Wisconsin Pedestrian and Bicycle Count Database and Expansion Factor Development

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Prepared for
Wisconsin Department of Transportation (WisDOT), Bureau of Transportation Safety (BOTS)
Grant: WisDOT BOTS: GFG-2023-UW-MILWAUKEE-00059 & GFG-2024-UW-MILWAUKEE-00143

March 2024

0. Introduction

The Wisconsin Department of Transportation (WisDOT) has identified safety for non-motorists as a priority in its 2023-2027 Strategic Highway Safety Plan.[1] Making our roadways safer for non-drivers is crucial for the safety of everyone, as every person is a pedestrian whether they are walking from their home to a bus stop, walking from their car to a business after they park, or walking as their primary means of transportation. Pedestrians and bicyclists are also much more vulnerable to severe and fatal injuries when they are involved in traffic crashes, so preventing these types of collisions can have a large impact on reducing traffic deaths and incapacitating injuries.[2] In order to make our roadways safer for non-motorists, it is first essential to understand where these non-motorists are, which roadways have a high number of pedestrian and bicycle volumes, and where pedestrian and bicycle crashes are occurring.

Documenting exposure to crash risk is fundamental to understanding pedestrian and bicyclist safety needs. While crash data can tell us specific locations or areas that have a high number of crashes, comparing crashes to pedestrian and bicyclist counts or volumes yields a crash rate that paints a more complete picture of risk. For example, a roadway segment with 10 crashes per year and a yearly count of 10,000 pedestrians has a greater rate (1 crash per 1000 pedestrians) than a segment with 50 crashes per year and a yearly count of 100,000 pedestrians (0.5 crashes per 1000 pedestrians).

This report outlines research done over two years to try and understand annual pedestrian volumes at locations throughout Wisconsin and analyze locations where crash risk is high for pedestrians. It also incorporates bicyclist counts and crashes into certain parts of the analysis.

Report Structure

This report builds on our previous work to document and understand pedestrian exposure in Wisconsin. We first used counts collected at more than 300 locations to develop a pedestrian volume model for the Southeast Region.[3] Then we used the pedestrian volume model to estimate total annual pedestrian crossing volumes at intersections along the entire Wisconsin State Highway System.[4] This report summarizes key steps toward validating the model and applying the model statewide to assess pedestrian crash risk. Validation involves comparing model-predicted pedestrian volumes with actual pedestrian volumes based on counts. However, this first requires having a consistently-formatted database of pedestrian counts. The first part of this report describes the development of the Wisconsin Pedestrian and Bicyclist Count Database, which can be used for this purpose. We also added bicyclist

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[1] Wisconsin Department of Transportation, *Strategic Highway Safety Plan: 2023-2027,* 2023, https://drive.google.com/file/d/1Dpu8-5TOCq4nOzRn3t5FPPf51-vglNAU/view.

[2] Federal Highway Administration, "Pedestrian and Bicycle Safety," https://highways.dot.gov/safety/pedestrian-bicyclist.

[3] Schneider, R.J., Schmitz, A., and Qin, X. "Pedestrian Exposure Data for the Wisconsin State Highway System: WisDOT Southeast Region Pilot Study," University of Wisconsin-Milwaukee for Wisconsin Department of Transportation, June 2021, https://uwm.edu/ipit/wp-content/uploads/sites/570/2023/05/wistudy-pedcount.pdf. Also see https://uwm.edu/ipit/projects/practical-application-of-pedestrian-exposure-tools-expanding-southeast-region-results-statewide/ for an interactive map.

[4] Schneider, R.J., Marshall, N., Crowley, C., and Qin, X. "Practical Application of Pedestrian Exposure Tools: Expanding Southeast Region Pedestrian Volume Model Results Statewide," University of Wisconsin-Milwaukee for Wisconsin Department of Transportation, October 2022, https://uwm.edu/ipit/wp-content/uploads/sites/570/2023/11/PedestrianExposureStatewideApplicationStudy_SummaryReport_FINAL.pdf.

counts and trail user counts to the database since there is a need to compile statewide counts for these types of travelers. Since the database includes pedestrian, bicyclist, and trail user counts, it can be used to develop, validate, and refine other pedestrian, bicyclist, and trail volume models.

Section 1 of this report describes the development and content of the Wisconsin Pedestrian and Bicyclist Count Database. Section 2 describes how we developed expansion factors that can be used to convert short-term counts (typically collected for durations of less than one day) to annual pedestrian or bicycle volume estimates. Section 3 presents a practical, statewide application of the pedestrian volume model. We first identify Wisconsin State Highway System segments with the largest absolute numbers of reported pedestrian and bicyclist crashes. Then we use pedestrian volume model estimates to calculate pedestrian crash rates on these segments. This allows us to estimate the relative risk of pedestrian crashes on selected segments of the state highway system.

1. Wisconsin Pedestrian and Bicycle Count Database Structure and Development

The initial structure for the Wisconsin Pedestrian and Bicycle Count Database was developed by Natalie Marshall, a graduate student in the University of Wisconsin-Milwaukee (UWM) Master of Urban Planning Program. She also entered the first 554 pedestrian and bicycle counts into the database. This work took approximately 55 hours to complete. This section describes how the database was developed and summarizes the current contents of the database.

1.1. Process

The process to develop the Wisconsin Pedestrian and Bicycle Count Database began with a request for various stakeholders to share pedestrian and bicycle counts with UWM. Most of this data came in Excel spreadsheets, but some counts were sent in a geodatabase, and several were found in tables in PDF reports. As these counts were emailed to UWM, the graduate student uploaded them into a folder in UWM's OneDrive shared file system and numbered and labeled them. The format for count titles in the UWM shared file is "Count#_LocationName". For example, an Excel sheet with counts along the Hank Aaron State Trail is labeled "25_HASTValleyPassage_Hourly". Any supporting documents are labeled with the same number as well as a letter, e.g., the report describing this count is labeled "25A_HASTValleyConnector_Report". Some spreadsheets in the folder include multiple counts and were labeled to reflect that. For example, one spreadsheet has counts for multiple intersections in Stevens Point. This spreadsheet is labeled "119_133_StevensPoint2018BikePed" and includes counts 119-133.

Although the majority of counts were uploaded into the UWM OneDrive folder, some are housed in a separate location. Counts from WisDOT's Southeast Region are found in their Box folder and counts from the East Central Wisconsin Regional Planning Commission (ECWRPC) are in a geodatabase, which was uploaded to the UWM OneDrive folder in a zipped folder but can only be viewed in ArcGIS or a similar program. WisDOT counts are slowly being migrated into the OneDrive folder to ensure access and consolidation.

We entered the attributes of all compiled counts into the Wisconsin Pedestrian and Bicycle Count Database. This database consists of three separate spreadsheets, one for pedestrian counts, one for bicyclist counts, and one for trail user counts (i.e., most of the trail user counts include both pedestrians and bicyclists and do not distinguish between them). Some of the counts entered into the database were collected for short durations (e.g., two hours), while others were taken for longer durations (e.g., three weeks). All counts include a start time and end time. The Wisconsin Pedestrian and Bicycle Count Database generally follows the structure outlined in the Federal Highway Administration's Traffic Monitoring Guide.[5,6]

1.2. Database Structure

Each of the three spreadsheets in the Wisconsin Pedestrian and Bicycle Count Database have the following fields:

1. Location ID
2. Count ID
3. ID
4. Organization performing count
5. Location name
6. City
7. WisDOT region
8. Year
9. Types of data collected during session
10. State FIPS code
11. County FIPS code
12. Station ID
13. Roadway classification
14. Direction of route
15. Location relative to roadway
16. Direction of movement
17. Facility type
18. Type of count represented in data row
19. Method of counting
20. Latitude
21. Longitude
22. Month
23. Date
24. Duration
25. Interval
26. Day of week
27. Time of week
28. Time of day
29. Weather
30. Precipitation

[5] Section 7.9: Nonmotorized Count Station Description Data Format in *Traffic Monitoring Guide,* U.S. Department of Transportation Federal Highway Administration, October 2016.
[6] Section 4.8: Micromobility Count Station Description Data Format (Fixed Width of Pipe Delimited) in *Traffic Monitoring Guide,* U.S. Department of Transportation Federal Highway Administration, 2022.

31. Total user count during count period
32. Total hours counted
33. Users/hour
34. Hour to week expansion factors
35. Hour to week average expansion factor
36. Week to year expansion factor
37. Estimated annual user volume
38. Notes

1.3. Field Descriptions

This section describes each field in the database and how it was determined and entered.

Location ID

This ID field lists a unique number for each count location. The Location ID corresponds with the number included in the document label on the UWM OneDrive. Note: documents that are located in the WisDOT Box account are NOT labeled with this Location ID. The ECWRPC geodatabase only has one unique ID, and it does not correspond with Location ID. Future iterations of the database may need to break the counts in this geodatabase down into separate entries, although ideally the count database as a whole will take a geodatabase format in the future.

Count ID

This ID field lists a unique number for each distinct count done at each location, starting with 1. Counts that are separated in time by more than one hour each have a unique Count ID.

ID

This ID field is a combination of the Location ID and Count ID field. It is a unique number representing each distinct count at each location.

Organization Performing Count

This field lists the organization or agency that conducted the count or shared the count data with the research team. It represents the main source of the data.

Location Name

This lists the location of where the count was conducted—e.g., “Oak Leaf Trail at S100” or “Stoughton Road and Pflaum Road”. The location is generally written with local street names rather than highway numbers (Stoughton Road rather than USH 51) for ease of searching on Google Maps and preference of the graduate researcher. However, some inconsistencies occurred when the graduate student did not know the local name of the state highway, or when the state highway number is the colloquial way of referring to the street (such as Highway 100). There are also many inconsistencies with how words like “street” or “road” are written; sometimes they are written out as “street”, sometimes abbreviated as “st”, and sometimes the street/road suffix was left off altogether. Future iterations of this metadata sheet could clean up these inconsistencies.

City

Denotes the city, town, or village where the count was taken.

WisDOT Region
Denotes the WisDOT region where the count was taken.

Year
Year of count.

Types of data collected during the data collection session

- Pedestrian (pedestrian only count)
- Cyclist (cyclist only count)
- Both (has both pedestrian and cyclist counts, listed separately)
- Combined (has counts of everyone moving through the area and does not specify if they are a pedestrian, cyclist, or using some other mobility device)

State FIPS Code
All of these counts are from Wisconsin, so each is coded with Wisconsin's FIPS Code 55.

County FIPS Code
The three-digit county FIPS code of where the count was taken.

Station ID
Some counts had an ID number associated with them which is listed here. Most do not.

Roadway Classification
Indicated numerically as required by the FHWA's Traffic Monitoring Guide. Table 1.1 shows the roadway classification codes.

Table 1.1: Roadway Classification	
1	Interstate
2	Principal Arterial – Other Freeways and Expressways
3	Principal Arterial – Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local
8	Trail or Shared Use Path
9	General Activity Count

Direction of Route
Table 1.2 shows the direction of route classification codes.

Table 1.2: Direction of Route	
0	East-West or Southeast-Northwest combined
1	North
2	Northeast
3	East
4	Southeast

5	South
6	Southwest
7	West
8	Northwest
9	North-South or Northeast-Southwest combined

Location Relative to Roadway

Table 1.3 shows the location relative to roadway classification codes.

Table 1.3: Location Relative to Roadway	
1	Count is taken on the side of the road for the listed Direction of Route
2	Count is taken on the opposite side of the road from the listed direction (i.e., the side with on-coming traffic, given the listed Direction of Route)
3	Both sides of the road combined
4	Traffic moving perpendicular to the roadway (crossing the street)

Direction of Movement

Table 1.4 shows the direction of movement classification codes.

Table 4: Direction of Movement	
1	Travel monitored only occurring in the Direction of Route
2	Travel monitored only occurring opposite to the Direction of Route
3	Travel in both (all) directions
4	Travel at an intersection that includes all movements (e.g., the sum of movements on all four crosswalks)
5	Travel monitored perpendicular to Direction of Route, crossing from Left to Right (facing Direction of Route)
6	Travel monitored perpendicular to Direction of Route, crossing from Right to Left (facing Direction of Route)

Facility Type

Table 1.5 shows the facility type classification codes.

Table 1.5: Facility Type	
0	On a trail not intended for on-road motor vehicles and not within the right of way of an adjacent road
1	In a shared roadway lane or shared trail right of way

2	Exclusively in a crosswalk
3	On a sidewalk intended primarily or exclusively for pedestrians
4	In a striped (painted) bicycle lane (with no physical barrier separating adjacent motorized traffic)
5	On an overpass intended to allow nonmotorized traffic to pass over a roadway
6	In an underpass intended to allow nonmotorized traffic to pass under a roadway
7	In a physically separated bicycle lane (separated by curb, bollards, or other vertical element from an immediately adjacent motorized roadway lane)
8	On a side-path intended for bicycles or for bicycles and pedestrians, occurring in a roadway right of way or immediately adjacent to a roadway
9	General area

Type of Count

Table 1.6 shows the type of count data classification codes. Note that this is different than the count data collected during the data collection session. For example, a data collection session may have counted both pedestrians and bicyclists. This field indicates which types of user(s) are being represented in the specific count data row, which might just be pedestrians. The codes follow the format recommended in the FHWA Traffic Monitoring Guide.

Table 1.6: Type of Count	
1	Pedestrians (only)
2	Bicycles (only)
4	Persons in wheelchairs
5	persons using other pedestrian assistive devices (skates, skateboards, scooters, hoverboards, etc.)
7	All bicycles and pedestrians
8	All nonmotorized traffic on the facility
9	All traffic on a trail

Method of Counting

Table 1.7 shows the method of counting classification codes.

Table 1.7: Method of Counting	
1	Human observation (manual), including human-analyzed video
2	Portable traffic recording device
3	Permanent continuous count station (CCS)

Latitude and Longitude

For some counts, this was included in the original spreadsheet or document. For many counts, this was found by searching the location on Google Maps and right clicking on a location to copy the latitude and longitude coordinate. The latitude and longitude values are given in decimal degrees.

Month
Month of count. Listed numerically (January = 1).

Date
Date of count (for short-term counts) or starting date of long-term counts.

Duration
Duration of time the count was conducted for.

Interval (only for long-term counts)
Denotes the interval that pedestrians or cyclists were counted in. For example, many trail counts have a separate row for each 15-minute interval and list the number of cyclists counted in those 15 minutes.

Day of Week (only for short-term counts)
Weekday of count (Sunday = 1).

Time of Week (only for short-term counts)
Weekday or weekend.

Time of Day (only for short-term counts)
Time of count (hour:minute for start time and hour:minute for end time)

Weather (only for short-term counts)
Taken from original count document.

Precipitation (only for short-term counts)
Listed as either 0 (no precipitation) or 1 (precipitation).

Total User Count During Count Period
The total number of pedestrians, bicyclists, or trail users observed during the count period.

Total Hours Counted
Total number of hours during the count period.

Users/Hour
Number of users per hour.

Hour to Week Expansion Factors
These factors apply to specific hours of the week. They are averaged and then multiplied by the users per hour to estimate the weekly user volume. Expansion factors are discussed later in this report.

Average Hour to Week Expansion Factor
Users per hour is multiplied by this average of all of the hour to week expansion factors to estimate the weekly user volume. Expansion factors are discussed later in this report.

Week to Year Expansion Factor
Estimated weekly user volume is multiplied by this factor to estimate the annual user volume. Expansion factors are discussed later in this report.

Estimated Annual Pedestrian, Bicyclist, or Trail User Count
Estimated total annual pedestrian, bicyclist, or trail user volume at the location.

1.4. Database Contents

As of March 2024, the Wisconsin Pedestrian and Bicyclist Count Database included:

- 1,486 unique pedestrian counts at 721 unique locations
- 1,452 unique bicyclist counts at 697 unique locations
- 29 unique trail user counts at 29 unique locations

These counts include both short-term and long-term counts. Most short-term counts were collected manually at intersections over two- to 13-hour periods. Nearly all of the short-term counts captured both pedestrians and bicyclists. Most long-term counts were collected at screenline locations along multi-use trails using automated counters over two- to three-week periods. Nearly all of the long-term counts captured all trail users and did not differentiate between pedestrians and bicyclists.

