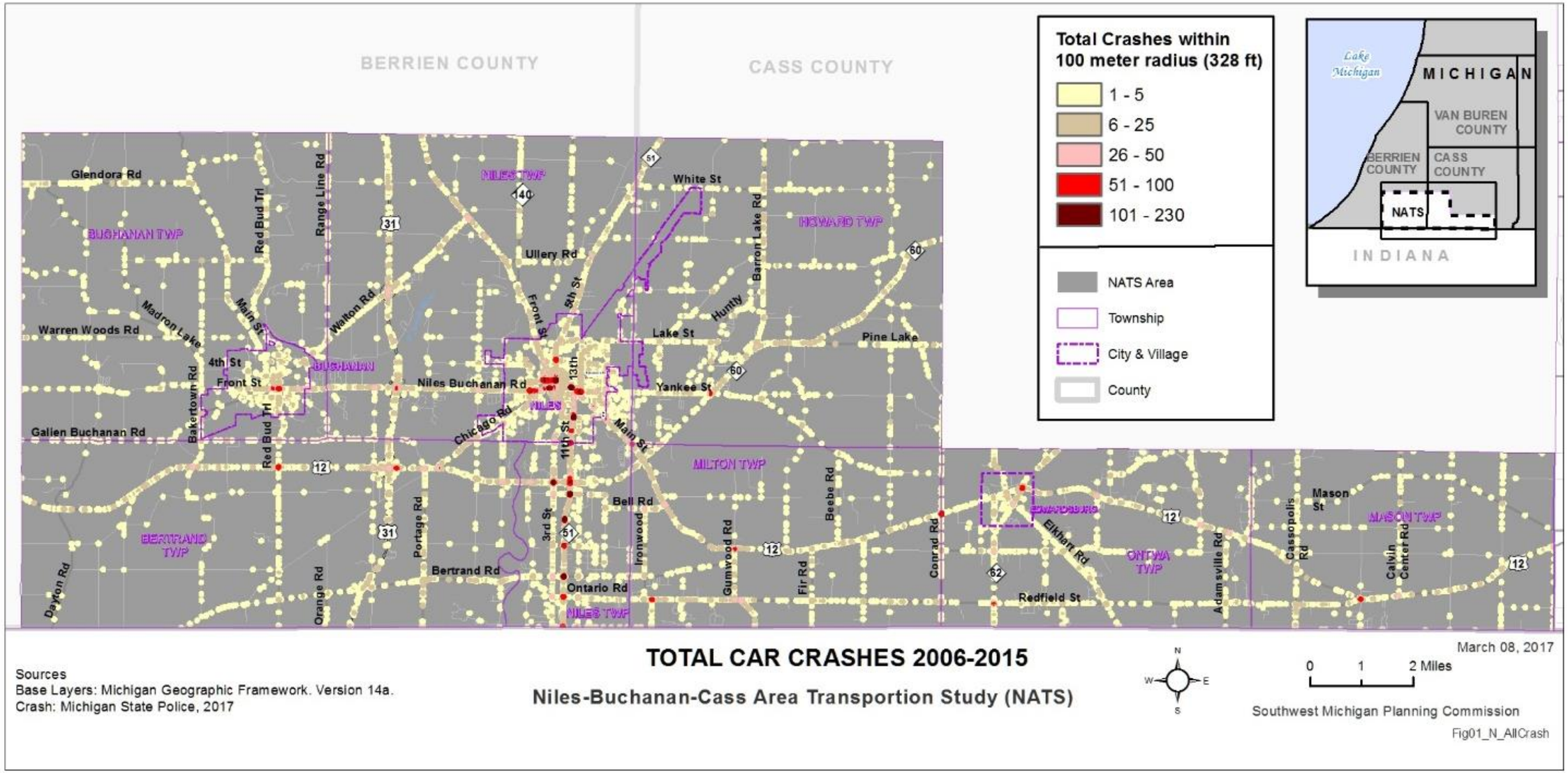


Figure 5. Comparison Between NATS and Statewide Trends in Non-Motorized Fatalities & Serious Injuries

CRASH LOCATIONS

The location of all crashes within NATS were aggregated within 100-meter radius (Map 1). The highest concentration of crashes is grouped into 101-230 crashes. The highest concentration of crashes occurred only in the City of Niles and Niles Charter Township. Other areas of high crash density were in downtown Buchanan and Edwardsburg, the exits on US-31 at Niles-Buchanan Road, and US-12, as well as US-12 having several high crash locations. This corresponds to the areas of highest traffic in NATS. To look at the density of accidents in more detail, the data was analyzed by road segment and intersection (Table 6 and Table 7).



Map 1. Total Crashes in the NATS Planning Area 2006-2015

The top ten segments with the most crashes is show in Table 6. The segments begin and end at intersections, jurisdictional boundaries, and bridges/overpasses. This table ranks segments by the total number of crashes, without taking into account the number of fatalities or serious injuries. All of the top highest crash segments are within the City of Niles, Niles Township, Milton township, and Bertrand Township. Furthermore, 11th Street (M-51) has 7 out of the 10 highest crash segments.

Table 6. Road Segments with the Most Crashes 2006-2015

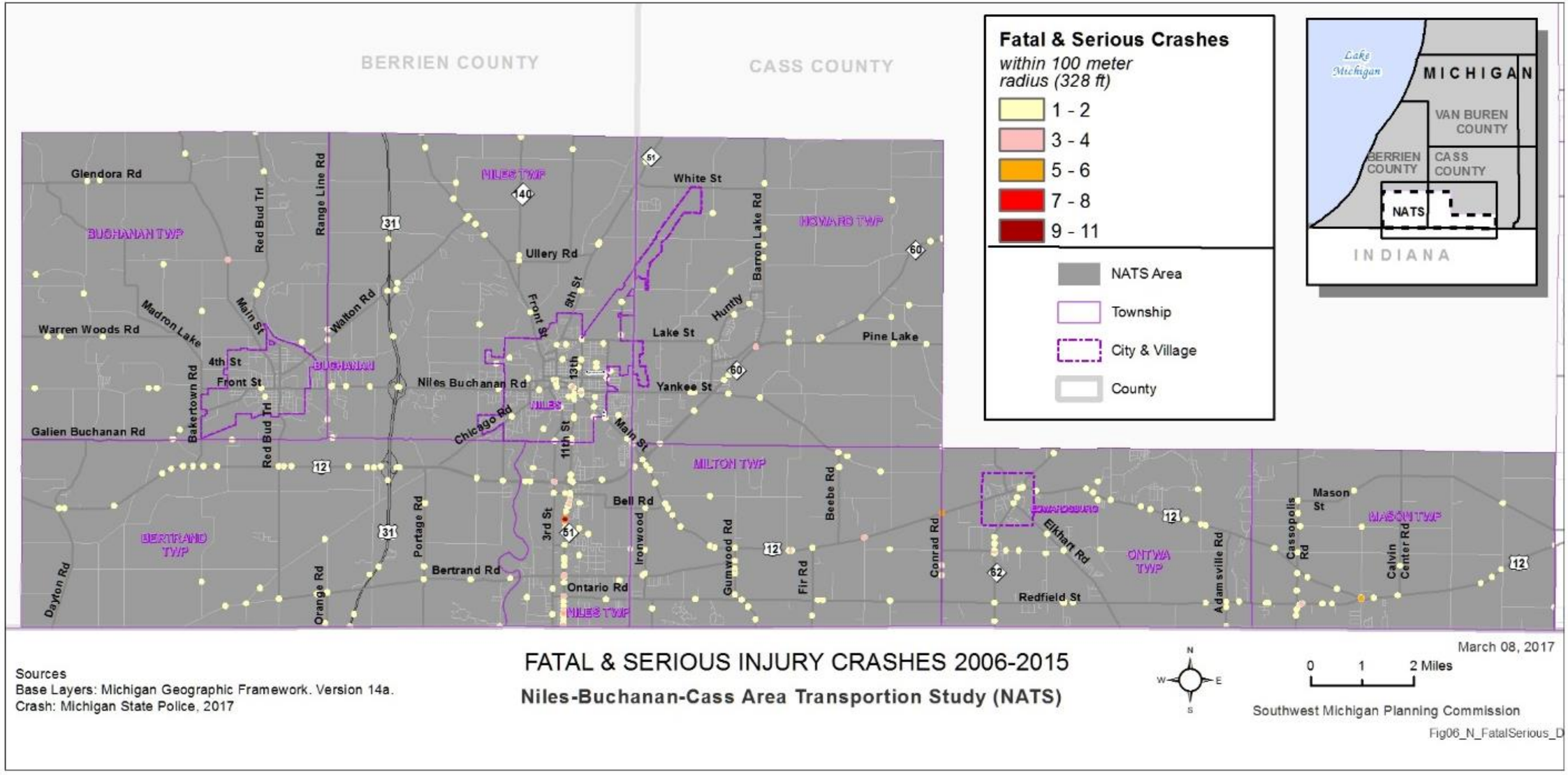
Road	From	To	Jurisdiction	Crashes
S 11th St	Wrightman St	Chestnut	Niles Twp	154
S 11th St	Moore Dr	Bell Rd	Niles Twp	154
US 12	Bell Rd	Gumwood Rd	Milton Twp	152
S 11th St	Lambert St	Silverbrook St	Niles	118
S 11th St	Ontario Rd	E Bertrand Rd & W Bertrand Rd	Niles Twp	107
S 11th St	Silverbrook St	Superior St	Niles	104
Broadway St	S 9th St	E Main St & N 10th St & S 10th St	Niles	95
S 11th St	Fort St	Marion St	Niles	86
S 11th St	E Bertrand Rd & W Bertrand Rd	De Witt Ave	Niles Twp	80
E Pulaski Hwy (US-12)	High Bridge Rd	Bakertown Rd	Bertrand Twp	80

The total number of crashes within 350 feet of the intersection is shown in Table 7. Three streets have streets have all off the 10 highest crash intersections; Main Street, Broadway and 11th Street.

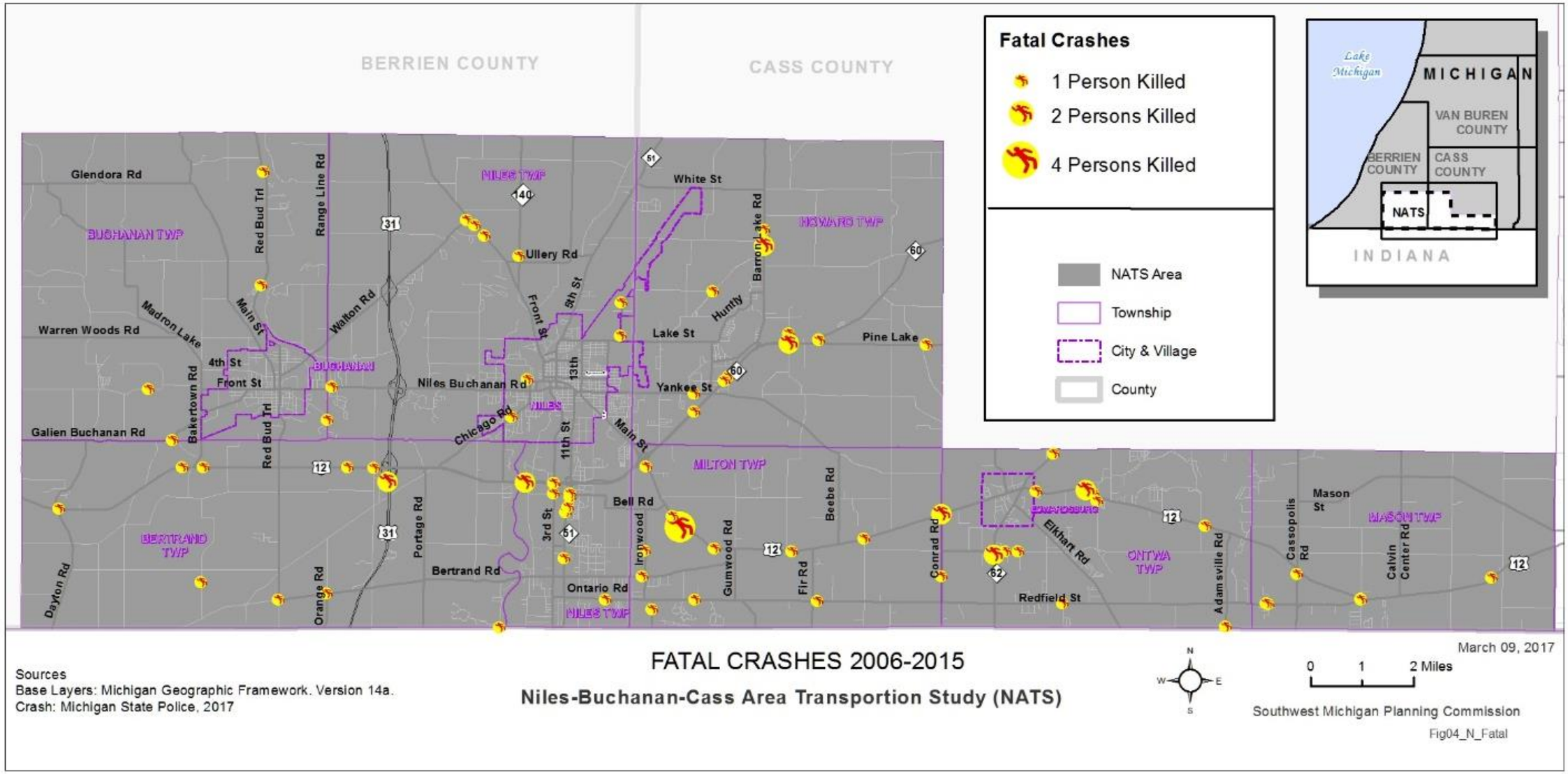
Table 7. Intersections with the Most Crashes 2006-2015

Intersection	*Jurisdiction*	*Number of Crashes 2006-2015*
Silverbrook St & S 11th St	City of Niles	236
Bell Rd & S 11th St	Niles Twp	227
Chestnut & S 11th St	Niles Twp	191
E Main St & Broadway St & 10th St	City of Niles	174
N 5th St & E Main St	City of Niles	155
S 11th St & Lawndale St	Niles Twp	150
N 3rd St & Broadway St & S 3rd St	City of Niles	138
S 11th St & E Bertrand Rd & W Bertrand Rd	Niles Twp	135
N 2nd St & S 2nd St & E Main St	City of Niles	128
S 13th St & Oak St & E Main St	City of Niles	125

Map 2 shows where serious crashes occurred. While some of the locations with the highest total crashes also have fatalities and serious injuries, there are locations with a high total for crashes but few fatalities or serious injuries. Particularly, Main St and Broadway in the City of Niles are both roads with a high total crashes but few of these resulted in a fatality of serious injury. This is mainly due to vehicle speed. Crashes are typically related to speed, traffic volume and number of access points (intersection, driveways, etc.) The jurisdictions with the most fatalities and serious injuries are places with higher volume and higher speed roads especially ones that have US-12 running through them (Table 10 & Table 11).