The pedestrian and bicyclist counts collected for this initial phase of database development were mainly from the Southeast Region and Madison area (Figure 1.1 and Figure 1.2). Smaller numbers of counts came from La Crosse and Stevens Point. Trail counts were mainly from the Southeast Region and Madison area (Figure 1.3). Note that the Southeastern Wisconsin Regional Planning Commission manages a Regional Non-Motorized Count Program and has posted counts from more than 100 multi-use trail locations on a public, online map[7]. Some counts from this source have been included in the Wisconsin Pedestrian and Bicycle Count Database. The East Central Wisconsin Regional Planning Commission has also collected more than 200 long-term trail counts across its seven-county region since 2017. These counts are documented in a geodatabase and spreadsheets, but they will take additional time to enter into the Wisconsin Pedestrian and Bicycle Count Database format.

Of the individual counts currently included in the Wisconsin Pedestrian and Bicycle Count Database, the highest annual pedestrian count estimate (2,286,530) was at Crosby Avenue & Water Street in downtown Stevens Point[8] (Table 1.8), highest annual bicyclist count estimate (871,909) was at John Nolen Drive & Wilson Street & Williamson Street in Madison (Table 1.9), and highest annual trail user count estimate (566,107) was on the Oak Leaf Trail near Brady Street in Milwaukee (Table 1.10).

Note that additional analysis can be done to estimate annual user volumes at locations with multiple counts. Since multiple counts tend to provide a more complete representation of activity levels, the separate estimated annual user volumes from each individual count at the same location can be averaged to provide the best estimate of the annual user volume at that location.

[7] Southeastern Wisconsin Regional Planning Commission. Regional Non-Motorized Count Program, https://www.sewrpc.org/SEWRPC/Transportation/nmcounts.htm, 2024.

[8] The estimated annual pedestrian volumes from Stevens Point are particularly high because the base counts were collected on a Saturday with a downtown market and an Art in the Park event occurring nearby. This underscores the importance of having notes about the context of certain counts included in the database.

Figure 1.1. Pedestrian Count Locations Included in the Statewide Pedestrian and Bicycle Count Database

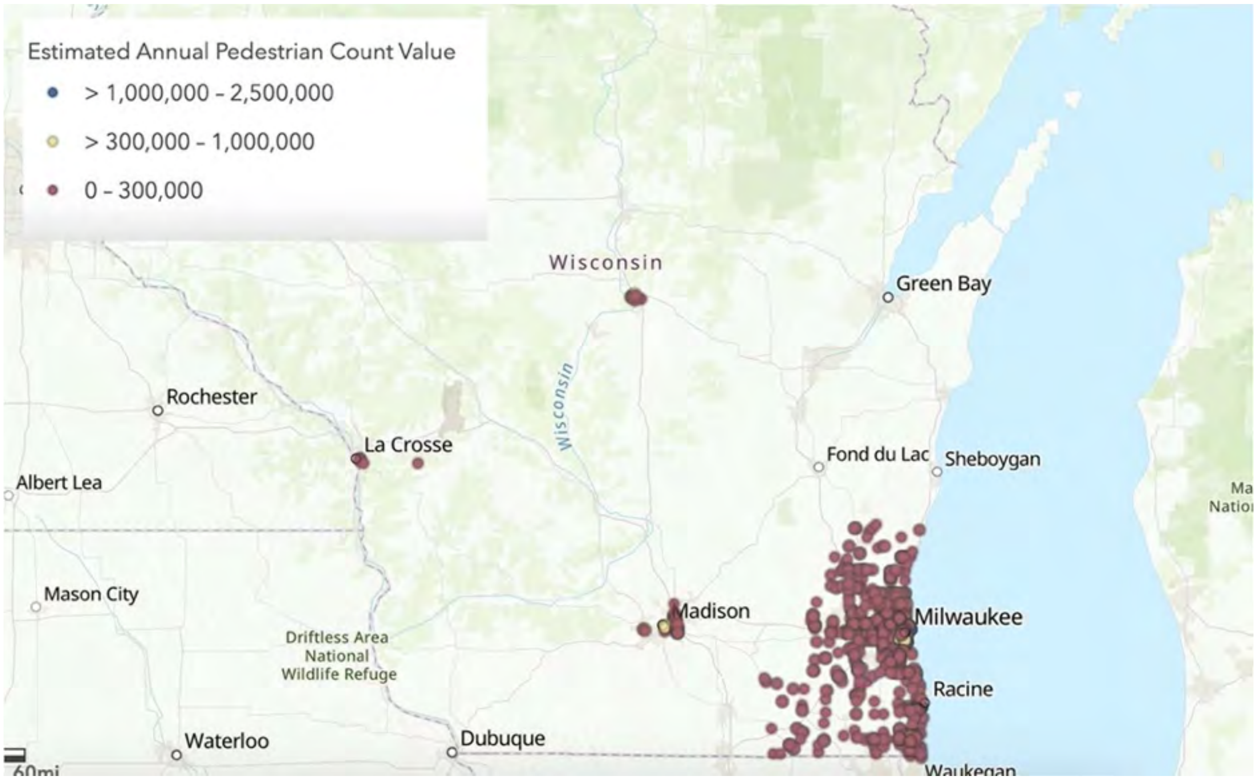


Figure 1.2. Bicyclist Count Locations Included in the Statewide Pedestrian and Bicycle Count Database

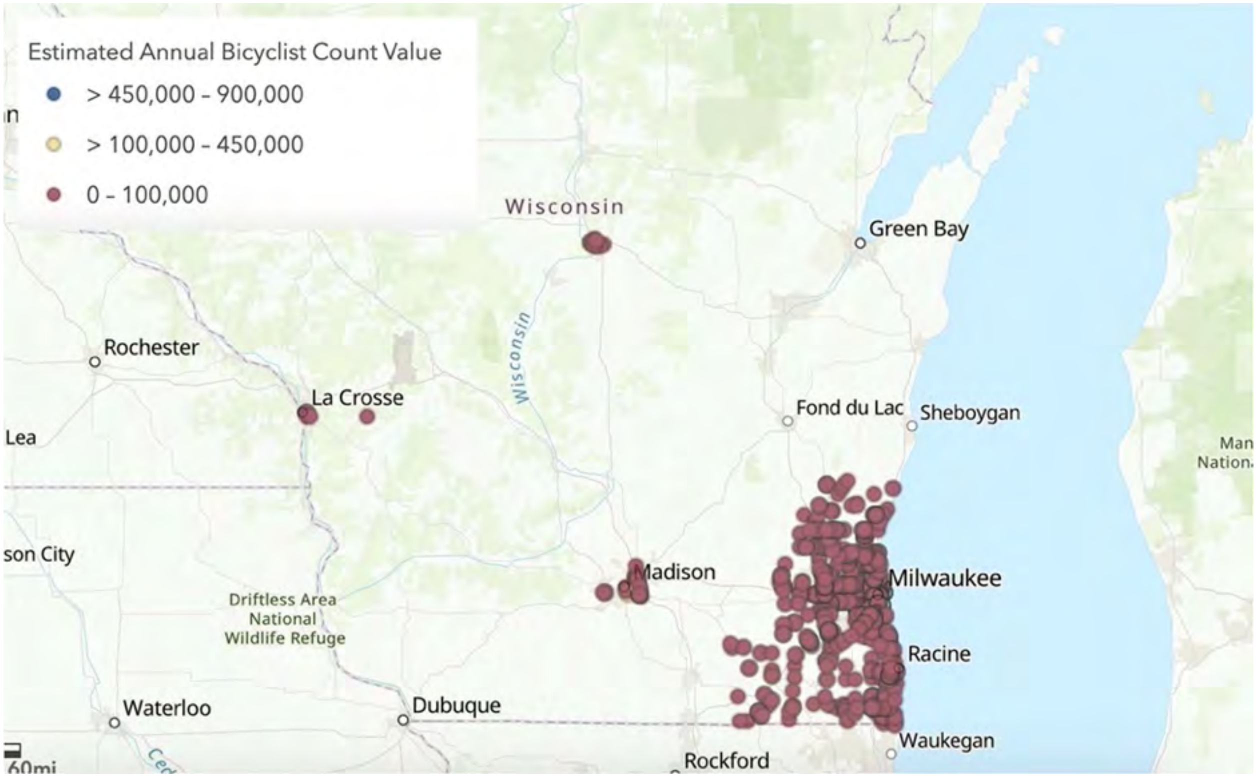


Figure 1.3. Trail User Count Locations Included in the Statewide Pedestrian and Bicycle Count Database

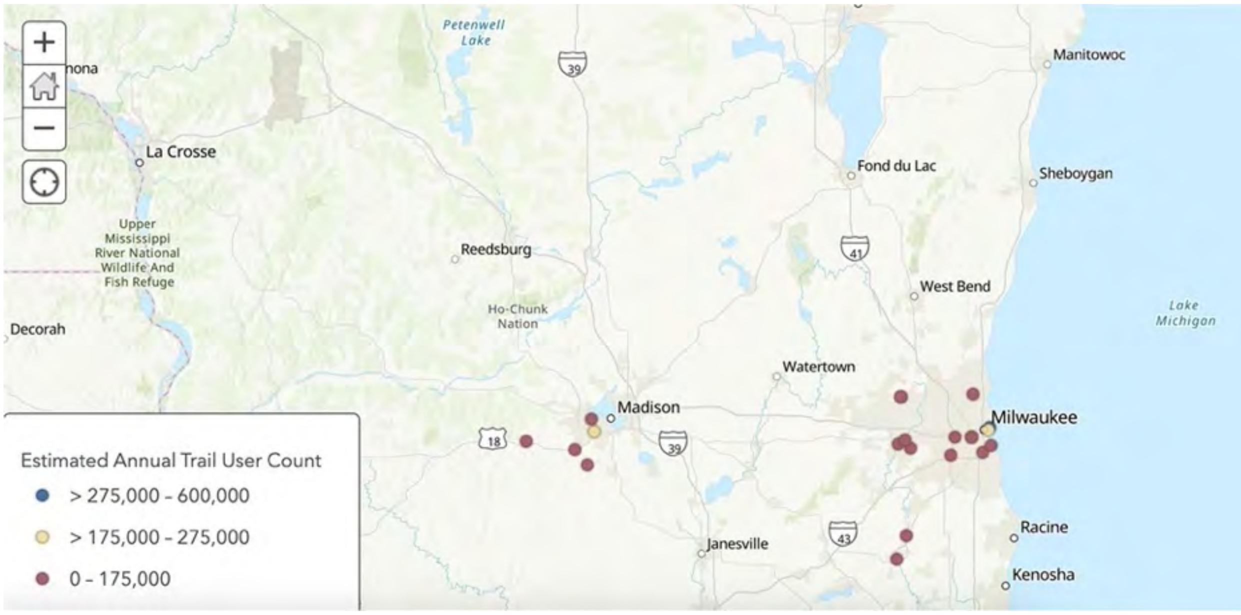


Table 1.8. Locations with Highest Estimated Annual Pedestrian Volumes

Pedestrian Count Location	City	Data Collection Date	Data Collection Period	Pedestrians Counted During Period	Estimated Annual Pedestrian Volume[1]
Crosby & Water[2]	Stevens Point	Saturday, September 15, 2018	10:00a-12:00p	1168	2286530
N. Farwell Ave. & E. North Ave.	Milwaukee	Saturday, October 10, 2020	3:00p-6:00p	1266	2176014
S. Kinnickinnic Ave. & E. Lincoln Ave.	Milwaukee	Saturday, September 19, 2020	10:00a-1:00p	1331	1698376
Main & Strongs[2]	Stevens Point	Saturday, September 15, 2018	10:00a-12:00p	593	1160884
West Ave. & Badger St.	La Crosse	Weekday, October 2016[3]	7:00-9:00a	282	1123123

1) This table lists the five highest estimated annual volumes based on the highest single count from any given location. The Milwaukee locations were each counted 15 times, so an average of all of the estimated annual volumes at a given location would be lower than the number reported in this table.
2) The estimated annual pedestrian volumes from Stevens Point are abnormally high because the base counts were collected on a Saturday with a downtown market and an Art in the Park event occurring nearby.
3) The count at West Ave. & Badger St. in La Crosse occurred on a weekday in October 2016. However, the specific date was not listed. Therefore, we applied the average of the Monday through Friday hour-to-week expansion factors when estimating the annual pedestrian volume at this location.

Table 1.9. Locations with Highest Estimated Annual Bicyclist Volumes

Bicyclist Count Location	City	Data Collection Date	Data Collection Period	Bicyclists Counted During Period	Estimated Annual Bicyclist Volume[1]
John Nolen & Wilson & Williamson	Madison	Thursday, May 7, 2015	7:00-8:30a; 4:15-5:45p	651	871909
John Nolen & Olin Ave.	Madison	Wednesday, April 15, 2015	6:00-9:00a; 3:00-6:00p	296	356781
West Ave. and Badger St.[2]	La Crosse	Weekday, October 2016	7:00-9:00a	129	278046
S. Kinnickinnic Ave. & E. Lincoln Ave.	Milwaukee	Saturday, September 19, 2020	10:00a-1:00p	154	185429
John Nolen & Northshore	Madison	Wednesday, May 6, 2015	7:00-8:30a; 4:15-5:45p	142	161487

1) This table lists the five highest estimated annual volumes based on the highest single count from any given location. The Milwaukee locations were each counted 15 times, so an average of all of the estimated annual volumes at a given location would be lower than the number reported in this table.
2) The count at West Ave. & Badger St. in La Crosse occurred on a weekday in October 2016. However, the specific date was not listed. Therefore, we applied the average of the Monday through Friday hour-to-week expansion factors when estimating the annual pedestrian volume at this location.

Table 1.10. Locations with Highest Estimated Annual Trail User Volumes

Trail User Count Location	City	Data Collection Start Date	Length of Data Collection Period	Trail Users Counted During Period	Estimated Annual Trail User Volume
Oak Leaf Trail and Brady Street Bridge	Milwaukee	Friday, September 2, 2011	22 days	45376	566107
Southwest Path Over Beltline	Madison	Wednesday, October 9, 2013	23 days	15098	250108
Oak Leaf Trail West of Veterans Park	Milwaukee	Saturday, September 24, 2011	22 days	14912	186041
Glacial Drumlin @ Fox River	Waukesha	Saturday, February 7, 2015[1]	79 days	12969	122626
Oak Leaf Trail and Cupertino Park	Milwaukee	Friday, September 2, 2011	22 days	7852	97961

1) The relatively low trail user count at this Glacial Drumlin Trail location produced a high estimated annual trail user volume because it was from February. February typically has a very low proportion of total annual trail use.

1.5. Next Steps for Database Development

Several steps should be taken to continue to refine and expand the Wisconsin Pedestrian and Bicycle Count Database.

First, additional data should be entered and cleaned. There are still WisDOT multimodal intersection counts from the WisDOT Box folder, additional trail counts from the Southeast Region, and trail counts from the East Central Wisconsin Regional Planning Commission that could be cleaned and added to the database. Further, we identified the numbers of unique pedestrian and bicyclist count locations by plotting the location of each count in GIS. Any count that was collected within 15 m (49 feet) of another count was considered to represent the same count location in the totals above. However, the database still lists some of these overlapping counts under different Location IDs, so these Location IDs should continue to be cleaned and combined. Additionally, new types of technology, such as automated video image processing should continue to be tested to collect pedestrian and bicyclist counts on trails as well as at street crossings, along sidewalks, and in bike lanes. This can help expand the types of locations that are represented in the database.

Second, the expansion factors used to estimate annual pedestrian, bicycle, and trail user volumes from shorter time periods should continue to be refined. This will require collecting more continuous counts at many different types of locations. Traffic monitoring practice typically identifies different factor groups that can be used to account for the different weekly and seasonal patterns that occur at different types of locations (often associated with different land uses, such as urban versus rural or commercial retail area versus residential area). Applying refined expansion factors that are tailored to the land use context surrounding each count location can produce better annual pedestrian, bicyclist, and trail user volume estimates. Our process to develop initial expansion factors is discussed in the next section of this report.

Third, the Wisconsin Pedestrian and Bicyclist Count Database should be institutionalized through a pedestrian and bicycle count program. This will involve maintaining the database, sharing it within WisDOT, and sharing it externally with the public. One of UWM's latest Bureau of Transportation Safety Grants is titled, "Establishment of A Pilot Pedestrian and Bicycle Count Program." This grant is designed to refine and expand the database so that it is a useful tool for WisDOT, local agencies, and the public. This project may lead to an interactive database of pedestrian and bicyclist counts and other exposure data. This exposure database can potentially be integrated with existing databases such as the Traffic Operations and Safety Lab Community Maps crash data clearinghouse[9] and the WisDOT TCMap that shows automobile traffic volumes statewide[10]. This will help provide more complete multimodal traffic data to that can be used to document, evaluate, and improve Wisconsin's multimodal transportation system.

[9] Wisconsin Traffic Operations and Safety Laboratory, The WisTransPortal System. "Community Maps: Traffic Safety for Wisconsin," https://transportal.cee.wisc.edu/partners/community-maps/, 2024.
[10] Wisconsin Department of Transportation. "Traffic Counts: TCMap (Traffic Count Map)," https://wisconsindot.gov/pages/projects/data-plan/traf-counts/default.aspx, 2024.

2. Pedestrian and Bicyclist Expansion Factors

The previous section describes the contents of the Wisconsin Pedestrian and Bicyclist Count Database. Several key fields in the database are expansion factors that are used to estimate annual pedestrian, bicyclist, or trail user volumes from short-term counts. The process of applying the expansion factors and "annualizing" the pedestrian, bicyclist, and trail user counts makes it possible to compare short-term counts collected on different days of the week and at different times of the year. The annual pedestrian and bicyclist volumes also provide the foundation to calculate crash rates (e.g., annual number of pedestrian crashes/annual pedestrian volume) and gain a better understanding of dangerous roadways and intersections. This information can be used to prioritize safety improvements across Wisconsin.

This section of the report describes how we developed the initial pedestrian, bicyclist, and trail user expansion factors that were applied to short-duration counts in the Wisconsin Pedestrian and Bicyclist Count Database. We developed expansion factors by gathering several types of user volume data that extended over at least one full year and calculating the proportion of the total annual volume that occurred each hour and each month. The sections below present our analysis and the resulting expansion factors.

2.1. Expansion Factor Development

We developed expansion factors for pedestrian, bicyclist, and trail user counts. We first describe the pedestrian expansion factor development process in detail below. The bicyclist and trail user processes were similar, so we provide notes about the unique aspects of those processes near the end of this section.

Many datasets were available for the development of pedestrian expansion factors, including:

- Wisconsin statewide pedestrian crash reports from 2016-2021 (excluding 2020)
- Pedestrian volumes from a permanent sidewalk counter in downtown Milwaukee from January 2021 thru March 2023
- Monthly trail user counts from six Milwaukee County automatic counters from various timeframes from 2015-2017 (a total of more than 2 million pedestrians and bicyclists passed these sensors during this timeframe)
- Pedestrian volumes from 13 permanent sidewalk counters in downtown Oakland, CA between 2008 and 2009
- Weighted pedestrian trips reported in the 2017 National Household Travel Survey (NHTS)
- Nationwide pedestrian fatalities from the 2010 thru 2020 Fatality Analysis Reporting System (FARS)

The text below describes how hour-to-week and week-to-year expansion factors were developed. These two expansion factors are defined as:

- Hour to Week expansion factor (HF) = Total weekly volume/Count for a specific hour of the week
- Week to Year expansion factor (WF) = Total annual volume/Total weekly volume

The annual pedestrian volume estimate (APV) = Hourly Pedestrian Volume * HF * WF.

Our first step was to estimate hour-to-week factors. After analyzing each data source individually by hour and by month, most showed similar trends. Most sources of hourly data showed that more pedestrian activity occurred during the daytime than the nighttime. FARS data showed opposite results, as most pedestrian fatalities happen during dark hours. This inconsistent trend is likely due to the higher risk of pedestrian fatalities at night despite lower pedestrian volumes, so this data source was excluded from the final hour-to-week pedestrian expansion factor. All other datasets were used and averaged together. While each has their individual limitations, the average helps balance the strengths and weaknesses to give a general representation of pedestrian volume patterns. Our final hour-to-week pedestrian expansion factors from a 10-hour period on Thursday can be seen below in Table 2.1. The lower the expansion factor correlates to a larger expected pedestrian volume at those times, for example between 3 and 5 pm.

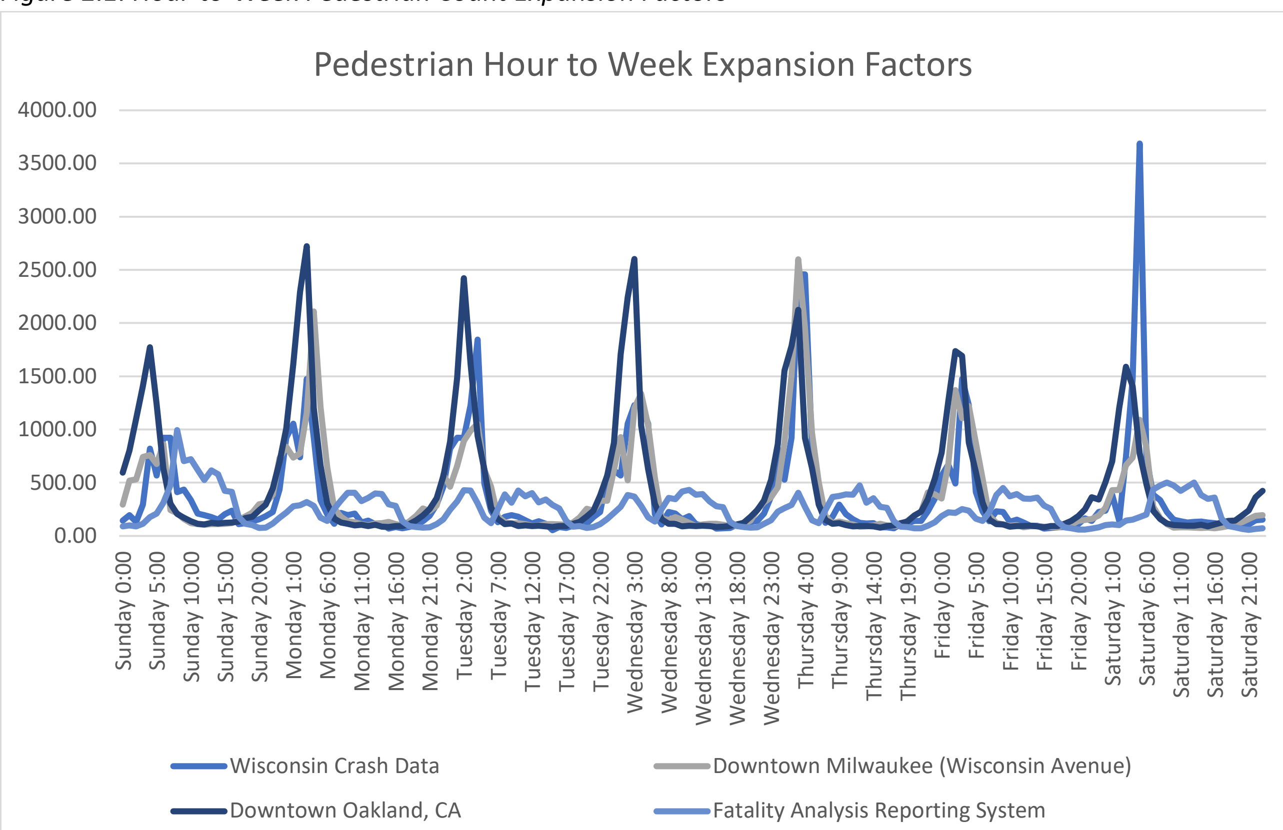
Our second step was to estimate week-to-year factors. Overall, the summer months had more and the winter months had fewer pedestrian trips, though the seasonal difference was less pronounced in the NHTS data than in the Wisconsin-specific sources. We explored differences by week within each month but found limited variation in weekly pedestrian volumes within specific months. With that in mind, our week-to-year expansion factor uses the same value for each week within an individual month.

The graphs below visualize the pedestrian expansion factors. Figure 2.1 shows the hour-to-week expansion factors that would be applied to counts from each of the 168 specific hours during a week. For example, consider a count of 100 pedestrians collected on Thursday at 1 pm. To estimate the weekly volume, this count would be multiplied by 98.8 (and produce a weekly volume estimate of 98,800). Our final Figure 2.2 shows the week-to-year expansion factors for particular months. Note that these factors account for the number of weeks in each specific month. The complete set of pedestrian count expansion factors are shown in Appendix A.

Table 2.1. Hour-to-Week Pedestrian Count Expansion Factor: Thursday Example

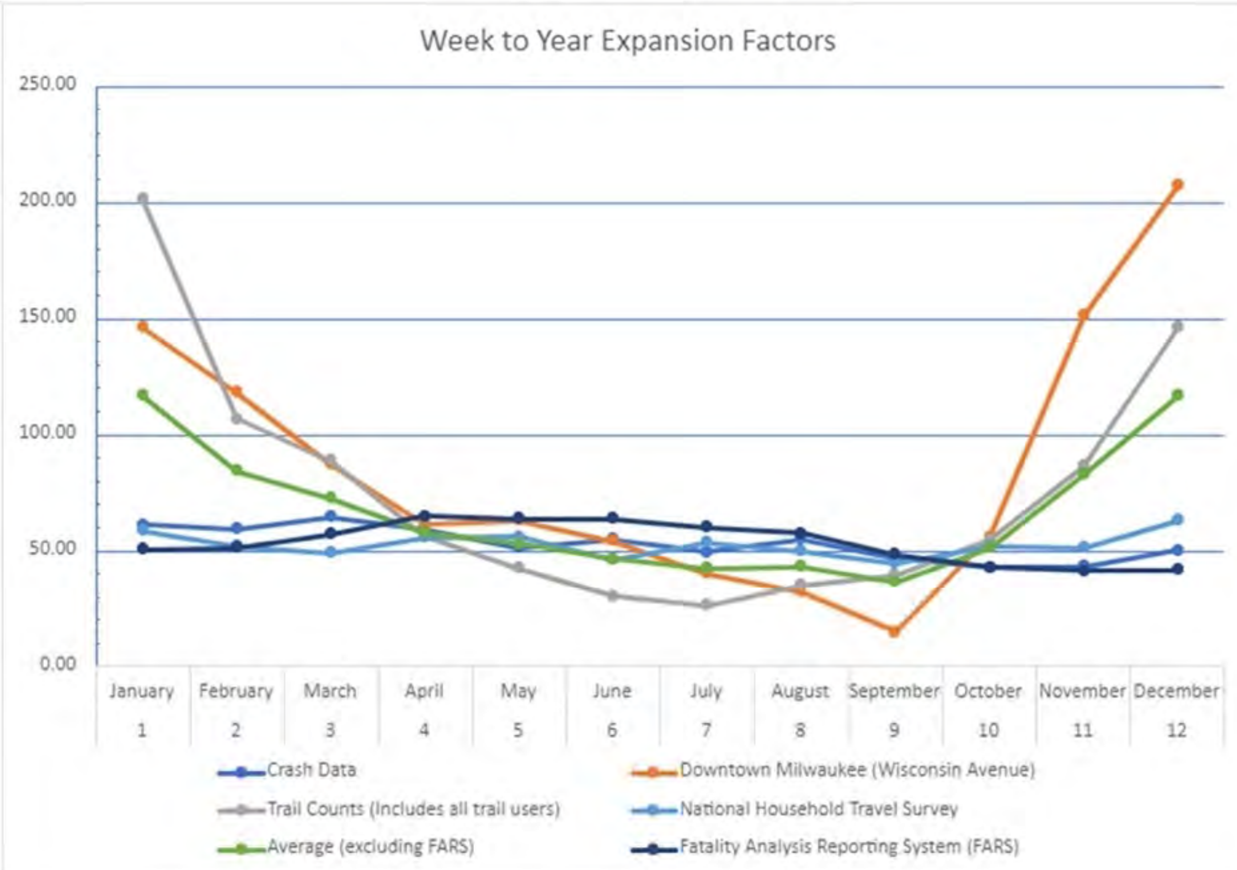
Pedestrian Count Expansion Factor - HOUR to WEEK					
Time of Day	Wisconsin Crash Data	Downtown Milwaukee (Wisconsin Avenue)	Downtown Oakland, CA	National Household Travel Survey	Average
Thursday 6:00	307.29	503.18	295.23	263.91	368.57
Thursday 7:00	122.92	186.77	150.81	108.71	153.50
Thursday 8:00	179.88	119.25	112.13	111.36	137.09
Thursday 9:00	295.00	134.99	120.78	154.59	183.59
Thursday 10:00	204.86	120.95	100.67	103.51	142.16
Thursday 11:00	156.91	107.62	90.86	122.34	118.47
Thursday 12:00	122.92	86.61	91.59	80.80	100.37
Thursday 13:00	115.23	88.07	93.09	95.69	98.80
Thursday 14:00	120.90	97.25	88.21	93.89	102.12
Thursday 15:00	79.30	113.58	78.22	80.81	90.37
Thursday 16:00	81.04	99.92	91.94	97.86	90.97
Thursday 17:00	70.91	93.70	98.89	93.10	87.84

Figure 2.1. Hour-to-Week Pedestrian Count Expansion Factors



NHTS data are not shown above as the extremes of the data exceeded the scale of the chart.

Figure 2.2. Week-to-Year Pedestrian Count Expansion Factors for Weeks within Specific Months



The same process was used for bicyclists, however fewer datasets were available. We analyzed the following:

- Wisconsin statewide bicyclist crash reports from 2016-2021 (excluding 2020)
- Monthly trail user counts from six Milwaukee County automatic counters from various timeframes from 2015-2017 (a total of more than 2 million pedestrians and bicyclists passed these sensors during this timeframe)
- Weighted bicyclist trips reported from the 2017 National Household Travel Survey (NHTS)

As for pedestrian counts, we developed hour-to-week and week-to-year expansion factor tables for bicyclist counts. The complete set of bicyclist count expansion factors are shown in Appendix B.

Finally, we developed month-to-year trail user count expansion factors using the six Milwaukee County automated counters. These are shown in Appendix C. Note that we did not develop hour-to-week factors for trail counts because nearly all of the trail counts in the Wisconsin Pedestrian and Bicyclist Count Database were collected over periods longer than one week.

2.2. Expansion Factor Application

After developing the hour-to-week and week-to-year expansion factors, we applied them to all short-term counts currently in our Wisconsin Pedestrian and Bicyclist Count Database to estimate annual pedestrian, bicyclist, and trail user volumes.

A specific example from a pedestrian count in Madison, WI at John Nolen Drive and Lakeside Street is detailed below. Counts were taken at this location in December 2014 on a Thursday from 6:00-9:00am and 3:00-6:00pm. The total number of pedestrians counted during these six hours was 72.

Pedestrians per hour = 12
Average hour to week expansion factor for 6:00am, 7:00am, 8:00am, 3:00pm, 4:00pm, & 5:00pm = (368.57*153.50*137.09*90.37*90.97*87.84)/6 = 154.27
Week to Year expansion factor for a week in December = 116.56

Annual Pedestrian Count Estimate = 12 * 154.27 * 116.56 = 216,409

Based on our calculations of expansion factors, we estimate there are 216,409 pedestrians crossing annually at John Nolen and Lakeside in Madison, WI.

2.3. Comparison of Expanded Pedestrian Volumes to Pedestrian Volume Model Outputs

Table 2.2 shows a comparison of estimated annual pedestrian volumes derived from expansion factors with estimated annual pedestrian crossings from the pedestrian volume model at several example locations. Overall, both the count-based and model-based estimates show high and low volumes in similar locations. At the individual location level, some of the expanded short-term counts produce similar annual pedestrian volumes as the pedestrian volume model, but others differ by more than 50%. Some discrepancies are underestimates while others are overestimates. The discrepancies could be due to multiple factors, including but not limited to, differences in nearby land uses, weather, special events, or other sources of variation. This difference in calculation reinforces that these are merely estimates, and more work needs to be done to improve the accuracy of annual pedestrian volume estimates from both the expansion factors and the pedestrian volume model.

Table 2.2. Comparison of Pedestrian Counts at Specific Locations

	Estimated Annual Pedestrian Volume from Counts	**Estimated Annual Pedestrian Volume from Pedestrian Volume Model**
East Washington Ave & Blair St (Madison)	744,757	262,093
Kinnickinnic Ave & Lincoln Ave & Allis St (Milwaukee)[1]	697,389	413,745
Port Washington Rd & Silver Spring Dr (Glendale)[2]	101,158	50,929
N 112th St & Bluemound Rd (Milwaukee)	68,685	62,745
Losey Blvd & State Rd (La Crosse)	23,896	8,713
Stoughton Rd & Broadway (Monona)	11,705	6,510
Green Bay Rd & Wright Ave (Racine)	7,225	12,678

1) The annual pedestrian volume estimate listed for Kinnickinnic Ave & Lincoln Ave & Allis St was based on the average of 15 separate counts.

2) The annual pedestrian volume estimate listed for Port Washington & Sliver Spring was based on the average of three separate counts.