Map 2. Fatal & Serious Injury Crashes 2006-2015



Map 3. Location of Fatalities Between 2006-2015

The list f road segments with the highest number of fatalities and serious injuries, shows that 11th St/M-51 and US-12 each have 4 of the top 10 highest fatality and serious injury segments (Table 8). The number of fatalities and serious injuries is the total for 10 years. This means that no road segment has had an average greater than one serious crash per year.

Table 8. Highest Fatality and Serious Injury Road Segments

Road	From	To	Jurisdiction	Fatal & Serious Injury crashes
S 11th St	Stateline Rd	Gary Ct	Niles Twp	10
US 12	Bell Rd	Gumwood Rd	Milton Twp	9
S 11th St	Wrightman St	Chestnut	Niles Twp	9
S 11th St	Moore Dr	Bell Rd	Niles Twp	6
US 12	Leet Rd	Fir Rd	Milton Twp	5
Gumwood Rd	Redfield St	Bertrand St	Milton Twp	5
M 60	Lilac Ave	Barron Lake Rd	Howard Twp	4
E Pulaski Hwy (US-12)	High Bridge Rd	Bakertown Rd	Bertrand Twp	4
S 11th St	Chestnut	Moore Dr	Niles Twp	4
E Pulaski Hwy (US-12)	Red Bud Trl	W Pulaski Hwy	Bertrand Twp	4

Similar to the road segments, 11th St/M-51 and US-12 contain the intersections with the most injuries or serious injuries (Table 9). Table 9 lists the total number of fatalities and serious injuries within 350 ft. of an intersection. This means that the crashes might not necessarily be directly at the intersection. Therefore, it is not possible to tell what role the intersection itself played in the crashes. Because crashes involve a high degree of chance it is possible that high fatality and serious injury locations are not due to do with the location itself. Only the top three highest fatality and serious injury intersections are significantly high. Furthermore, 11th St/M-51 is among the highest traveled roads in the NATS area and Chestnut and 11th is a particularly well-traveled area since it is the location of several large retail outlets (Walmart, Lowes, Tractor Supply). Without further analysis of the location it is not possible to tell whether this is a particularly dangerous intersection.

Table 9. Highest Fatality and Serious Injury Intersections 2006-2015

Intersection	Jurisdiction	Fatal & Serious Injury crashes
Chestnut & S 11th St	Niles Twp	11
US 12 & Conrad Rd	Milton Twp	6
Old M 205 & US 12	Mason Twp	5
US 12 & Five Points Rd	Mason Twp	4
S 11th St & E Bertrand Rd & W Bertrand Rd	Niles Twp	4
S 11th St & Stateline Rd	Niles Twp	4
Redfield St & Old M 205	Mason Twp	4
S 3rd St & E Pulaski Hwy (US-12)	Niles Twp	3
Moore Dr & S 11th St	Niles Twp	3
M 62 & May St	Ontwa Twp	3

Breaking down crashes by jurisdiction shows that the jurisdictions with US-12 and 11thSt/M-51 are the areas with both the highest fatalities and serious injuries.

Table 10. Annual Fatalities by Jurisdiction

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Bertrand Twp		1	3			1	2	1	1	2	11
Buchanan											0
Buchanan Twp						1	1	1		1	4
Edwardsburg											0
Howard Twp		1	1	2	2	1	5		2		14
Mason Twp	1	2				1			2		6
Milton Twp	2		1	1		5	2	3		2	16
Niles	1	1				2					4
Niles Twp	3	1	1	2	3	3	2	1	1		17
Ontwa Twp	1	3		1	1		2	3		5	16

Table 11. Annual Serious Injuries by Jurisdiction

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Bertrand Twp	4	6	6	3	5	1	3	4	4	4	40
Buchanan	2		1								3
Buchanan Twp	3	1	3	2	3	4	4	2	2		24
Edwardsburg						2	2			1	5
Howard Twp	6	6	8	2	3	2	2	4	5		38
Mason Twp	5	4	3	5	6	4	3		12		42
Milton Twp	8	3	12	4	3	7	8	1	1	3	50
Niles	5	5	12	5	2	7		3	3	3	45
Niles Twp	17	24	16	11	12	4	5	6	4	9	108
Ontwa Twp	6	10	5	2	4	3	3	1	1	6	41

To further explain the crash locations, Figure 6 breaks down fatalities by road type within the NATS planning area while Figure 7 breaks down serious injuries by road type. NATS contains 692 centerline miles of road which have been broken down into the following categories: "US-31," "US-12," "Other MDOT Trunkline," "Locally Controlled Federal-Aid Roads," and "Locally Controlled Non-Federal Aid Roads." MDOT controls 107 centerline miles of road (MDOT controlled roads are called trunklines) within NATS, which includes US-31, US-12, 11th St/M-51, M-60, M-62, M-140, and a portion of Main Street and Broadway (see Map 5 in Appendix B). Between 2006-2015, 2 percent, of fatalities and serious injuries have been on US-31. The other US route, US-12 had 24 percent of all fatalities within NATS and 17 percent of serious injuries. Over the 10-year period of the study, 28 percent of fatalities and 29 percent of serious injuries occurred on the other MDOT controlled roads. Altogether, 54 percent of fatalities and 48 percent of serious injuries occurred on non-locally controlled roads.

Outside of MDOT's trunkline, the remaining 585 miles of roads are controlled by cities, villages, the Berrien County Road Commission, or the Cass County Road Commission. Of these roads, 152 miles are eligible for federal aid. Between 2006-2015, 30 percent of fatalities and serious injuries occurred on locally controlled federal aid eligible roads. This indicates that there could be a significant improvement in safety overall if the federal funds allocated to NATS were used

for safety improvements. Within NATS there are 433 miles of locally controlled roads not eligible for federal aid. These roads have the fewest serious injury crashes with 16 percent of fatalities and 22 percent of serious injuries occurring on non-federal aid eligible roads. Non-federal aid eligible roads tend to have less traffic and lower speeds explaining why they have less serious accidents than federal aid eligible roads.