2.4. Considerations and Future Research for Pedestrian and Bicyclist Expansion Factors

We developed initial hour-to-week and week-to-year expansion factors for pedestrian and bicyclist counts in Wisconsin. However, our expansion factors were based on aggregating a variety of count and survey data sources. In the future, more accurate expansion factors could be developed by accounting for land use characteristics surrounding count locations and weather conditions during the count periods.[11]

For example, locations near commercial retail, residential neighborhoods, parks, and schools may each have different hourly and seasonal pedestrian and bicyclist activity patterns. These different patterns may warrant their own distinct expansion factors, as done in previous studies. To develop land-use specific expansion factors, more data need to be collected from locations with a variety of land uses throughout the state.

Similarly, pedestrian and bicyclist counts taken during hot, cold, cloudy, or rainy weather may also be lower than counts taken during pleasant weather. Separate weather-specific expansion factors can potentially improve annual pedestrian and bicyclist count estimates in the future. However, more data need to be collected under different weather conditions to develop weather-specific expansion factors.

While additional data and analysis can help improve our Wisconsin-specific expansion factors in the future, the initial expansion factors developed here provide a baseline to estimate annual pedestrian and bicyclist volumes from short-duration counts. These expansion factors will be useful for comparing counts collected at different times of year. Estimated annual counts can then be used to represent exposure and calculate crash rates for more rigorous pedestrian and bicycle safety analyses.

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[11] Schneider, R.J., L.S. Arnold, and D.R. Ragland. 2009. "A Methodology for Counting Pedestrians at Intersections: Using Automated Counters to Extrapolate Weekly Volumes from Short Manual Counts," Transportation Research Record: Journal of the Transportation Research Board, Volume 2140, pp. 1-12.

3. Application: State Highway System Segments with High Pedestrian and Bicyclist Crashes and Crash Rates

In this section, we analyze pedestrian and bicyclist crashes reported from 2018 to 2022 on the Wisconsin State Highway Network to identify segments that are the most dangerous for pedestrians and bicyclists. By adapting the High Injury Network concept used in City of Milwaukee's Pedestrian Plan,[12] we create preliminary pedestrian high-crash and bicyclist high-crash networks in Wisconsin showing highway segments that have high pedestrian and bicyclist crash numbers, as well as their related injury severity levels. Then we apply model-estimated pedestrian volumes to the High Crash Network segments to create pedestrian crash rates and represent the relative risk of pedestrian crashes on these segments.

The sections below describe the process of state highway network segmentation, pedestrian and bicyclist crash assignment, pedestrian volume assignment, and pedestrian and bicyclist High Injury Network creation.

This preliminary Wisconsin High Crash Network could be expanded in the future to become a component of WisDOT's Vulnerable Road User (VRU) Safety Assessment. The Federal Highway Administration requires all states to complete a VRU Assessment as part of their Highway Safety Improvement Plan (HSIP)[13]. Vulnerable road users are defined as pedestrians, bicyclists, or a person using a personal conveyance such as a scooter or a wheelchair.

To provide background for our segment-based crash analysis, we downloaded police-reported pedestrian crash data from the WisTransPortal database. We analyzed the proportion of pedestrian crashes that were geocoded during each five-year period between 2000 and 2019 (Appendix D). This showed increasing proportions of crashes being geocoded over time. Then we used kernel density analysis to create heat maps showing "hot spots" of pedestrian crashes in the largest urban areas of Wisconsin during each five-year period between 2005 and 2019 (Appendix E).

3.1. State Highway Network Segmentation

Our goal was to create ½ mile (804 meters) segments of the Wisconsin State Highway System, including highways that are classified as Interstate Highways, US Highways, and State Trunk Highways (STH). We obtained the Wisconsin Information System for Local Roads (WISLR) shapefile from the Wisconsin Department of Transportation (WisDOT). The WISLR shapefile contains road polylines with geometric and traffic information across the entire state.[14]

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[12] City of Milwaukee. (2019). Milwaukee Pedestrian Plan, Prepared by Toole Design Group and University of Wisconsin-Milwaukee, https://city.milwaukee.gov/dpw/infrastructure/multimodal/Milwaukee-Pedestrian-Plan.

[13] Federal Highway Administration. (2022, October 22). Vulnerable road user safety assessment guidance. https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf

[14] Wisconsin Department of Transportation Wisconsin Information System for Local Roads (WISLR). (n.d.). https://wisconsindot.gov/Pages/doing-bus/local-gov/wislr/default.aspx

We first used ArcGIS Pro to dissolve Interstate Highways, US Highways and STHs by name and road category to merge highways with the same number into one polyline.[15] We then imported the dissolved highways into QGIS to create highway segments that are approximately ½ mile long. The segmentation process in GIS is complex due to highway centerlines dividing and coming together and crossing each other at various locations, so not all segments ended up being ½ mile long. After observing the generated segment lengths and locations, we defined segments between 0.47 miles (750 meters) and 0.53 miles (850 meters) as ½ mile segments. Then, we manually dissolved segments that were not in the ½ mile range and created ½ mile segments from them through a multi-step GIS process.[16] In total, we were able to create 29,931 segments, and over 95% of them were in the ½ mile range (Table 3.1).

Table 3.1. Summary of Generated Highway Segments

Category	Total Segments		Segments less than ½ mile		½ mile Segments	
	Number	Percentage	Number	Percentage	Number	Percentage
US Highway & Interstate Highway	10,815	36.1%	322	3.0%	10,493	97.0%
STH	19,116	63.9%	964	5.0%	18,152	95.0%
Total	29,931		1,286	4.3%	28,645	95.7%

3.2. Crash and Pedestrian Volume Assignment

For our more detailed analysis, we downloaded both pedestrian and bicyclist crash data from the WisTransPortal System.[17] The crash database includes coordinates for most crashes, which allowed us to geocode pedestrian and bicyclist crashes that occurred between 2018 and 2022. Of the 664,912 total crashes reported from 2018 to 2022 in Wisconsin, 6,699 (1.0%) were pedestrian crashes and 3,589 (0.5%) were bicyclist crashes. More than 95% of pedestrian and bicyclist crashes contained longitude and latitude coordinates and were geocoded. We defined pedestrian and bicyclist crashes within 50 meters of a highway segment centerline as crashes associated with that segment. Following previous research, we determined that this 50-meter distance would typically capture the full width of the highway segment right-of-way and a short distance on intersecting highways influenced by the segment.[18] Nearly 30% of pedestrian and bicyclist crashes occurred on just 1,393 highway segments (4.7% of all highway segments) (Table 3.2).

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[15] We did not include highway crossovers in this process because they are all shorter than ½ mile and are not continuous. If there were crashes on highway crossovers, they would be covered in the nearest highway segment 50m buffer described in the next section. See Appendix F.1 for the dissolved highway map.

[16] The common method to generate polylines of a certain length in ArcGIS Pro involves a two-step process: use Generate Points along Lines with a specific distance, and then use Split Line at Point to split polylines generated in the first step. When it comes to segmenting the highways, the Split Line at Point tool searched for the nearest point possible instead of the nearest point on the polyline to split polylines. See Appendix F.2. Given the complexity of the highway network, nearly half of the segments are generated of arbitrary lengths instead of ½ mile. The Split tool in QGIS allows for bypassing the point generation step and it directly creates segments of certain lengths. Certain segments of arbitrary lengths were generated with QGIS due to the dividing and merging of highways, we manually merged segments that were out of the ½ mile range in such scenarios and generated ½ mile segments from them. Please see Appendix F.3 for details.

[17] The WISTransPortal system. (n.d.). https://transportal.cee.wisc.edu/services/crash-data/

[18] Schneider, R. J., Proulx, F. R., Sanders, R. L., & Moayyed, H. (2021). United States fatal pedestrian crash hot spot locations and characteristics. *Journal of Transport and Land Use*, 14(1), 1–23. https://doi.org/10.5198/jtlu.2021.1825

Table 3.2. Summary of Pedestrian and Bicyclist Crashes from 2018 to 2022

Category	Total Number of Crashes	Geocoded Crashes		Crashes on Highway Segments	
		Number	Percentage of Total	Number	Percentage of Geocoded
Pedestrian	6,699	6,495	97.0%	1,943	29.9%
Bicyclist	3,589	3,509	97.8%	1,108	31.6%

Nearly 50% of the highway segments with crashes are segments with only pedestrian crashes (665 segments), more than 25% are highway segments with only bicyclist crashes (365 segments), and the rest are segments that contain both pedestrian and bicyclist crashes (363 segments). Most segments with pedestrian and bicyclist crashes were approximately ½-mile long. Only approximately 6% of the segments with crashes were shorter than ½ mile (see Table 3.3).

Table 3.3 Summary of Highway Segments with Geocoded Crashes

Category	Number of Segments	Number of ½ Mile Segments		Number of under ½ Mile Segments	
		Number	Percentage	Number	Percentage
Pedestrian Crash Only	665	625	94.0%	40	6.0%
Bicyclist Crash Only	365	343	94.0%	22	6.0%
Pedestrian & Bicyclist Crash	363	342	94.2%	21	5.8%
Total	1,393	1,310	94.0%	83	6.0%

To count the number of pedestrian and bicyclist crashes reported between 2018 and 2022 on highway segments, we first spatially joined geocoded pedestrian and bicyclist crashes that were within a 50m-buffer of each highway segment. Then we counted the number of crashes by crash injury severity level.[19] However, this process would count crashes that are in the overlapping buffers of highway segments several times, thus potentially inflated the number of crashes per segment on segments with overlapping buffers.[20] In order to get a more accurate count of crashes per segment, we took the top 100 segments with the most pedestrian crashes (the threshold number of crashes was 5) and the most bicyclist crashes (the threshold number of crashes was 3) separately, manually deleted non-intersection crashes that had been counted more than once, then recalculated the total number of crashes per segment by crash type and by injury severity level. We finalized lists of segments: one list with the most pedestrian crashes and another list with the most bicyclist crashes.[21] We initially aimed to create lists of

[19] WisDOT uses the "KABCO" Scale to describe the injury severity level for a person involved in a crash. K: fatal injury; A: suspected serious injury; B: suspected minor injury; C: possible injury; O: no apparent injury. See The Traffic Operations and Safety Laboratory. (2019, May 28). *Wisconsin DT4000 crash data user guide*. https://transportal.cee.wisc.edu/services/crash-data/

[20] Please see Appendix F.4 for details.

[21] After selecting the top 100 segments with the most pedestrian and bicyclist crashes separately, we first sorted the number of crashes in a descending order in ArcGIS Pro and assigned non-intersection crashes in overlapping buffers only to segments that had the highest number of crashes. When there were overlapping segments with the same number of total crashes, we assigned non-intersection crashes in the overlapping buffers to the segments that were the closest to the crashes. For intersection crashes, we assigned them to all segments that met at at-grade junctions. We then recalculated the total number of crashes and the number of crashes by injury severity level for pedestrian and bicyclist crashes separately to identify the final top 50 segments with the most crashes for further analysis.

the top 50 segments in each group. Lastly, we used our geocoded annual pedestrian volume estimates to calculate the average pedestrian volume on the segments with the most pedestrian crashes.[22]

3.3. Pedestrian and Bicyclist High Crash Networks

We identified a Pedestrian High Crash Network, defined as the 58 segments with the most pedestrian crashes reported between 2018 and 2022 and a Bicyclist High Crash Network, defined as the 98 segments with the most bicyclist crashes reported between 2018 and 2022.

We created the following variables for each Pedestrian High Crash Network segment:

- P_K: Total number of pedestrian crashes with fatal injury.
- P_A: Total number of pedestrian crashes with suspected serious injury.
- P_BCO: Total number of pedestrian crashes with suspected minor injury to no apparent injury.
- P_Tot: Total number of pedestrian crashes.
- P_KA_Mi: The number of pedestrian crashes with fatal and suspected serious injury per mile.
- P_Tot_Mi: The total number of pedestrian crashes per mile.
- PVol_Avg: Average pedestrian volume across all intersections within the segment.
- P_KA_Rate: The number of pedestrian crashes with fatal and suspected serious injury per mile per average pedestrian volume.
- P_Tot_Rate: The total number of pedestrian crashes per mile per average pedestrian volume.

Table 3.4 shows the details of the top 58 segments with the most pedestrian crashes. We chose 58 segments because the minimum number of pedestrian crashes to be considered in the top 50 segments was 6, and there were 58 highway segments with at least 6 pedestrian crashes. The lengths of 56 of the 58 (96.6%) segments were in the ½-mile range.

Table 3.4 sorts the 58 segments from highest to lowest fatal plus severe pedestrian crash rate (fourth column from the right). Fatal plus severe pedestrian crash rates are calculated as the number of fatal plus severe pedestrian crashes per mile divided by the estimated annual pedestrian crossings averaged across all intersections in the segment.

The highest absolute number of pedestrian crashes (23) was on STH 190 (between N. 20th Street and N. 27th Street). Twenty-two segments had more than 10 pedestrian crashes reported between 2018 and 2022. Twenty-one of these segments were in Milwaukee County, and 19 were specifically in the City of Milwaukee.

Twenty-four (41.4%) segments had fatal pedestrian crashes; 6 segments had 2 fatal pedestrian crashes per segment while the rest of them had 1 fatal pedestrian crash per segment. Twenty of the segments with fatalities were in Milwaukee County, and 18 of them were specifically in the City of Milwaukee.

[22] We used annual pedestrian volume estimates at intersections that were within our 50-meter segment buffers to calculate the pedestrian volume per segment. For segments with multiple intersection pedestrian volume estimates, we used the average value from all intersections within the segment. For segments that did not have intersections with annual pedestrian volume estimates in their buffers, we assigned a pedestrian volume estimate from the nearest available state highway system intersection.

Forty-five (77.6%) segments had at least one pedestrian crash with a serious injury. 36 of these 45 were in Milwaukee County, and 31 were in the City of Milwaukee. STH 190 between N. 20th Street and N. 27th Street had the highest number (8) of pedestrian crashes with a serious injury.

When it comes to pedestrian crashes per segment per mile, 22 (37.9%) segments had more than 20 pedestrian crashes per mile; all of them were in Milwaukee County, with 21 of them in the City of Milwaukee. STH 190 between N. 20th Street and N. 27th Street had 46 pedestrian crashes per mile, making it the segment with the highest total number of pedestrian crashes per mile. Fifty (86.2%) segments had either fatal pedestrian crashes or pedestrian crashes with serious injury, 6 of them had more than 10 pedestrian crashes with more than serious injuries per mile. Many of these segments were in Milwaukee County, so we created a map of their locations in Milwaukee County (Figure 3.1). STH 57 between US Highway 18 and W. Wells Street had the highest number (16.53) of pedestrian crashes with more than serious injuries per mile.

Importantly, when we took the average pedestrian volume into consideration, the two highest fatal plus severe pedestrian crash rates were on segments of US 151 (between Ridgewood Way and the Beltline) (0.000237) and STH 113 (between Sherman Avenue and Dryden Drive) (0.000118) in Madison. Considering total pedestrian crash rates, 9 (15.5%) segments had a rate higher than 0.000200, with STH 13 between Eddy Street and Church Street in Wisconsin Dells having the highest rate (0.000664). These rates could be considered as a measure of the relative risk that individual pedestrians experience when traveling along highway segments.[23]

[23] Please see Appendix F.5 for maps showing fatal plus severe pedestrian crash rates for selected counties.

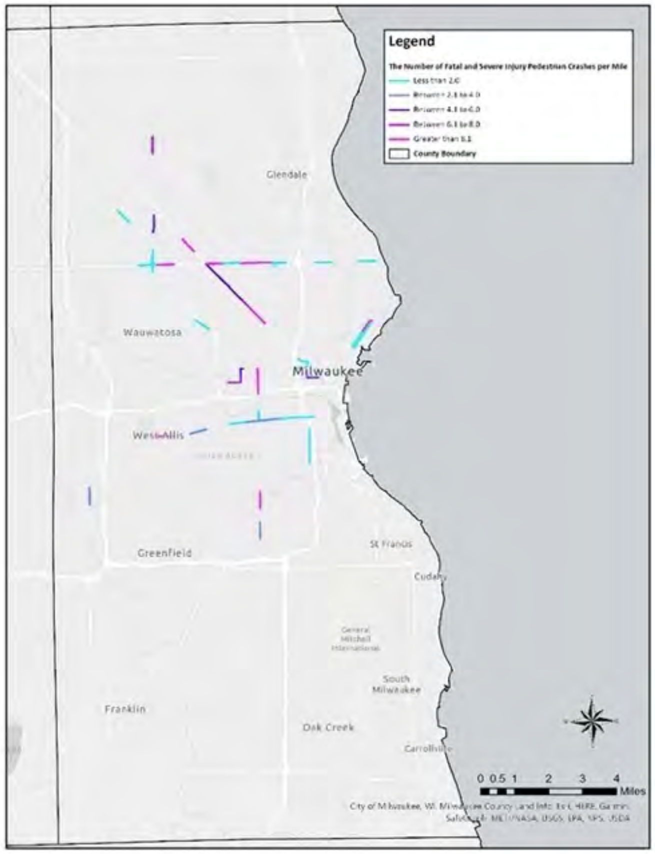


Figure 3.1. State Highway Segments with the most Fatal + Severe Pedestrian Crashes per Mile in Milwaukee County

Table 3.4 Top 58 Highway Segments with the Highest Number of Pedestrian Crashes (2018-2022)

Segment ID	Segment length (mi)	Highway Number	Total Pedestrian Crashes	Fatal Pedestrian Crashes	Severe Pedestrian Injury (A) Crashes	Other Pedestrian Crashes (B, C, O)	Estimated Average Annual Pedestrian Crossings at Intersections	Fatal + Severe Pedestrian Crashes per Mile	Total Pedestrian Crashes per Mile	Fatal + Severe Pedestrian Crashes per Mile per Annual Pedestrian Crossings	Total Pedestrian Crashes per Mile per Annual Pedestrian Crossings	Municipality	Location Reference
2889	0.50	US 151	8	0	4	4	33739.00	8.00	16.00	**0.000237**	**0.000474**	Madison	Between Ridgewood Way and Highway 12
11662	0.50	WI 113	6	1	1	4	33854.67	4.00	12.00	**0.000118**	**0.000354**	Madison	Between N Sherman Ave and Dryden Dr
15152	0.50	WI 181	8	1	2	5	55914.67	6.00	16.00	**0.000107**	**0.000286**	Milwaukee	Between W Acacia St and W Hustis St
13374	0.50	WI 145	6	2	2	2	94874.75	8.00	12.00	**0.000084**	**0.000126**	Milwaukee	Between W Ely Pl and W Baldwin St, intersecting N 60th St
15451	0.50	WI 190	15	2	3	10	128502.63	10.00	30.00	**0.000078**	**0.000233**	Milwaukee	Between Highway 145 and N 42nd St
13781	0.50	WI 158	7	2	2	3	106875.63	8.00	14.00	**0.000075**	**0.000131**	Kenosha	Between 26th Ave and 18th Ave
10888	0.50	WI 100	6	1	1	4	66470.50	4.00	12.00	**0.000060**	**0.000181**	West Allis	Between D Road and NN Road
15453	0.50	WI 190	14	0	5	9	168172.67	10.00	28.00	**0.000059**	**0.000166**	Milwaukee	Between N 35th St and N 26th St
15449	0.50	WI 190	10	1	3	6	138842.50	8.00	20.00	**0.000058**	**0.000144**	Milwaukee	Between N 74th St and N 66th St
15486	0.50	WI 190	23	0	8	15	286130.00	16.00	46.00	**0.000056**	**0.000161**	Milwaukee	Between N 20th St and N 27th St
19984	0.50	WI 35	6	0	1	5	40701.00	2.00	12.00	**0.000049**	**0.000295**	La Crosse	Between King St and La Crosse St
15125	0.50	WI 181	7	0	2	5	88135.50	4.00	14.00	**0.000045**	**0.000159**	Milwaukee	Between W Hampton Ave and W Grantosa Dr
16769	0.50	WI 241	19	2	3	14	222124.50	10.00	38.00	**0.000045**	**0.000171**	Milwaukee	Between W Ohio Ave and W Dakota St
16731	0.50	WI 241	9	0	2	7	95710.00	4.00	18.00	**0.000042**	**0.000188**	Milwaukee	Between STH 36 and W Howard Ave
13366	0.50	WI 145	12	1	4	7	247105.71	10.00	24.00	**0.000040**	**0.000097**	Milwaukee	Between W Hadley St and W Wright St,

													intersecting W Center St
353	0.51	US 151	10	1	2	7	152880.75	5.90	19.67	**0.000039**	**0.000129**	Madison	Between Brearly St. and S Blair St
13365	0.50	WI 145	7	0	4	3	206041.40	8.00	14.00	**0.000039**	**0.000068**	Milwaukee	Between N 34th St and N 28th St, intersecting Locust St and W Hadley St
15540	0.48	WI 20	6	0	2	4	106754.13	4.21	12.62	**0.000039**	**0.000118**	Racine	Between S Memorial Dr and 11st St
13780	0.50	WI 158	6	0	3	3	172495.13	6.00	12.00	**0.000035**	**0.000070**	Kenosha	Between 18th Ave and 8th Ave
13370	0.50	WI 145	7	1	2	4	187864.80	6.00	14.00	**0.000032**	**0.000075**	Milwaukee	Between Highway 190 and W Roosevelt Dr
14044	0.50	WI 16	6	0	1	5	66935.75	2.00	12.00	**0.000030**	**0.000179**	La Crosse	Between 7th N and Oakland St
24027	0.50	WI 59	6	0	2	4	138610.80	4.00	12.00	**0.000029**	**0.000087**	West Milwaukee	Between S 60th St and S 52nd St
13368	0.50	WI 145	6	2	1	3	232917.00	6.00	12.00	**0.000026**	**0.000052**	Milwaukee	Between W Roosevelt Dr and W Concordia Ave, intersecting N Sherman Blvd
13372	0.48	WI 145	17	0	2	15	158859.43	4.13	35.14	**0.000026**	**0.000221**	Milwaukee	Between W Concordia Ave and W Burleigh St
29635*	0.24	WI 57	10	1	3	6	699628.75	16.53	41.33	**0.000024**	**0.000059**	Milwaukee	Between Highway 18 and W Wells St
15458	0.50	WI 190	8	0	1	7	88659.71	2.00	16.00	**0.000023**	**0.000180**	Milwaukee	Between N 83rd St and N 75th St
3728	0.50	US 18	7	2	2	3	383205.75	8.00	14.00	**0.000021**	**0.000037**	Milwaukee	On N 35th St, between W Wells St and W Wisconsin Ave
13359	0.50	WI 145	7	1	0	6	94577.00	2.00	14.00	**0.000021**	**0.000148**	Milwaukee	Between W McKinley Ave and W Highland Ave
15488	0.50	WI 190	9	0	1	8	101706.67	2.00	18.00	**0.000020**	**0.000177**	Milwaukee	Between N Sherman Blvd and N 35th St
2895	0.50	US 151	8	1	0	7	111953.75	2.00	16.00	**0.000018**	**0.000143**	Madison	Between Brearly St. and S Dickinson St
15448	0.50	WI 190	10	0	1	9	109963.13	2.00	20.00	**0.000018**	**0.000182**	Milwaukee	Between N 83rd St and Highway 175

112*	0.35	US 18	7	1	1	5	365773.67	5.74	20.08	**0.000016**	**0.000055**	Milwaukee	On N 35th St, between W Wells St and W Highland Blvd
14871	0.50	WI 175	8	1	0	7	124417.75	2.00	16.00	**0.000016**	**0.000129**	Milwaukee	Between W Stark St and N 91st St
15159	0.50	WI 181	9	0	1	8	124987.80	2.00	18.00	**0.000016**	**0.000144**	Milwaukee	Between W Vienna Ave and W Hope Ave
24025	0.50	WI 59	12	1	3	8	489763.75	8.00	24.00	**0.000016**	**0.000049**	West Allis	Between S 76th St and South 70th St
20826	0.50	WI 38	6	0	1	5	132186.75	2.00	12.00	**0.000015**	**0.000091**	Milwaukee	Between S Chase Ave and W Maple St
15123	0.50	WI 181	13	0	1	12	139029.60	2.00	26.00	**0.000014**	**0.000187**	Milwaukee	Between W Congress St and Highway 190
23361	0.50	WI 57	10	1	3	6	623815.33	8.00	20.00	**0.000013**	**0.000032**	Milwaukee	Between I94 and W Kilbourn Ave
3741	0.50	US 18	7	1	2	4	516334.40	6.00	14.00	**0.000012**	**0.000027**	Milwaukee	Between N 6th St and N Plankinton Ave
15493	0.50	WI 190	8	0	1	7	160058.33	2.00	16.00	**0.000012**	**0.000100**	Shorewood	Between N Oakland Ave and N Downer Ave
23368	0.50	WI 57	14	1	0	13	164086.29	2.00	28.00	**0.000012**	**0.000171**	Milwaukee	Between W Melvina St and N 15th St
18977	0.50	WI 32	10	0	4	6	792908.67	8.00	20.00	**0.000010**	**0.000025**	Milwaukee	Between E Kenilworth Pl and E Bradford Ave
15542	0.50	WI 20	9	0	1	8	223218.00	2.00	18.00	**0.000009**	**0.000081**	Racine	Between Grand Ave and S Main St
24029	0.50	WI 59	12	0	2	10	466217.43	4.00	24.00	**0.000009**	**0.000051**	Milwaukee	Between S 33rd St and S25th St
24030	0.50	WI 59	10	1	1	8	497412.75	4.00	20.00	**0.000008**	**0.000040**	Milwaukee	Between S 25th St and S 18th St
18975	0.50	WI 32	7	1	0	6	274174.71	2.00	14.00	**0.000007**	**0.000051**	Milwaukee	Between E Brady St and E Woodstock Pl
24028	0.50	WI 59	10	0	1	9	267230.70	2.00	20.00	**0.000007**	**0.000075**	West Milwaukee	Between S 41st St and S 33rd St
24032	0.50	WI 59	6	0	1	5	283358.17	2.00	12.00	**0.000007**	**0.000042**	Milwaukee	Between S 11st St and S 4th St
20827	0.50	WI 38	10	0	1	9	501911.33	2.00	20.00	**0.000004**	**0.000040**	Milwaukee	Between W Maple St and W Madison St

23359	0.50	WI 57	17	0	1	16	512955.67	2.00	34.00	**0.000004**	**0.000066**	Milwaukee	Between STH 59 and W Evergreen Ln
3740	0.50	US 18	6	0	0	6	353806.00	0.00	12.00	**0.000000**	**0.000034**	Milwaukee	On W Highland Ave, between Highway 145 and N 11th St
12132	0.50	WI 13	7	0	0	7	21086.86	0.00	14.00	**0.000000**	**0.000664**	Wisconsin Dells	Between Eddy St and Church St
14043	0.50	WI 16	6	0	0	6	59105.60	0.00	12.00	**0.000000**	**0.000203**	La Crosse	Between La Crosse St and Cass St
14854	0.50	WI 175	6	0	0	6	246820.57	0.00	12.00	**0.000000**	**0.000049**	Milwaukee	Between N 56th St and N 49th St
15484	0.50	WI 190	12	0	0	12	89159.67	0.00	24.00	**0.000000**	**0.000269**	Milwaukee	On W Capitol Dr, between N 2nd St and N Holton St
18976	0.47	WI 32	8	0	0	8	814277.20	0.00	16.91	**0.000000**	**0.000021**	Milwaukee	Between E Woodstock Pl and E Bradford Ave
18978	0.50	WI 32	6	0	0	6	633781.00	0.00	12.00	**0.000000**	**0.000019**	Milwaukee	Between E Kenilworth Pl and E Brady St
24031	0.50	WI 59	10	0	0	10	315261.40	0.00	20.00	**0.000000**	**0.000063**	Milwaukee	Between S 18th St and S 11th St

Note:

1. Segments with asterisked Segment IDs are segments that are shorter than ½ mile. The actual total number of pedestrian crashes per mile, the total number of fatal crashes and pedestrian crashes with serious injury per mile, the total number of pedestrian crashes with fatal and suspected serious injury per mile per average pedestrian volume, and the total number of pedestrian crashes per mile per average pedestrian volume on these segments might be higher than those presented in this table.
2. Segments with "WI" prefix to their Highway Numbers are STH highways.
3. The reference location gives an approximate reference to locate the highway segments. Please use the ArcGIS shapefile for the accurate location for each segment.

We created the following variables for each Bicyclist High Crash Network segment:

- B_K: Total number of bicyclist crashes with fatal injury.
- B_A: Total number of bicyclist crashes with suspected serious injury.
- B_BCO: Total number of bicyclist crashes with suspected minor injury to no apparent injury.
- B_Tot: Total number of bicyclist crashes.
- B_KA_Mi: The number of bicyclist crashes with fatal and suspected serious injury per mile.
- B_Tot_Mi: The total number of bicyclist crashes per mile.

Table 3.5 shows the details of the top 98 segments with the most bicyclist crashes. We selected the top 98 segments because segments needed at least 3 bicyclist crashes to be in the top 50, and 98 segments had at least 3 crashes. The lengths of 90 of the 98 (91.8%) segments were in the ½ mile range.

Table 3.5 sorts the 98 segments from highest to lowest fatal plus severe bicyclist crashes per mile (fourth column from the right). Fatal plus severe bicyclist crashes per mile is calculated as the total number of fatal plus severe bicyclist crashes per mile. Since the most bicyclist crashes were in Dane County, we present a map of the most fatal and severe injury crashes per mile from Dane County (Figure 3.2).[24]

[24] Please see Appendix F.6 for maps of bicyclist crashes by injury severity level per mile for selected counties.

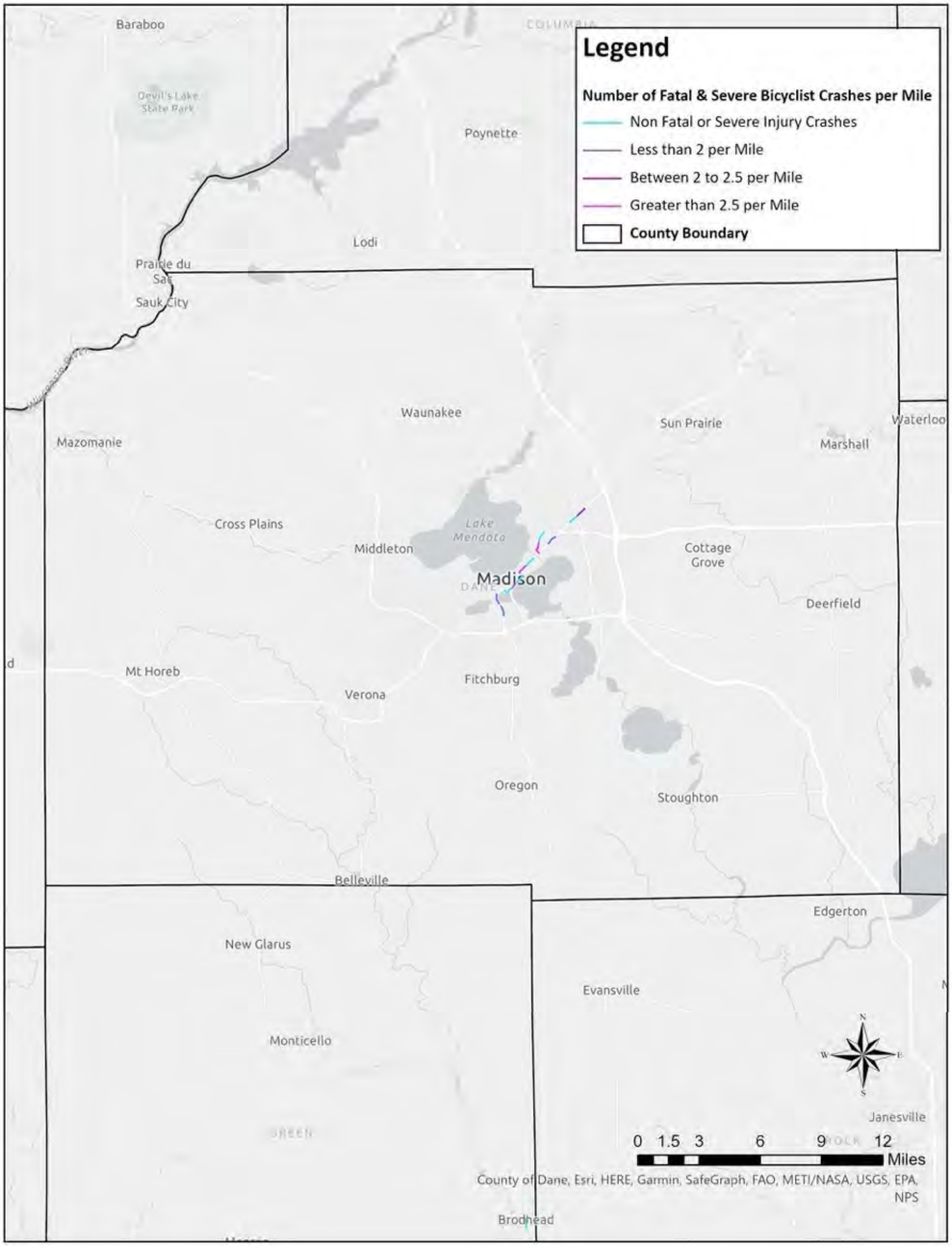


Figure 3.2. State Highway Segments with the most Fatal + Severe Bicyclist Crashes per Mile in Dane County

The highest absolute number of bicyclist crashes (11) was on US Highway 151 (between S. Bedford Street and S. Carroll Street). Twenty-one of the top 98 segments had more than 5 bicyclist crashes reported between 2018 and 2022. Seven of these segments were in the City of Madison and 5 of them were in the City of La Crosse.