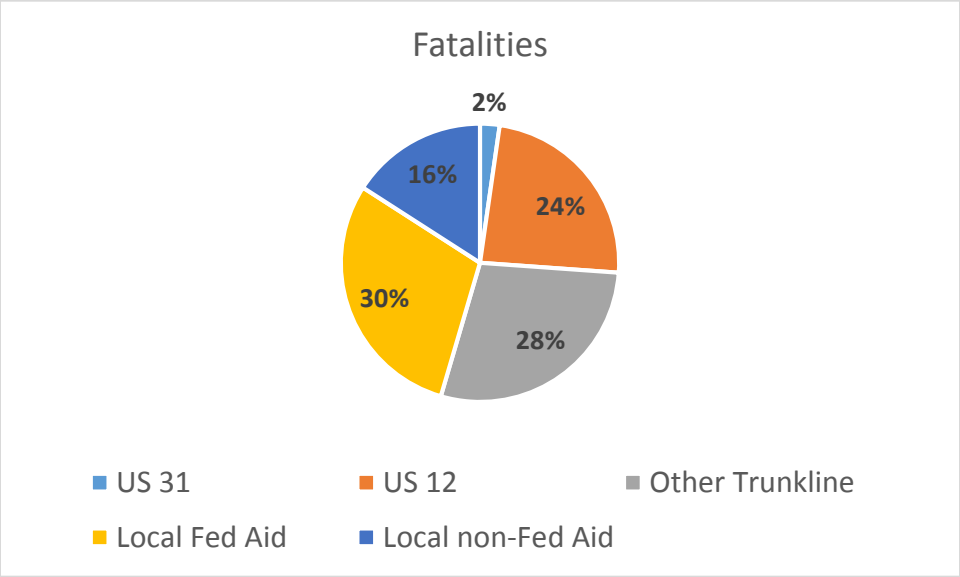


Figure 6. Fatalities by Road Type 2006-2015

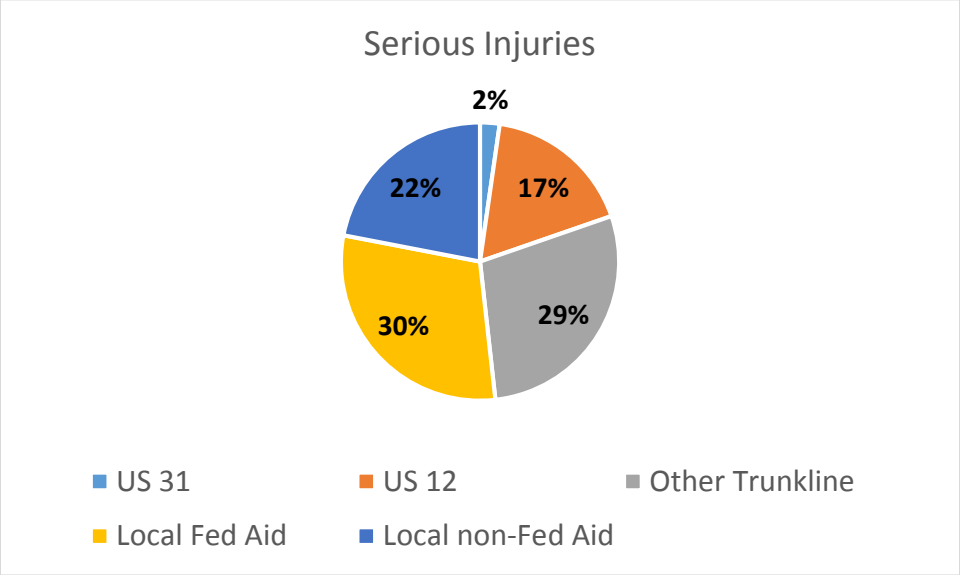
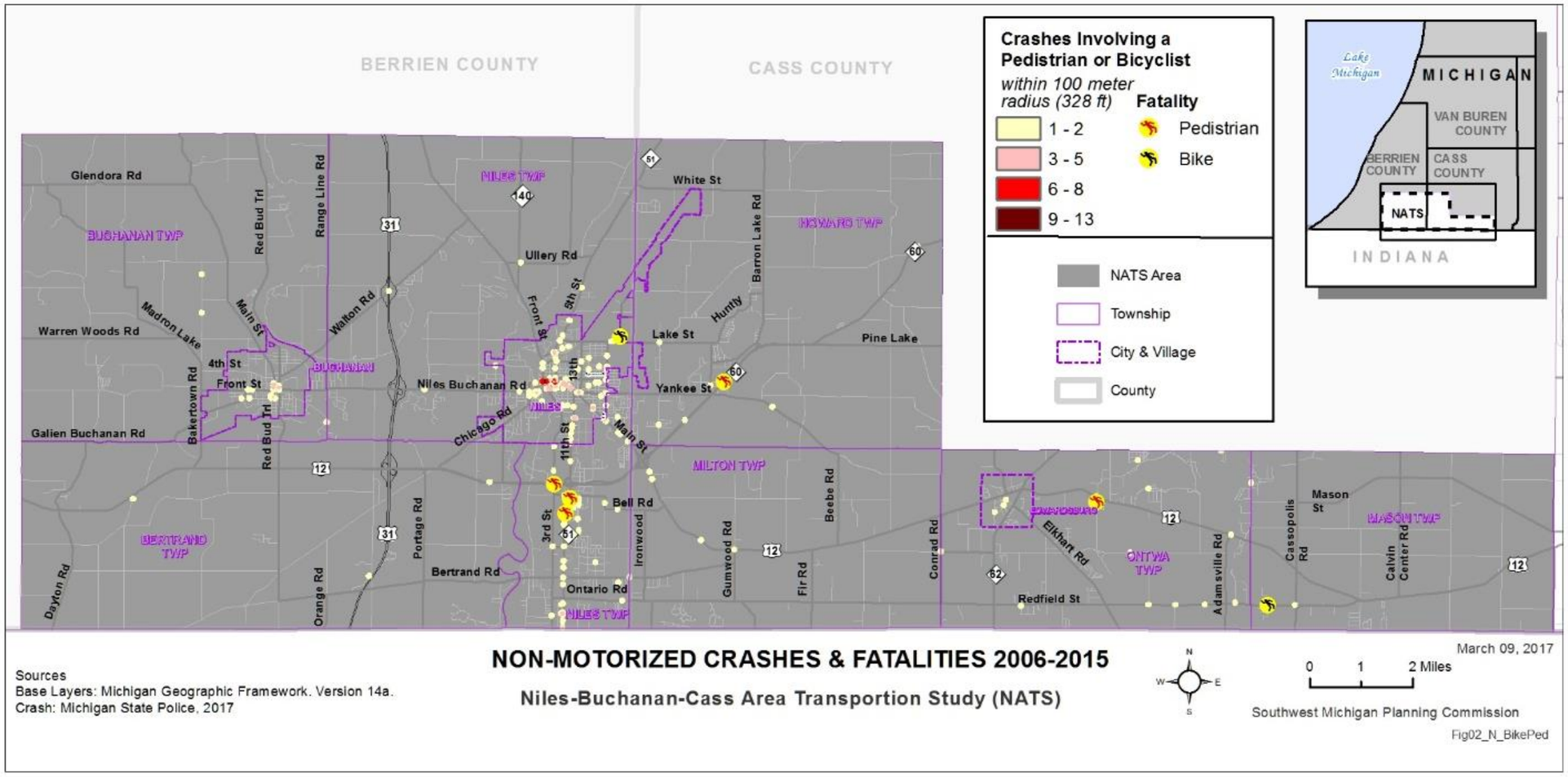


Figure 7. Serious Injuries by Road Type 2006-2015

NON-MOTORIZED CRASH LOCATIONS

The locations of pedestrian and bicycle crashes was aggregated into a density map based on the number of crashes within 100 meters (328 ft.) of each other. The highest density of non-motorized crashes were between 9 and 13 non-motorized crashes in 10 years. The highest number of crashes occurred in the City of Niles, although few of these were fatal or resulted in a serious injury.



Map 4. Non-Motorized Crashes 2006-2015 NATS Planning Area

Identifying which roads have had the most non-motorized crashes is necessary to help target safety improvements. The top 10 roads with the most non-motorized crashes overall are shown in Table 12. Main Street in the City of Niles, with 21 non-motorized crashes had the most non-motorized crashes in the NATS area from 2006-2015. On the other hand, 11th St/M-51 while having fewer total non-motorized crashes had the highest number of pedestrian or bicyclist fatalities and serious injuries. The only road to have more than 2 fatalities or serious injuries was 11th St/M-51 in Niles Charter Township. Furthermore, a very high percentage of non-motorized crashes on 11th St/M-51 resulted in a fatality or serious injury. While typically only 16 percent of non-motorized crashes led to a fatality or serious injury, on 11th St/M-51, 61 percent of the crashes were serious.

Table 12. Roads with the Most Non-Motorized Crashes 2006-2015

Road Name	Jurisdiction	Non-motorized Crashes	Fatalities & Serious Injuries
Main	City of Niles	21	2
11th	Niles Twp	13	8
5th	City of Niles	12	2
Broadway	City of Niles	8	1
17th	City of Niles	6	0
3rd	City of Niles	5	2
Main	Niles Twp	5	0
Front	Buchanan	4	0
Main	Buchanan	4	0
13th	Niles Twp	4	2

Just over half of all non-motorized crashes occurred within the city of Niles (Figure 8). The City of Niles also accounted for about 30 percent of the combined non-motorized fatalities and serious injuries. Niles Charter Township had the second most non-motorized crashes but the highest number of pedestrian or bicycle fatalities and serious injuries. Half of all non-motorized fatalities or serious injuries in NATS occurred in Niles Charter Township.

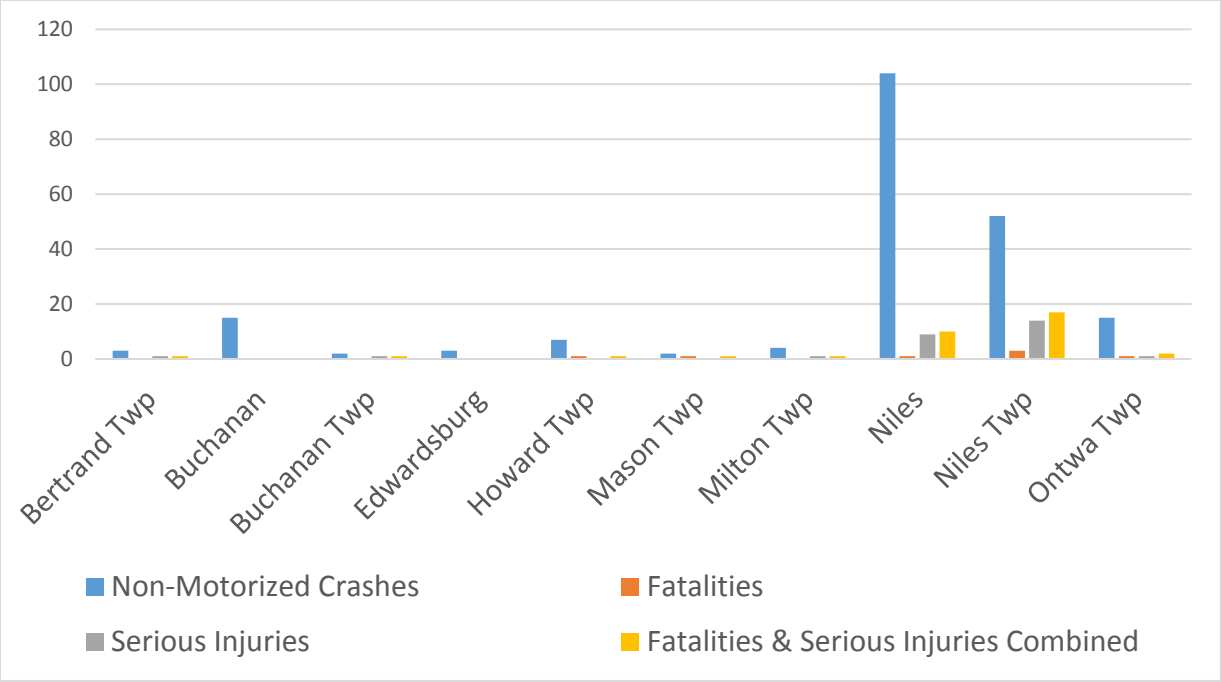


Figure 8. Non-Motorized Crashes by Jurisdiction

CRASH RATES

To make comparisons between NATS and other areas the rate of fatalities per 100 million Vehicle Miles Traveled (VMT) and serious injuries per 100 million VMT Is used. The VMT is the annual total miles driven in a particular area. The rate is also useful to compare changes in fatalities and serious injuries in the future, if the population and amount of driving changes. It is helpful to know if changes in fatalities and serious injuries are due to the roads being safer or whether it is due mostly to changes in the number of vehicles on the road.

Currently VMT is categorized by state, county, or urbanized area. VMT for just the NATS planning area is not available. Therefore, crash rates are being reported based on the Michigan portion of the South Bend Urbanized Area and the Michigan portion of the Elkhart Urbanized Area. The NATS planning area includes the entire urbanized area as well as non-urbanized portions of jurisdictions which contain some urbanized area and some non-urbanized are (see Map 5 in Appendix B). Furthermore, VMT is only available for 2011-2015. Therefore, while total crashes are being reported for a 10-year period, the crash rates are only for a 5-year period.

Consequently, there will only be a single 5-year average. Table 13 below shows the VMT, fatalities, and serious injuries in the urbanized portion of NATS

Table 13. VMT Fatalities, and Serious Injuries- Urbanized Portion of NATS

	Annual VMT	Fatalities	Serious Injuries
2011	216,454,344	5	14
2012	222,485,495	7	16
2013	288,258,604	6	12
2014	302,920,472	4	21
2015	309,832,696	6	23

The fatality rate constitutes the fatalities divided by the VMT then multiplied by 100 million (Table 14). As can be seen by the variability in crash rates, changes in VMT alone cannot predict fatalities or serious injuries.

Table 14. Fatality and Serious Injury rate per 100 Million VMT

	Fatality Rate	Serious Injury Rate
2011	2.31	6.47
2012	3.15	7.19
2013	2.08	4.16
2014	1.32	6.93
2015	1.94	7.42
Average	2.16	6.44

While it appears that the NATS area is less safe this may be misleading. Statewide about 30 percent of all VMT is driven on limited access highways. Although limited access highways have high speeds and high traffic volumes, the limited access lowers potential conflict points for crashes to occur. Therefore, limited Access Highways typically have a lower fatality or serious injury rate per mile driven than other road types. Areas with limited access highways will typically have lower fatality or serious injury rates per VMT. In addition, many people are using the highways for long distance travel and. This adds a number of travelers who use the limited access highway but don't use other roads. VMT is calculated using traffic counts, which measures the number of vehicles; there is no way to know if travelers are local or driving

through the area. Personal details are obscured in crash data thus one cannot tell if a crash was from a local resident or a through traveler. This means it difficult to tell how safe an area is for the people who live there. Furthermore, the NATS urbanized area is only incorporating a portion of the total South Bend Urbanized Area. It is not known currently what portion of travel NATS residents do on average is in Indiana versus Michigan. Future safety analysis will include data for the entire South Bend Urbanized Area in order to make better comparisons.

CONCLUSION

This report has given baseline data for crashes, fatalities, and serious injuries. The report has also identified where crashes occurred. While the report does not indicate the specific causes of crashes its does give an indication of which locations may warrant further study. Safety improvements can include education, enforcement, signage or changing road design. Future analysis is needed to determine what mix of methods would provide the best results. The next phase for safety planning is to assess the resources available for safety investments and determine out how best to target those resources to improve the performance measures. These resources include funding sources which can be used for safety improvements, as well as technical expertise available to do further analysis.