Four of the top 98 (4.1%) segments had fatal bicyclist crashes, and each segment had one fatal bicyclist crash. Two of these segments were in the City of Madison, 1 in the City of Green Bay, and 1 in the City of Beloit.

Twenty-eight (28.6%) segments had bicyclist crashes with a serious injury. Six of these had more than 2 bicyclist crashes with serious injury, and half (3) of these segments were in Winnebago. STH 113 between Fordem Avenue and N. 6th Street in the City of Madison had the absolute highest number (3) of bicyclist crashes with a serious injury.

When it comes to bicyclist crashes per segment per mile, 23 (23.5%) segments had more than 10 bicyclist crashes per mile, the City of Madison had the highest number (6) of such segments. US Highway 151 between S. Bedford Street and S. Carroll Street had the highest number (22.9) of bicyclist crashes per mile. Thirty-one (31.6%) segments had either fatal bicyclist crashes or bicyclist crashes with serious injury, 8 of them had more than 3 bicyclist crashes with more than serious injuries per mile. STH 113 between Fordem Avenue and N. 6th Street in Madison had the highest number (6.0) in this category.

In conclusion, pedestrian high-crash and high-injury segments were more concentrated in the City of Milwaukee while bicyclist high-crash and high-injury segments were more concentrated in the City of Madison.

Table 3.5 Top 98 Highway Segments with the Highest Number of Bicyclist Crashes (2018-2022)

Segment ID	Segment length (mi)	Highway Number	Total Bicyclist Crashes	Fatal Bicyclist Crashes	Severe Bicyclist Injury (A) Crashes	Other Bicyclist Crashes (B, C, O)	Fatal + Severe Bicyclist Crashes per Mile	Total Bicyclist Crashes per Mile	Municipality	Location Reference
11657	0.50	WI 113	6	0	3	3	**6.000000**	**11.999999**	Madison	Between Fordem Ave and N 6th St
106	0.48	US 151	11	1	1	9	**4.162660**	**22.894630**	Madison	Between S Bedford St and S Carroll St
29635*	0.24	WI 57	4	0	1	3	**4.132864**	**16.531457**	Milwaukee	Between W Kilbourn Ave and W Highland Blvd
29579	0.49	WI 47	3	0	2	1	**4.115777**	**6.173666**	Menasha	Between Mayer St and Wittmann Park Ln
21571	0.50	WI 47	4	0	2	2	**4.000000**	**8.000000**	Menasha	Between Wittmann Dr and Tuckaway Ln
382	0.50	US 45	3	0	2	1	**4.000000**	**6.000000**	Oshkosh	Between Jackson St and Pioneer Dr
23362	0.50	WI 57	3	0	2	1	**4.000000**	**6.000000**	Milwaukee	Between W Highland Ave and W Galenda St
353	0.51	US 151	5	0	2	3	**3.933679**	**9.834199**	Madison	Between S Blair St and S Brearly St
29666*	0.34	WI 59	3	0	1	2	**2.956488**	**8.869465**	West Allis	Between S 97th St and S 92nd St
29073*	0.38	WI 113	4	0	1	3	**2.611944**	**10.447776**	Madison	Between S 1st St and E Johnson St

15540	0.48	WI 20	3	0	1	2	**2.103148**	**6.309445**	Racine	Between S Memorial Dr and 11th St
7605	0.50	US 53	10	0	1	9	**2.000000**	**19.999999**	La Crosse	Between Sill St and St James St
7602	0.50	US 53	7	0	1	6	**2.000000**	**14.000001**	La Crosse	Between Causeway Blvd and Pine St
24023	0.50	WI 59	7	0	1	6	**2.000000**	**13.999999**	West Allis	Between S 92nd St and STH 181
21576	0.50	WI 47	6	0	1	5	**2.000000**	**11.999999**	Appleton	Between W South Aly and W Oklahoma St
2886	0.50	US 151	5	0	1	4	**2.000000**	**10.000000**	Madison	Between W Lake St and Vilas Ave
2898	0.50	US 151	5	1	0	4	**2.000000**	**10.000000**	Madison	Between N 6th St and Oak St
2884	0.50	US 151	4	0	1	3	**2.000000**	**8.000000**	Madison	Between Plaenert Dr and Emerson St
3986	0.50	US 2	4	0	1	3	**2.000000**	**7.999999**	Superior	Between STH 35 and Grand Ave
6582	0.50	US 45	4	0	1	3	**2.000000**	**8.000000**	Fond Du Lac	Between VV Road and N Seymour St
15449	0.50	WI 190	4	0	1	3	**2.000000**	**8.000000**	Milwaukee	Between N 74th St and N 66th St
17867	0.50	WI 29	4	1	0	3	**2.000000**	**8.000000**	Green Bay	Between N Oakland Ave and N Washington St
2902	0.50	US 151	3	0	1	2	**2.000000**	**6.000000**	Madison	Between Mendota St and Thierer Rd
10892	0.50	WI 100	3	0	1	2	**2.000000**	**6.000000**	Greenfield	Between Layton Ave and W Cold Spring Road
14118	0.50	WI 16	3	0	1	2	**2.000000**	**6.000000**	Sparta	Between Alpine Ave and STH 27
15117	0.50	WI 181	3	0	1	2	**2.000000**	**6.000000**	Wauwatosa	Between Portland Ave and W State St
20664	0.50	WI 36	3	0	1	2	**2.000000**	**6.000000**	Greendale	Between ZZ Road and Churchwood Cir
21072	0.50	WI 42	3	0	1	2	**2.000000**	**6.000000**	Sheboygan	Between Michigan Ave and Sibley Ct
21578	0.50	WI 47	3	0	1	2	**2.000000**	**5.999999**	Appleton	Between W 3rd St and W Washington St
27332	0.50	WI 81	3	1	0	2	**2.000000**	**6.000000**	Beloit	Between Lee Ln and Cranston Rd
28914	0.50	WI 50	3	0	1	2	**2.000000**	**6.000000**	Kenosha	Between 24th Ave and 15th Ave
2891	0.50	US 151	10	0	0	10	**0.000000**	**19.999999**	Madison	Between Findorff Ct and John Nolen Dr
19984	0.50	WI 35	8	0	0	8	**0.000000**	**16.000000**	La Crosse	Between King St and STH 16
24029	0.50	WI 59	7	0	0	7	**0.000000**	**13.999999**	Milwaukee	Between S 33rd St and S 25th St
167	0.53	US 45	6	0	0	6	**0.000000**	**11.384654**	Fond Du Lac	Between Satterlee St and N Main St
309	0.50	US 12	6	0	0	6	**0.000000**	**11.999999**	Lake Delton	Near Dekorra Ln and 0.6 miles west of Lake Delton
2893	0.50	US 151	6	0	0	6	**0.000000**	**12.000000**	Madison	Between S Henry St and S Franklin St
19983	0.50	WI 35	6	0	0	6	**0.000000**	**11.999999**	La Crosse	Between Mississippi St and King St

24028	0.50	WI 59	6	0	0	6	**0.000000**	**12.000000**	West Milwaukee	Between S 41st St and S 33rd St
7615	0.50	US 53	5	0	0	5	**0.000000**	**10.000001**	La Crosse	Between La Crosse River and Car St
13780	0.50	WI 158	5	0	0	5	**0.000000**	**10.000000**	Kenosha	Between 18th Ave and 8th Ave
19446	0.50	WI 33	5	0	0	5	**0.000000**	**10.000000**	West Bend	Between N University Dr and N 18th Ave
22379	0.50	WI 52	5	0	0	5	**0.000000**	**10.000000**	Wausau	Between S 4th Ave and N 1st St
366	0.50	US 41	4	0	0	4	**0.000000**	**8.000000**	Marinette	Between Currie St and Stephenson St
1629	0.50	US 12	4	0	0	4	**0.000000**	**8.000000**	Lake Delton	About 1 mile northwest of Lake Delton
2901	0.50	US 151	4	0	0	4	**0.000000**	**8.000000**	Madison	Between Reindahl Ave and Mendota St
3740	0.50	US 18	4	0	0	4	**0.000000**	**8.000000**	Milwaukee	Between N 11th St and N 6th St
6588	0.50	US 45	4	0	0	4	**0.000000**	**8.000000**	Fond Du Lac	Between E Johnson St and W Scott St
10853	0.50	WI 100	4	0	0	4	**0.000000**	**8.000000**	West Allis	Between S Wollmer Rd and NN Road
11752	0.50	WI 114	4	0	0	4	**0.000000**	**8.000000**	Neenah	Between Harrison St and Washington Ave
15457	0.50	WI 190	4	0	0	2	**0.000000**	**8.000000**	Milwaukee	Between STH 181 and N 67th St
18906	0.50	WI 32	4	0	0	4	**0.000000**	**8.000000**	Kenosha	Between 54th St and 47th St
18968	0.50	WI 32	4	0	0	4	**0.000000**	**8.000000**	Milwaukee	Between E Linus St and E Stewart St
19443	0.50	WI 33	4	0	0	4	**0.000000**	**7.999999**	West Bend	Between N Silverbrook Dr and N 7th Ave
19987	0.50	WI 35	4	0	0	4	**0.000000**	**8.000000**	La Crosse	Between Island St and Winneshiek Rd
20827	0.50	WI 38	4	0	0	4	**0.000000**	**8.000001**	Milwaukee	Between W Maple St and W Madison St
28496	0.50	WI 96	4	0	0	4	**0.000000**	**8.000000**	Appleton	Between N Badger Ave and N Mason St
28856	0.50	WI 32	4	0	0	4	**0.000000**	**7.999999**	Kenosha	Between 62nd St and 54th St
29677*	0.24	WI 60	4	0	0	4	**0.000000**	**16.554017**	Grafton	Between 13th Ave and V Road
29925*	0.42	WI B51	4	0	0	4	**0.000000**	**9.616312**	Wausau	Between STH 52 and Spruce St
1582	0.50	US 12	3	0	0	3	**0.000000**	**6.000000**	Lake Delton	Between Shady Ln and E Lake Ave
2526	0.50	US 141	3	0	0	3	**0.000000**	**6.000000**	Green Bay	Between N Quincy St and St George St
2536	0.50	US 141	3	0	0	3	**0.000000**	**6.000000**	Green Bay	Between N Washington St and Bond St
2895	0.50	US 151	3	0	0	3	**0.000000**	**6.000001**	Madison	Between S Brearly St and S Dickinson St
3733	0.50	US 18	3	0	0	3	**0.000000**	**6.000000**	Milwaukee	Between Highway 145 and Highway 32

6589	0.50	US 45	3	0	0	3	**0.000000**	**6.000000**	Fond Du Lac	Between Water St and N Main St
7601	0.50	US 53	3	0	0	3	**0.000000**	**6.000000**	La Crosse	Between Cass St and Pine St
10857	0.50	WI 100	3	0	0	3	**0.000000**	**6.000000**	West Allis	Between W Madison St and W Mitchell St
10877	0.50	WI 100	3	0	0	3	**0.000000**	**5.999999**	Wauwatosa	Between W Center St and W Burleigh St
10881	0.50	WI 100	3	0	0	3	**0.000000**	**6.000000**	Wauwatosa	Between W Wisconsin Ave and W Watertown Plank Rd
10916	0.50	WI 100	3	0	0	3	**0.000000**	**6.000000**	Brown Deer	Between N 51st St and N Deerwood Dr
11335	0.50	WI 11	3	0	0	3	**0.000000**	**6.000000**	Brodhead	Between 19th St and E Exchange St
11658	0.50	WI 113	3	0	0	3	**0.000000**	**6.000000**	Madison	Between N 6th St and Commercial Ave
11754	0.50	WI 114	3	0	0	3	**0.000000**	**6.000000**	Menasha	Between E North Water St and Garfield Ave
13333	0.50	WI 144	3	0	0	3	**0.000000**	**6.000000**	West Bend	Between Kuester Ln N and Roosevelt Dr
14043	0.50	WI 16	3	0	0	3	**0.000000**	**6.000000**	La Crosse	Between Cass St and Badger St
14044	0.50	WI 16	3	0	0	3	**0.000000**	**6.000000**	La Crosse	Between 6th St N and West Ave N
14335	0.50	WI 164	3	0	0	3	**0.000000**	**6.000000**	Sussex	Approx. 1 mile northwest of Sussex Village Park, intersecting VV Road
15489	0.48	WI 190	3	0	0	3	**0.000000**	**6.196233**	Milwaukee	Between STH 145 and N Sherman Blvd
15490	0.50	WI 190	3	0	0	3	**0.000000**	**6.000000**	Shorewood	Between Estabrook Dr and N Oakland Ave
17816	0.50	WI 28	3	0	0	3	**0.000000**	**5.999999**	Sheboygan	Between Mead Ave and Union Ave
18902	0.50	WI 32	3	0	0	3	**0.000000**	**6.000000**	Kenosha	Between 54th St and 46th St
18928	0.50	WI 32	3	0	0	3	**0.000000**	**5.999999**	Racine	Between Rapids Dr and Romayne Ave
18966	0.50	WI 32	3	0	0	3	**0.000000**	**6.000000**	Milwaukee	Between S Linebarger Ter and S Logan Ave
18971	0.50	WI 32	3	0	0	3	**0.000000**	**6.000000**	Milwaukee	Between E Walker St and W Pittsburgh Ave
21128	0.50	WI 42	3	0	0	3	**0.000000**	**6.000000**	Manitowoc	Between S 35th St and Custer St
21584	0.50	WI 47	3	0	0	3	**0.000000**	**6.000000**	Appleton	Between W Commercial St and W Grant St
22386	0.50	WI 52	3	0	0	3	**0.000000**	**6.000000**	Wausau	Between S 8th Ave and S 1st Ave
22708	0.50	WI 54	3	0	0	3	**0.000000**	**6.000000**	Wisconsin Rapids	Between S 6th St and 16th St S
23384	0.50	WI 57	3	0	0	3	**0.000000**	**6.000000**	Milwaukee	Between W Olive St and W Glendale Ave

24007	0.50	WI 59	3	0	0	3	**0.000000**	**6.000000**	West Allis	Between STH 100 and I41
28493	0.50	WI 96	3	0	0	3	**0.000000**	**6.000000**	Grand Chute	Between I41 and N Bluemound Dr
28497	0.50	WI 96	3	0	0	3	**0.000000**	**6.000000**	Appleton	Between N Mason St and N Erb St
28857*	0.36	WI 32	3	0	0	3	**0.000000**	**8.284065**	Kenosha	Between 61st St and 66th Pl
29030	0.50	WI 96	3	0	0	3	**0.000000**	**6.000000**	Appleton	Between N Morrison St and N Meade St
29176*	0.37	WI 158	3	0	0	3	**0.000000**	**8.142388**	Kenosha	Between 13th Ct and 6th Ave
29264	0.49	WI 21	3	0	0	3	**0.000000**	**6.116098**	Oshkosh	Between N Sawyer St and Algoma Blvd
29378*	0.19	WI 29	3	0	0	3	**0.000000**	**15.763161**	Menomonie	Between STH 25 and 4th St E

Note:
1. Segments with asterisked Segment IDs are segments that are shorter than ½ mile. The actual total number of bicyclist crashes per mile and the total number of fatal bicyclist crashes and bicyclist crashes with serious injury per mile, might be higher than those presented in this table.
2. Segments with "WI" prefix to their Highway Numbers are STH highways.
3. The reference location gives an approximate reference to locate the highway segments. Please use the ArcGIS shapefile for the accurate location for each segment.

4. Conclusion

Having a consistently-formatted database of pedestrian, bicyclist, and trail user counts is essential for documenting non-motorized user exposure, developing and evaluating pedestrian and bicycle volume models, and quantifying pedestrian and bicyclist crash rates. Expansion factors help make counts more comparable and useful for safety analysis. Finally, high-crash networks are a useful way to spatially analyze which locations are the most dangerous, and subsequently which roadway segments should be prioritized for safety improvement projects.