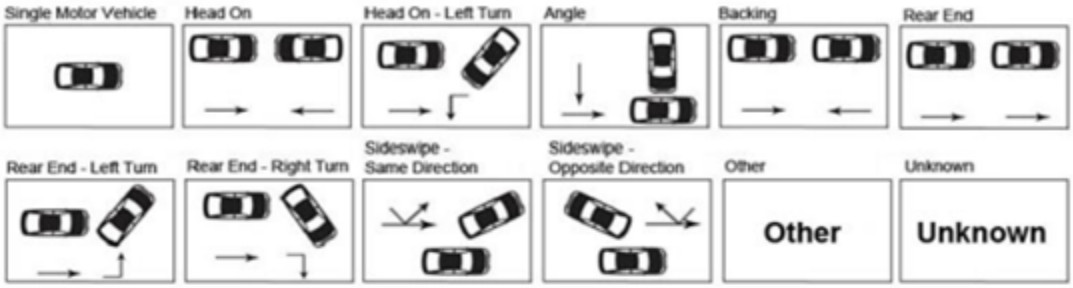
This report has given the current values for the safety performance measures created by the FHWA as a way to measure the success of safety improvements. The Michigan Department of Transportation will be setting targets for the safety performance measures. To meet these targets NATS will have to do its share to ensure safety improvements. After any safety improvements are made the assessment of them will include evaluating if the number of fatalities and the number of serious injuries decreased within NATS. The fatalities rate per 100 million VMT and serious injuries per 100 million VMT, will be used for making comparisons with other areas. The rate will also be used to compare safety in the future if there are changes in the amount of travel. The goal of performance measures is to provide a quantifiable way to determine the effectiveness of safety improvements to ensure NATS is making the most effective choices.

APPENDIX A: UD-10 GUIDE

STATE OF MICHIGAN TRAFFIC CRASH REPORT GUIDE

Revised 10/16/15

Crash Type (First Impact)



Animal

1. Deer
2. Turkey
3. Elk
4. Moose
5. Bear
97. Animal (Other)
98. Animal (Unknown)

Weather

1. Clear
2. Cloudy
3. Fog
4. Rain
5. Snow
6. Severe Crosswinds
7. Sleet / Hail
8. Blowing Snow
9. Blowing Sand, Soil, Dirt
10. Smoke
98. Unknown

Light

1. Daylight
2. Dawn
3. Dusk
4. Dark-Lighted
5. Dark-Unlighted
97. Other
98. Unknown

Road Surface Condition

1. Dry
2. Wet
3. Ice
4. Snow
5. Mud, Dirt, Gravel
6. Slush
7. Debris
8. Water (Standing / Moving)
9. Sand
10. Oily
97. Other
98. Unknown

Area

►Freeway

1. Entrance / Exit Ramp Related
2. Authorized Median Crossover Related
3. Transition Area / Increase or Decrease in Travel Lanes
4. Rest Area Related
5. Scale / Weigh Station Related
20. Curved Roadway
6. All Other Freeway Areas

►Intersection

7. Within Intersection
8. Driveway Related within 150 ft. of Nearest Edge of Intersection
9. Intersection Related-Other
21. Roundabout

►Other Non-Freeway Areas

10. Straight Roadway Not Related to Other Selections
11. Curved Roadway Not Related to Other Selections
12. Driveway Related Not within 150 ft. of Intersection
13. Parking Related Legal Roadside
14. Transition Area / Increase or Decrease in Travel Lanes
15. Median Crossing Related
16. Railroad Crossing Related
17. Rest Area Related
18. Scale / Weigh Station Related
19. Non-Traffic Area
97. Other
98. Unknown

Traffic Control

1. Signal
2. Stop Sign
3. Stop Sign with Flashing Beacon
4. Yield Sign
96. None

Work Zone - Activity

1. Lane Closure
2. Lane Shift / Crossover
3. Work on Shoulder or Median
4. Intermittent or Moving Work
97. Other

Work Zone - Location

1. Before the First Work Zone Warning Sign
2. Between the First and Last Work Zone Warning Sign
3. No Warning Signs

Contributing Circumstances

1. Prior Crash
2. Backup Due to Regular Congestion
3. Backup Due to Other Incident
4. Glare
5. Traffic Control Device Inoperative, Missing or Obscured
6. Shoulders (None, Low, Soft, High)
96. None
97. Other
98. Unknown

Relation to Roadway

1. On the Road
2. Median
3. Shoulder
4. Outside of Shoulder / Curb
5. Gore
6. On-Street Parking
7. Off Roadway (Non-Traffic)
8. Sidewalk
9. Bicycle Lane
98. Unknown

Trafficway

1. Not Physically Divided (Two-Way Traffic)
2. Divided Highway without Traffic Barrier
3. Divided Highway with Traffic Barrier
4. One-Way Traffic
5. Non-Traffic
6. Two-Way, Not Divided, with a Continuous Left Turn Lane

Position

B Bicyclist
P Pedestrian
E Engineer (Railroad / Train)

13. Sleeper Section
14. Other Enclosed Passenger / Cargo Area
15. Other Unenclosed Passenger / Cargo Area
16. Riding In / On Trailing Unit
17. Riding On Vehicle Exterior
98. Unknown

►Motorcycles, Snowmobiles, Etc. (In-Line Seating)

1. Driver
4. Passenger One
7. Passenger Two
15. Other Unenclosed Passenger / Cargo Area

Restraint Use

1. No Belts Available
2. Shoulder Belt Only Used
3. Lap Belt Only
4. Shoulder and Lap Belt
5. No Belts Used
6. Child Restraint System – Forward Facing
7. Child Restraint Not Used or Improperly Used
8. Child Restraint System – Rear Facing
9. Child Restraint System – Booster Seat
10. Restraint Failure
11. Restraint Use Unknown
12. Helmet Worn
13. Helmet Not Worn
14. Helmet Use Unknown

Airbag

1. Deployed-Front
2. Not Deployed
3. Not Equipped
4. Deployed-Side
5. Deployed-Curtain
6. Deployed-Other (Knee, Air Belt, Etc.)
7. Deployed-Combination

98. Unknown

Condition at Time of Crash

1. Appeared Normal
4. Sick
5. Fatigued or Asleep
7. Medication
10. Physically Disabled
11. Emotional
97. Other
99. Unknown

Driver Distracted By

1. Not Distracted
2. Manually Operating an Electronic Communications Device (Texting, Typing, Dialing)
3. Talking on Hands-Free Electronic Device
4. Talking on Hand-Held Electronic Device
5. Other Activity, Electronic Device (Book Player, Navigation Aid)
6. Passenger
7. Other Activity Inside the Vehicle (Eating, Personal Hygiene)
8. Outside the Vehicle (Includes Unspecified External Distractions)

98. Unknown

Hazardous Action

0. None
1. Speed Too Fast
2. Speed Too Slow
3. Failed to Yield
4. Disregard Traffic Control
5. Drove Wrong Way
6. Drove Left of Center
7. Improper Passing
8. Improper Lane Use
9. Improper Turn
10. Improper / No Signal
11. Improper Backing
12. Unable to Stop in Assured Clear Distance
13. Other
14. Unknown
15. Reckless Driving
16. Careless Driving

Action Prior to Crash

▶Driver Action

1. Going Straight Ahead
2. Turning Left
3. Turning Right
4. Stopped on Roadway
5. Involved in Prior Crash at Same Location
6. Changing Lanes
7. Backing
8. Slowing / Stopping on Roadway
9. Slowing / Stopping Other Area
10. Starting Up on Roadway
11. Starting Up in Other Area
12. Entering Parking
13. Leaving Parking
14. Entering Roadway
15. Leaving Roadway
16. Making U-Turn
17. Overtaking or Passing
18. Avoiding Object
19. Avoiding Pedestrian
20. Avoiding Vehicle (Front / Back)
21. Avoiding Vehicle (Angle)
22. Driverless Moving
23. Parked
35. Other
36. Unknown
37. Avoiding Animal
38. Negotiating a Curve