We were able to use estimates from our Wisconsin pedestrian intersection crossing model to calculate pedestrian crash rates for the high-pedestrian-crash segments. These helped account for differences in pedestrian exposure and provided a more accurate representation of the risk that individual pedestrians experience when traveling on highway corridors. We did not have similar bicyclist volume estimates for the state highway system, so we were not able to calculate bicyclist crash rates for the high-bicyclist-crash segments. Developing reliable bicycle volume models is an important task for future bicyclist safety analyses.

In the future, other researchers should continue to expand the Wisconsin Pedestrian and Bicyclist Count Database and fine-tuning the methods for developing expansion factors and pedestrian and bicyclist high-crash networks in Wisconsin. Eventually, the Wisconsin Pedestrian and Bicyclist Count Database could be shared publicly. WisDOT could also integrate the pedestrian and bicyclist high-crash network segments as part of its VRU Assessment and prioritize these areas in the Highway Safety Improvement Program.

Appendix A. Pedestrian Count Expansion Factors

The final pedestrian count expansion factors are shown in the right-hand columns of Table A.1 and Table A.2. The final pedestrian count expansion factors are based on average values from the data sources in each column of the tables.

Table A.1: Pedestrian Hour-to-Week Count Expansion Factors

	Time of Day	Wisconsin Crash Data	Downtown Milwaukee (Wisconsin Avenue)	Trail Counts	Downtown Oakland, CA	National Household Travel Survey	Final Expansion Factor (Average)
1	**Sunday 0:00**	144.61	294.02	*Not used*	593.03	2737.73	343.89
2	**Sunday 1:00**	194.08	520.55	*Not used*	802.45	30899.28	505.70
3	**Sunday 2:00**	131.70	530.04	*Not used*	1103.16	29036.39	588.30
4	**Sunday 3:00**	295.00	742.16	*Not used*	1409.03	*No Data*	815.40
5	**Sunday 4:00**	819.44	760.89	*Not used*	1772.59	3848.18	1117.64
6	**Sunday 5:00**	567.31	674.52	*Not used*	1233.72	1211.95	825.18
7	**Sunday 6:00**	921.88	860.62	*Not used*	632.42	574.12	804.97
8	**Sunday 7:00**	921.88	242.31	*Not used*	301.96	273.97	488.71
9	**Sunday 8:00**	409.72	213.91	*Not used*	206.46	196.70	276.70
10	**Sunday 9:00**	433.82	159.04	*Not used*	171.97	138.26	254.95
11	**Sunday 10:00**	335.23	118.68	*Not used*	138.72	96.60	197.54
12	**Sunday 11:00**	210.71	109.52	*Not used*	114.36	92.46	144.86
13	**Sunday 12:00**	194.08	104.43	*Not used*	108.92	84.39	135.81
14	**Sunday 13:00**	175.60	109.53	*Not used*	121.79	119.92	135.64
15	**Sunday 14:00**	153.65	108.99	*Not used*	117.59	94.70	126.74
16	**Sunday 15:00**	204.86	114.59	*Not used*	121.78	91.80	147.07
17	**Sunday 16:00**	237.90	120.95	*Not used*	126.06	113.78	161.64
18	**Sunday 17:00**	111.74	148.22	*Not used*	133.58	140.88	131.18
19	**Sunday 18:00**	120.90	183.53	*Not used*	166.73	116.57	157.05
20	**Sunday 19:00**	136.57	217.86	*Not used*	180.77	159.14	178.40
21	**Sunday 20:00**	156.91	296.59	*Not used*	238.81	262.52	230.77
22	**Sunday 21:00**	184.38	307.69	*Not used*	292.94	259.99	261.67
23	**Sunday 22:00**	223.48	388.24	*Not used*	446.77	551.45	352.83
24	**Sunday 23:00**	433.82	728.87	*Not used*	696.41	1264.83	619.70
25	**Monday 0:00**	921.88	838.46	*Not used*	1008.86	5729.43	923.07
26	**Monday 1:00**	1053.57	735.45	*Not used*	1616.86	48444.45	1135.30
27	**Monday 2:00**	737.50	776.12	*Not used*	2288.35	107413.05	1267.32
28	**Monday 3:00**	1475.00	1156.46	*Not used*	2723.34	2925519.47	1784.93
29	**Monday 4:00**	921.88	2109.19	*Not used*	1200.26	3550.96	1410.44
30	**Monday 5:00**	335.23	1213.33	*Not used*	663.30	874.23	737.29

31	**Monday 6:00**	204.86	645.12	*Not used*	304.42	259.33	384.80
32	**Monday 7:00**	113.46	258.87	*Not used*	162.21	96.71	178.18
33	**Monday 8:00**	216.91	179.21	*Not used*	124.94	94.24	173.69
34	**Monday 9:00**	194.08	136.81	*Not used*	112.82	147.12	147.90
35	**Monday 10:00**	210.71	129.11	*Not used*	97.69	95.40	145.84
36	**Monday 11:00**	125.00	111.24	*Not used*	105.28	100.11	113.84
37	**Monday 12:00**	144.61	97.57	*Not used*	93.81	86.47	112.00
38	**Monday 13:00**	110.07	116.54	*Not used*	104.11	92.17	110.24
39	**Monday 14:00**	118.95	118.52	*Not used*	86.58	94.67	108.02
40	**Monday 15:00**	68.29	131.48	*Not used*	84.48	75.78	94.75
41	**Monday 16:00**	84.77	111.30	*Not used*	93.88	100.32	96.65
42	**Monday 17:00**	71.60	98.47	*Not used*	91.39	108.54	87.15
43	**Monday 18:00**	83.81	133.34	*Not used*	110.75	82.70	109.30
44	**Monday 19:00**	106.88	188.11	*Not used*	145.57	110.00	146.86
45	**Monday 20:00**	136.57	256.75	*Not used*	191.45	140.44	194.92
46	**Monday 21:00**	189.10	232.95	*Not used*	252.31	237.28	224.79
47	**Monday 22:00**	295.00	284.07	*Not used*	353.63	575.00	310.90
48	**Monday 23:00**	460.94	577.00	*Not used*	561.32	1286.81	533.09
49	**Tuesday 0:00**	819.44	462.85	*Not used*	885.14	5423.91	722.48
50	**Tuesday 1:00**	921.88	657.10	*Not used*	1482.81	25979.18	1020.59
51	**Tuesday 2:00**	921.88	891.73	*Not used*	2421.62	5791.57	1411.74
52	**Tuesday 3:00**	1229.17	989.24	*Not used*	1617.35	*No Data*	1278.59
53	**Tuesday 4:00**	1843.75	1053.23	*Not used*	941.17	1532.23	1279.38
54	**Tuesday 5:00**	491.67	621.49	*Not used*	623.34	663.56	578.83
55	**Tuesday 6:00**	237.90	461.80	*Not used*	267.32	301.18	322.34
56	**Tuesday 7:00**	127.16	181.97	*Not used*	157.29	74.70	155.47
57	**Tuesday 8:00**	179.88	128.23	*Not used*	111.80	84.03	139.97
58	**Tuesday 9:00**	194.08	117.03	*Not used*	115.64	126.85	142.25
59	**Tuesday 10:00**	179.88	120.45	*Not used*	91.96	125.53	130.76
60	**Tuesday 11:00**	147.50	110.12	*Not used*	97.08	106.59	118.24
61	**Tuesday 12:00**	117.06	94.65	*Not used*	93.91	79.13	101.87
62	**Tuesday 13:00**	136.57	99.44	*Not used*	93.96	110.30	109.99
63	**Tuesday 14:00**	113.46	109.93	*Not used*	89.38	85.23	104.26
64	**Tuesday 15:00**	55.87	110.02	*Not used*	82.03	74.38	82.64
65	**Tuesday 16:00**	81.94	106.44	*Not used*	90.94	75.78	93.11
66	**Tuesday 17:00**	73.02	105.88	*Not used*	91.83	91.04	90.25
67	**Tuesday 18:00**	95.78	126.01	*Not used*	113.75	103.16	111.85
68	**Tuesday 19:00**	129.39	172.12	*Not used*	130.93	125.90	144.15
69	**Tuesday 20:00**	117.06	254.58	*Not used*	184.01	218.15	185.22
70	**Tuesday 2100**	175.60	237.08	*Not used*	235.35	358.83	216.01
71	**Tuesday 22:00**	223.48	330.15	*Not used*	382.28	589.44	311.97
72	**Tuesday 23:00**	567.31	329.61	*Not used*	566.57	801.17	487.83
73	**Wednesday 0:00**	614.58	618.65	*Not used*	874.66	3962.73	702.63

74	**Wednesday 1:00**	567.31	928.33	*Not used*	1706.96	78370.74	1067.53
75	**Wednesday 200**	1053.57	522.22	*Not used*	2240.95	226746.04	1272.25
76	**Wednesday 3:00**	1229.17	1200.81	*Not used*	2601.72	28929.82	1677.23
77	**Wednesday 4:00**	1229.17	1336.86	*Not used*	1035.69	2057.39	1200.57
78	**Wednesday 5:00**	1053.57	1035.81	*Not used*	625.13	739.09	904.84
79	**Wednesday 6:00**	204.86	544.22	*Not used*	300.61	201.18	349.90
80	**Wednesday 7:00**	108.46	165.68	*Not used*	156.00	102.20	143.38
81	**Wednesday 8:00**	223.48	149.08	*Not used*	112.29	97.20	161.62
82	**Wednesday 9:00**	210.71	177.07	*Not used*	113.78	131.43	167.19
83	**Wednesday 10:00**	156.91	152.63	*Not used*	88.93	140.67	132.83
84	**Wednesday 11:00**	184.38	123.04	*Not used*	96.35	113.45	134.59
85	**Wednesday 12:00**	111.74	91.23	*Not used*	91.02	75.42	98.00
86	**Wednesday 13:00**	99.66	106.68	*Not used*	94.08	102.30	100.14
87	**Wednesday 14:00**	106.88	112.02	*Not used*	91.22	94.83	103.38
88	**Wednesday 1500**	68.29	114.54	*Not used*	82.94	81.33	88.59
89	**Wednesday 16:00**	70.91	103.74	*Not used*	86.80	96.59	87.15
90	**Wednesday 17:00**	74.49	93.33	*Not used*	93.40	121.85	87.07
91	**Wednesday 18:00**	105.36	98.72	*Not used*	108.58	103.76	104.22
92	**Wednesday 19:00**	115.23	109.00	*Not used*	123.58	145.08	115.94
93	**Wednesday 20:00**	131.70	144.40	*Not used*	178.54	203.35	151.55
94	**Wednesday 21:00**	141.83	245.74	*Not used*	243.80	415.20	210.46
95	**Wednesday 22:00**	210.71	313.62	*Not used*	332.19	641.10	285.51
96	**Wednesday 23:00**	368.75	364.27	*Not used*	525.68	1639.17	419.57
97	**Thursday 0:00**	819.44	455.85	*Not used*	861.55	3305.42	712.28
98	**Thursday 1:00**	526.79	880.16	*Not used*	1552.15	2335.27	986.36
99	**Thursday 2:00**	921.88	1507.68	*Not used*	1784.65	20627.48	1404.73
100	**Thursday 3:00**	2458.33	2601.11	*Not used*	2123.87	67313.85	2394.44
101	**Thursday 4:00**	2458.33	1952.39	*Not used*	918.53	7915.46	1776.42
102	**Thursday 5:00**	819.44	966.92	*Not used*	636.21	540.66	807.53
103	**Thursday 6:00**	307.29	503.18	*Not used*	295.23	263.91	368.57
104	**Thursday 7:00**	122.92	186.77	*Not used*	150.81	108.71	153.50
105	**Thursday 8:00**	179.88	119.25	*Not used*	112.13	111.36	137.09
106	**Thursday 9:00**	295.00	134.99	*Not used*	120.78	154.59	183.59
107	**Thursday 10:00**	204.86	120.95	*Not used*	100.67	103.51	142.16
108	**Thursday 11:00**	156.91	107.62	*Not used*	90.86	122.34	118.47
109	**Thursday 12:00**	122.92	86.61	*Not used*	91.59	80.80	100.37
110	**Thursday 13:00**	115.23	88.07	*Not used*	93.09	95.69	98.80
111	**Thursday 14:00**	120.90	97.25	*Not used*	88.21	93.89	102.12
112	**Thursday 15:00**	79.30	113.58	*Not used*	78.22	80.81	90.37
113	**Thursday 16:00**	81.04	99.92	*Not used*	91.94	97.86	90.97
114	**Thursday 17:00**	70.91	93.70	*Not used*	98.89	93.10	87.84
115	**Thursday 18:00**	110.07	102.40	*Not used*	119.09	77.99	110.52
116	**Thursday 19:00**	118.95	140.73	*Not used*	133.12	109.46	130.94

117	**Thursday 20:00**	141.83	190.94	*Not used*	190.92	145.61	174.56
118	**Thursday 21:00**	141.83	227.86	*Not used*	228.43	378.84	199.37
119	**Thursday 22:00**	230.47	409.53	*Not used*	343.42	441.49	327.81
120	**Thursday 23:00**	351.19	389.36	*Not used*	538.85	1516.47	426.47
121	**Friday 0:00**	567.31	351.08	*Not used*	781.51	2095.75	566.63
122	**Friday 1:00**	670.45	674.52	*Not used*	1267.88	1185.05	870.95
123	**Friday 2:00**	491.67	1370.62	*Not used*	1736.15	4808.96	1199.48
124	**Friday 3:00**	1475.00	1106.18	*Not used*	1692.22	2672.15	1424.47
125	**Friday 4:00**	1229.17	1218.78	*Not used*	875.93	3956.38	1107.96
126	**Friday 5:00**	409.72	874.49	*Not used*	600.82	1098.28	628.34
127	**Friday 6:00**	230.47	535.98	*Not used*	310.59	295.75	359.01
128	**Friday 7:00**	136.57	188.72	*Not used*	152.91	94.89	159.40
129	**Friday 8:00**	230.47	121.04	*Not used*	109.20	98.03	153.57
130	**Friday 9:00**	223.48	106.83	*Not used*	108.62	111.40	146.31
131	**Friday 10:00**	131.70	96.10	*Not used*	86.99	156.68	104.93
132	**Friday 11:00**	153.65	101.06	*Not used*	91.77	121.35	115.49
133	**Friday 12:00**	125.00	79.66	*Not used*	92.29	84.50	98.98
134	**Friday 13:00**	95.78	88.02	*Not used*	96.29	100.52	93.36
135	**Friday 14:00**	95.78	92.92	*Not used*	90.50	77.10	93.06
136	**Friday 15:00**	68.29	87.59	*Not used*	81.02	85.50	78.96
137	**Friday 16:00**	74.49	84.39	*Not used*	93.64	106.83	84.18
138	**Friday 17:00**	81.04	79.83	*Not used*	93.38	91.53	84.75
139	**Friday 18:00**	84.77	93.80	*Not used*	114.40	105.73	97.65
140	**Friday 19:00**	115.23	104.30	*Not used*	140.08	122.27	119.87
141	**Friday 20:00**	111.74	140.56	*Not used*	186.00	172.84	146.10
142	**Friday 21:00**	163.89	149.30	*Not used*	247.80	187.36	187.00
143	**Friday 22:00**	139.15	158.36	*Not used*	363.48	413.64	220.33
144	**Friday23:00**	223.48	192.65	*Not used*	343.30	1222.16	253.14
145	**Saturday 0:00**	237.90	264.08	*Not used*	504.50	2496.79	335.49
146	**Saturday 1:00**	388.16	430.54	*Not used*	700.11	2009.34	506.27
147	**Saturday 2:00**	141.83	432.37	*Not used*	1200.33	5988.92	591.51
148	**Saturday 3:00**	737.50	664.61	*Not used*	1588.32	92782.05	996.81
149	**Saturday 4:00**	1475.00	736.78	*Not used*	1404.84	2775.63	1205.54
150	**Saturday 5:00**	3687.50	1091.35	*Not used*	773.28	2668.08	1850.71
151	**Saturday 6:00**	737.50	833.31	*Not used*	486.58	576.27	685.80
152	**Saturday 7:00**	388.16	274.31	*Not used*	238.12	239.21	300.20
153	**Saturday 8:00**	335.23	168.77	*Not used*	157.62	133.43	220.54
154	**Saturday 9:00**	223.48	111.28	*Not used*	115.05	119.65	149.94
155	**Saturday 10:00**	153.65	76.35	*Not used*	100.60	100.87	110.20
156	**Saturday 11:00**	136.57	80.64	*Not used*	97.09	89.01	104.77
157	**Saturday 12:00**	125.00	79.97	*Not used*	95.89	108.99	100.29
158	**Saturday 13:00**	131.70	77.06	*Not used*	96.05	112.50	101.60
159	**Saturday 14:00**	134.09	74.77	*Not used*	105.73	112.10	104.86