▶Pedestrian Action

24. Crossing at Intersection
25. Crossing Not at Intersection
26. Getting On / Off Vehicle
27. In Roadway with Traffic
28. In Roadway Against Traffic
29. Standing / Lying in Roadway
30. Pushing / Working on Vehicle
31. Other Working in Roadway
32. Playing in Roadway
33. In Roadway Other Reason
34. Not in Roadway
35. Other
36. Unknown

Sequence of Events

▶Non-Collision

1. Loss of Control
2. Cross Centerline
46. Cross Median
3. Ran Off Roadway - Left
4. Ran Off Roadway - Right
5. Re-enter Roadway
6. Overturn
7. Separation of Units
8. Fire / Explosion
9. Immersion
10. Jackknife
11. Downhill Runaway
12. Cargo Loss / Shift
13. Individual Fell from Vehicle
47. Equipment Failure (Blown Tire, Brake Failure, Etc.)
14. Other Non-Collision

▶Collision with Non-Fixed Object

15. Pedestrian
16. Bicyclist
17. Motor Vehicle in Transport*
18. Parked Motor Vehicle

Sequence of Events (cont.)

48. Work Zone / Maintenance Equipment
49. Cargo Falling / Shifting / or Anything Set in Motion (SIM) By a Motor Vehicle
19. Engineer (Railroad / Train)
20. Animal
21. Other Non-Fixed Object

▶Collision with Fixed Object

22. Bridge Pier / Support
24. Bridge Rail
50. Bridge Overhead Structure
25. Guardrail Face
26. Guardrail End
51. Cable Barrier
27. Concrete Barrier
28. Traffic Sign / Post
29. Traffic Signal Equipment
30. Utility Pole / Light Support
32. Other Post / Pole / Support
33. Culvert
34. Curb
35. Ditch
36. Embankment
37. Fence
38. Mailbox
39. Tree
40. Railroad Crossing Signal
41. Building
42. Traffic Island
43. Fire Hydrant
44. Impact Attenuator / Crash Cushion
45. Other Fixed Object

** In transport means a motor vehicle in motion or on a roadway.*

Injury

K - Fatal Injury: Any injury which results in death

A - Suspected Serious Injury: Any injury other than fatal which prevents normal activities and generally requires hospitalization

B - Suspected Minor Injury: Any minor injury that is evident to others at the scene

C - Possible Injury: Any possible injury that is reported or claimed

O - No Injury: No indication of injury

Special Vehicles

1. Police
2. Fire
3. Bus
4. Ambulance
5. Farm Equipment
6. Construction / Maintenance Equipment
7. Tow Truck / Wrecker

Vehicle Use

1. Private
2. Commercial (Business)
3. In Pursuit / On Emergency
4. Farm
5. School / Education
6. Club / Church

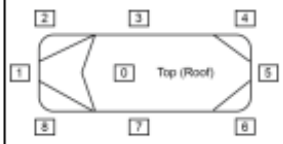
Vehicle Use (cont.)

7. Military
8. Other Government
9. Utility
10. Road Construction / Other Maintenance
11. Other

Vehicle Type

1. Passenger Car, SUV, Van
2. Motor Home
3. Pickup Truck
4. Small Truck (Under 10,000 lbs)
5. Motorcycle
6. Moped / Goped
7. Go-Cart / Golf Cart
8. Snowmobile
9. Off Road Vehicle (ATV Type)
10. Other
11. Truck / Bus

Location of Greatest Damage / First Impact



9. Undercarriage
10. Multiple
11. None
98. Unknown

Extent of Damage

1. No Damage
2. Minor Damage
3. Functional Damage
4. Disabling Damage

98. Unknown

Vehicle Direction

1. North
2. South
3. East
4. West

Private Trailer Type

1. Utility
2. Travel Trailer
3. Boat Trailer
4. Farm Equipment
5. Towed Auto
6. Recreational Double
7. Other

Vehicle Defects

1. Brakes
2. Lights
3. Steering
4. Tires / Rims
5. Windows / Windshield
6. Truck Coupling / Trailer Hitch / Safety Chains

97. Other

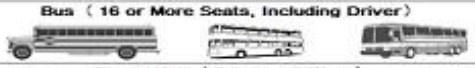
Vehicle Configuration

1 Passenger Car (Only if Vehicle Has HM Placard)

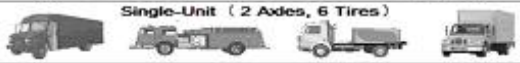
2 Light Truck (Only if Vehicle Has HM Placard)

3 Bus (9-15 Seats, Including Driver)

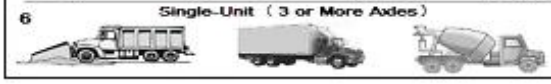
4 Bus (16 or More Seats, Including Driver)



5 Single-Unit (2 Axles, 6 Tires)



6 Single-Unit (3 or More Axles)



7 Truck/Trailer (Single-Unit Truck Pulling a Trailer)

8 Truck Tractor (Bobtail)

9 Tractor / Semi Trailer (One Trailer)

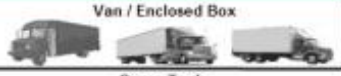
10 Truck Tractor / Double (Two Trailers)

11 Truck Tractor / Triple (Three Trailers)

99 Unknown Heavy Truck > 10,000 lbs - Unclassified (Not Listed Above)

Cargo Body Type

1 Van / Enclosed Box



2 Cargo Tank

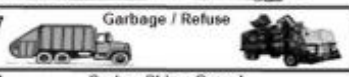
3 Flat Bed

4 Dump

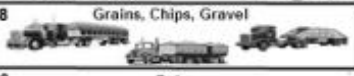
5 Concrete Mixer

6 Auto Transporter

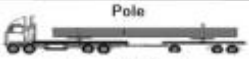
7 Garbage / Refuse



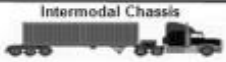
8 Grains, Chips, Gravel



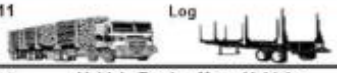
9 Pole



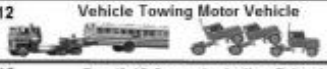
10 Intermodal Chassis



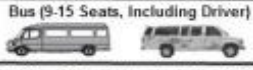
11 Log



12 Vehicle Towing Motor Vehicle



13 Bus (9-15 Seats, Including Driver)



14 Bus (16 or More Seats, Including Driver)

15 No Cargo Body

97 Other

Hazardous Materials

CLASS 1 Explosives: Divisions 1.1, 1.2, 1.3, 1.4, 1.5, 1.6

CLASS 2 Gases: Divisions 2.1, 2.2, 2.3

CLASS 3 Flammable Liquid and Combustible Liquid

CLASS 4 Flammable Solid, Spontaneously Combustible, and Dangerous When Wet: Divisions 4.1, 4.2, 4.3

CLASS 5 Oxidizer, Organic Peroxide: Divisions 5.1 and 5.2

CLASS 6 Poison (Toxic) Poison Inhalation Hazard, Infectious Substance: Divisions 6.1 and 6.2

CLASS 7 Radioactive

CLASS 8 Corrosive

CLASS 9 Miscellaneous Hazardous Material

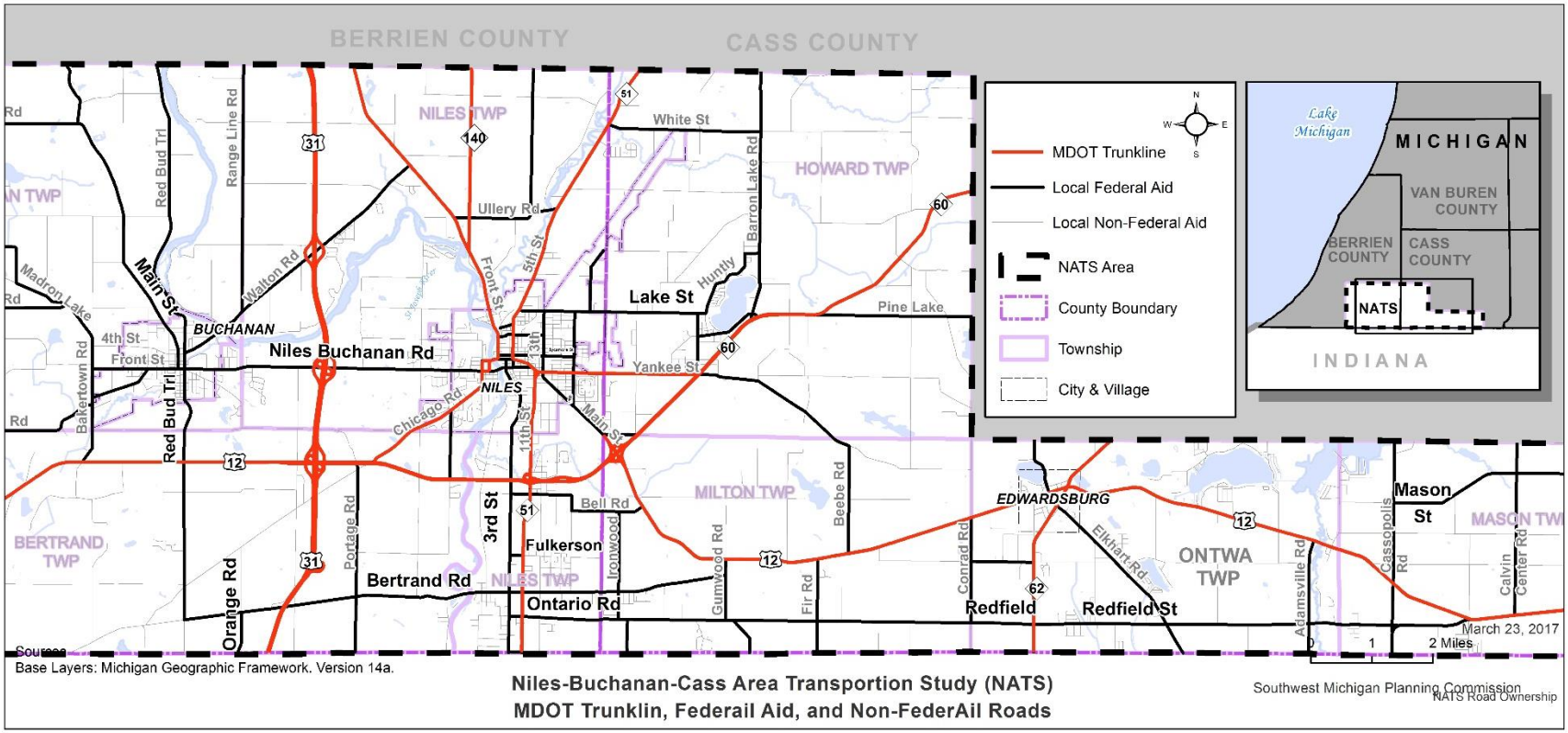
Endorsements

H. Hazardous	P. Passenger	T. Double/Triple
N. Tank	S. School Bus	X. Tank and Hazardous

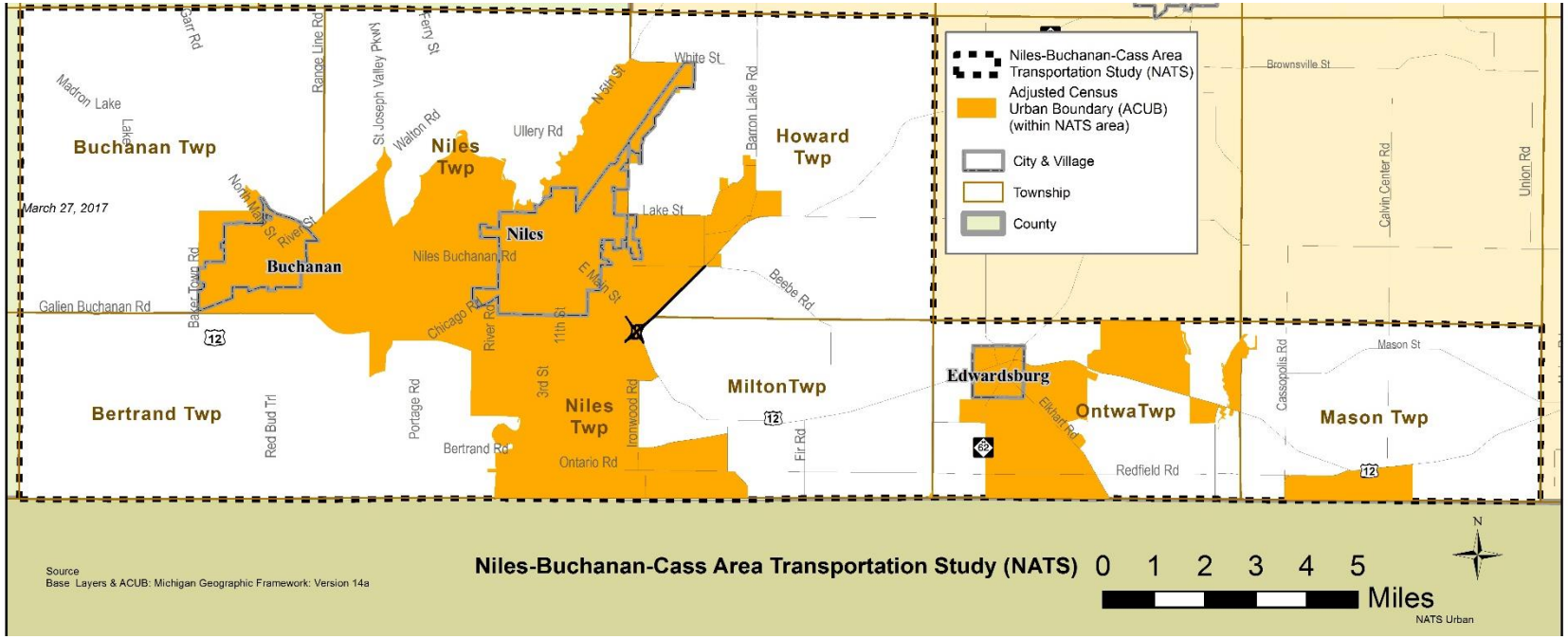
Contact Information

For any questions, please contact the Criminal Justice Information Center at CrashTCRS@michigan.gov.

APPENDIX B: REFERENCE MAPS



Map 5. MDOT, Local Federal-Aid, and Non-Federal Aid Roads within NATS



Map 6. Urbanized Area Within the NATS Planning Area