160	**Saturday 15:00**	125.00	76.26	*Not used*	90.77	110.20	97.34
161	**Saturday 16:00**	120.90	74.18	*Not used*	106.36	94.45	100.48
162	**Saturday 17:00**	108.46	80.33	*Not used*	124.22	114.13	104.34
163	**Saturday 18:00**	120.90	93.90	*Not used*	139.23	135.66	118.01
164	**Saturday 19:00**	134.09	112.72	*Not used*	142.86	142.30	129.89
165	**Saturday 20:00**	99.66	127.91	*Not used*	190.67	212.07	139.41
166	**Saturday 21:00**	106.88	159.11	*Not used*	239.97	232.80	168.65
167	**Saturday 22:00**	147.50	187.38	*Not used*	362.61	560.90	232.50
168	**Saturday 23:00**	153.65	194.82	*Not used*	424.11	843.85	257.53

Table A.2: Pedestrian Week-to-Year Expansion Factors for a Typical Week in Each Month

Month		**Crash Data**	**Downtown Milwaukee (Wisconsin Avenue)**	**Trail Counts (Includes all trail users)**	**Downtown Oakland, CA**	**National Household Travel Survey**	**Final Expansion Factor (Average)**
1	**January**	61.13	146.12	201.35	*Not used*	58.56	116.79
2	**February**	59.43	117.98	106.71	*Not used*	51.89	84.00
3	**March**	64.12	87.48	88.64	*Not used*	48.89	72.28
4	**April**	59.16	61.74	56.06	*Not used*	55.43	58.10
5	**May**	50.96	63.01	42.18	*Not used*	55.90	53.01
6	**June**	54.96	54.26	30.23	*Not used*	46.24	46.42
7	**July**	49.27	40.39	26.21	*Not used*	53.46	42.33
8	**August**	54.70	32.26	34.69	*Not used*	49.76	42.86
9	**September**	46.98	14.75	39.21	*Not used*	44.78	36.43
10	**October**	42.67	55.93	54.43	*Not used*	51.75	51.20
11	**November**	43.08	150.90	86.22	*Not used*	50.99	82.80
12	**December**	50.03	207.20	146.02	*Not used*	62.99	116.56

Appendix B. Bicyclist Count Expansion Factors

The final bicyclist count expansion factors are shown in the right-hand columns of Table B.1 and Table B.2. The final bicyclist count expansion factors are based on average values from the data sources in each column of the tables.

Table B.1: Bicyclist Hour-to-Week Count Expansion Factors

	Time of Day	Crash Data	Trail Counts	National Household Travel Survey	Final Expansion Factor (Average)
1	**Sunday 0:00**	1395.33	*Not used*	*No Data*	1395.33
2	**Sunday 1:00**	1395.33	*Not used*	*No Data*	1395.33
3	**Sunday 2:00**	1046.50	*Not used*	2036.06	1541.28
4	**Sunday 3:00**	2093.00	*Not used*	*No Data*	2093.00
5	**Sunday 4:00**	4186.00	*Not used*	*No Data*	4186.00
6	**Sunday 5:00**	*No Data*	*Not used*	619.00	619.00
7	**Sunday 6:00**	837.20	*Not used*	722.67	779.93
8	**Sunday 7:00**	4186.00	*Not used*	237.01	2211.50
9	**Sunday 8:00**	697.67	*Not used*	171.52	434.59
10	**Sunday 9:00**	465.11	*Not used*	137.53	301.32
11	**Sunday 10:00**	161.00	*Not used*	117.91	139.45
12	**Sunday 11:00**	190.27	*Not used*	89.28	139.78
13	**Sunday 12:00**	104.65	*Not used*	116.36	110.50
14	**Sunday 13:00**	139.53	*Not used*	101.58	120.56
15	**Sunday 14:00**	104.65	*Not used*	116.00	110.33
16	**Sunday 15:00**	113.14	*Not used*	93.53	103.33
17	**Sunday 16:00**	102.10	*Not used*	136.24	119.17
18	**Sunday 17:00**	167.44	*Not used*	114.24	140.84
19	**Sunday 18:00**	149.50	*Not used*	214.83	182.17
20	**Sunday 19:00**	246.24	*Not used*	120.01	183.12
21	**Sunday 20:00**	199.33	*Not used*	323.29	261.31
22	**Sunday 21:00**	380.55	*Not used*	272.21	326.38
23	**Sunday 22:00**	322.00	*Not used*	15605.15	7963.57
24	**Sunday 23:00**	4186.00	*Not used*	584.76	2385.38
25	**Monday 0:00**	4186.00	*Not used*	18269.05	11227.53
26	**Monday 1:00**	1395.33	*Not used*	*No Data*	1395.33
27	**Monday 2:00**	*No Data*	*Not used*	*No Data*	*No Data*
28	**Monday 3:00**	*No Data*	*Not used*	*No Data*	*No Data*
29	**Monday 4:00**	*No Data*	*Not used*	5988.44	5988.44
30	**Monday 5:00**	*No Data*	*Not used*	357.61	357.61

31	**Monday 6:00**	697.67	*Not used*	307.34	502.50
32	**Monday 7:00**	80.50	*Not used*	153.29	116.90
33	**Monday 8:00**	123.12	*Not used*	101.08	112.10
34	**Monday 9:00**	149.50	*Not used*	105.63	127.56
35	**Monday 10:00**	174.42	*Not used*	190.70	182.56
36	**Monday 11:00**	139.53	*Not used*	190.23	164.88
37	**Monday 12:00**	102.10	*Not used*	181.79	141.94
38	**Monday 13:00**	149.50	*Not used*	105.92	127.71
39	**Monday 14:00**	83.72	*Not used*	115.58	99.65
40	**Monday 15:00**	64.40	*Not used*	129.91	97.16
41	**Monday 16:00**	59.80	*Not used*	84.78	72.29
42	**Monday 17:00**	58.96	*Not used*	71.83	65.39
43	**Monday 18:00**	119.60	*Not used*	84.39	102.00
44	**Monday 19:00**	116.28	*Not used*	89.87	103.08
45	**Monday 20:00**	182.00	*Not used*	119.44	150.72
46	**Monday 21:00**	279.07	*Not used*	325.27	302.17
47	**Monday 22:00**	348.83	*Not used*	518.40	433.62
48	**Monday 23:00**	465.11	*Not used*	28007.68	14236.39
49	**Tuesday 0:00**	1046.50	*Not used*	4630.18	2838.34
50	**Tuesday 1:00**	1046.50	*Not used*	13237.09	7141.79
51	**Tuesday 2:00**	4186.00	*Not used*	24867.85	14526.93
52	**Tuesday 3:00**	4186.00	*Not used*	*No Data*	4186.00
53	**Tuesday 4:00**	*No Data*	*Not used*	6591.35	6591.35
54	**Tuesday 5:00**	465.11	*Not used*	337.79	401.45
55	**Tuesday 6:00**	279.07	*Not used*	213.00	246.03
56	**Tuesday 7:00**	74.75	*Not used*	99.64	87.20
57	**Tuesday 8:00**	135.03	*Not used*	82.03	108.53
58	**Tuesday 9:00**	232.56	*Not used*	120.22	176.39
59	**Tuesday 10:00**	220.32	*Not used*	143.31	181.81
60	**Tuesday 11:00**	155.04	*Not used*	132.80	143.92
61	**Tuesday 12:00**	102.10	*Not used*	204.81	153.46
62	**Tuesday 13:00**	123.12	*Not used*	147.02	135.07
63	**Tuesday 14:00**	89.06	*Not used*	104.96	97.01
64	**Tuesday 15:00**	45.01	*Not used*	84.99	65.00
65	**Tuesday 16:00**	48.11	*Not used*	113.72	80.92
66	**Tuesday 17:00**	64.40	*Not used*	96.99	80.70
67	**Tuesday 18:00**	69.77	*Not used*	103.13	86.45
68	**Tuesday 19:00**	119.60	*Not used*	102.23	110.92
69	**Tuesday 20:00**	167.44	*Not used*	197.08	182.26
70	**Tuesday 2100**	199.33	*Not used*	392.25	295.79
71	**Tuesday 22:00**	348.83	*Not used*	1630.76	989.80
72	**Tuesday 23:00**	465.11	*Not used*	3094.15	1779.63
73	**Wednesday 0:00**	4186.00	*Not used*	1658.27	2922.14

74	**Wednesday 1:00**	2093.00	*Not used*	863.03	1478.02
75	**Wednesday 200**	4186.00	*Not used*	*No Data*	4186.00
76	**Wednesday 3:00**	*No Data*	*Not used*	*No Data*	*No Data*
77	**Wednesday 4:00**	4186.00	*Not used*	8667.44	6426.72
78	**Wednesday 5:00**	837.20	*Not used*	1387.58	1112.39
79	**Wednesday 6:00**	209.30	*Not used*	311.36	260.33
80	**Wednesday 7:00**	80.50	*Not used*	118.26	99.38
81	**Wednesday 8:00**	144.34	*Not used*	55.70	100.02
82	**Wednesday 9:00**	246.24	*Not used*	134.68	190.46
83	**Wednesday 10:00**	130.81	*Not used*	131.14	130.98
84	**Wednesday 11:00**	232.56	*Not used*	72.53	152.54
85	**Wednesday 12:00**	139.53	*Not used*	105.63	122.58
86	**Wednesday 13:00**	113.14	*Not used*	112.55	112.84
87	**Wednesday 14:00**	95.14	*Not used*	81.03	88.08
88	**Wednesday 1500**	64.40	*Not used*	133.09	98.75
89	**Wednesday 16:00**	46.51	*Not used*	56.61	51.56
90	**Wednesday 17:00**	49.25	*Not used*	55.58	52.41
91	**Wednesday 18:00**	123.12	*Not used*	72.71	97.91
92	**Wednesday 19:00**	123.12	*Not used*	108.84	115.98
93	**Wednesday 20:00**	139.53	*Not used*	304.07	221.80
94	**Wednesday 21:00**	465.11	*Not used*	212.18	338.64
95	**Wednesday 22:00**	261.63	*Not used*	2671.95	1466.79
96	**Wednesday 23:00**	1046.50	*Not used*	10750.05	5898.28
97	**Thursday 0:00**	2093.00	*Not used*	4596.92	3344.96
98	**Thursday 1:00**	697.67	*Not used*	*No Data*	697.67
99	**Thursday 2:00**	4186.00	*Not used*	97961.82	51073.91
100	**Thursday 3:00**	4186.00	*Not used*	*No Data*	4186.00
101	**Thursday 4:00**	*No Data*	*Not used*	2300.42	2300.42
102	**Thursday 5:00**	598.00	*Not used*	728.68	663.34
103	**Thursday 6:00**	279.07	*Not used*	204.88	241.97
104	**Thursday 7:00**	82.08	*Not used*	115.22	98.65
105	**Thursday 8:00**	174.42	*Not used*	71.67	123.05
106	**Thursday 9:00**	232.56	*Not used*	90.55	161.55
107	**Thursday 10:00**	155.04	*Not used*	177.29	166.16
108	**Thursday 11:00**	110.16	*Not used*	196.68	153.42
109	**Thursday 12:00**	102.10	*Not used*	252.17	177.13
110	**Thursday 13:00**	155.04	*Not used*	152.23	153.64
111	**Thursday 14:00**	85.43	*Not used*	96.28	90.85
112	**Thursday 15:00**	58.14	*Not used*	64.90	61.52
113	**Thursday 16:00**	61.56	*Not used*	66.84	64.20
114	**Thursday 17:00**	57.34	*Not used*	85.46	71.40
115	**Thursday 18:00**	70.95	*Not used*	79.90	75.43
116	**Thursday 19:00**	190.27	*Not used*	82.66	136.47

117	**Thursday 20:00**	199.33	*Not used*	154.07	176.70
118	**Thursday 21:00**	220.32	*Not used*	400.41	310.36
119	**Thursday 22:00**	523.25	*Not used*	670.16	596.70
120	**Thursday 23:00**	1395.33	*Not used*	808.10	1101.72
121	**Friday 0:00**	837.20	*Not used*	4275.19	2556.19
122	**Friday 1:00**	2093.00	*Not used*	*No Data*	2093.00
123	**Friday 2:00**	1046.50	*Not used*	48404.98	24725.74
124	**Friday 3:00**	*No Data*	*Not used*	*No Data*	*No Data*
125	**Friday 4:00**	1046.50	*Not used*	941.84	994.17
126	**Friday 5:00**	697.67	*Not used*	2161.12	1429.39
127	**Friday 6:00**	199.33	*Not used*	280.26	239.80
128	**Friday 7:00**	107.33	*Not used*	93.98	100.66
129	**Friday 8:00**	119.60	*Not used*	103.28	111.44
130	**Friday 9:00**	182.00	*Not used*	85.43	133.72
131	**Friday 10:00**	135.03	*Not used*	137.87	136.45
132	**Friday 11:00**	135.03	*Not used*	166.67	150.85
133	**Friday 12:00**	139.53	*Not used*	176.91	158.22
134	**Friday 13:00**	97.35	*Not used*	123.82	110.58
135	**Friday 14:00**	82.08	*Not used*	71.35	76.72
136	**Friday 15:00**	68.62	*Not used*	85.59	77.11
137	**Friday 16:00**	78.98	*Not used*	93.72	86.35
138	**Friday 17:00**	72.17	*Not used*	55.60	63.89
139	**Friday 18:00**	74.75	*Not used*	107.94	91.34
140	**Friday 19:00**	149.50	*Not used*	153.09	151.29
141	**Friday 20:00**	155.04	*Not used*	197.84	176.44
142	**Friday 21:00**	182.00	*Not used*	271.60	226.80
143	**Friday 22:00**	322.00	*Not used*	2282.97	1302.49
144	**Friday23:00**	697.67	*Not used*	1594.15	1145.91
145	**Saturday 0:00**	1046.50	*Not used*	2522.21	1784.36
146	**Saturday 1:00**	523.25	*Not used*	*No Data*	523.25
147	**Saturday 2:00**	1046.50	*Not used*	4112.87	2579.68
148	**Saturday 3:00**	1395.33	*Not used*	1517.83	1456.58
149	**Saturday 4:00**	*No Data*	*Not used*	181544.05	181544.05
150	**Saturday 5:00**	4186.00	*Not used*	2614.64	3400.32
151	**Saturday 6:00**	837.20	*Not used*	424.08	630.64
152	**Saturday 7:00**	523.25	*Not used*	199.23	361.24
153	**Saturday 8:00**	232.56	*Not used*	121.73	177.14
154	**Saturday 9:00**	174.42	*Not used*	97.07	135.74
155	**Saturday 10:00**	130.81	*Not used*	55.78	93.30
156	**Saturday 11:00**	123.12	*Not used*	104.99	114.05
157	**Saturday 12:00**	99.67	*Not used*	106.53	103.10
158	**Saturday 13:00**	161.00	*Not used*	96.84	128.92
159	**Saturday 14:00**	113.14	*Not used*	66.57	89.85

160	**Saturday 15:00**	107.33	*Not used*	70.18	88.76
161	**Saturday 16:00**	87.21	*Not used*	80.19	83.70
162	**Saturday 17:00**	89.06	*Not used*	63.99	76.53
163	**Saturday 18:00**	123.12	*Not used*	82.29	102.70
164	**Saturday 19:00**	174.42	*Not used*	232.49	203.46
165	**Saturday 20:00**	299.00	*Not used*	594.31	446.65
166	**Saturday 21:00**	199.33	*Not used*	819.04	509.19
167	**Saturday 22:00**	322.00	*Not used*	839.52	580.76
168	**Saturday 23:00**	465.11	*Not used*	1198.86	831.99

Table B.2: Bicyclist Week-to-Year Expansion Factors for a Typical Week in Each Month

	Month	**Crash Data**	**Trail Counts (Includes all trail users)**	**National Household Travel Survey**	**Average**
1	**January**	403.96	201.35	70.93	225.42
2	**February**	246.82	106.71	63.43	138.99
3	**March**	137.65	88.64	71.84	99.37
4	**April**	89.02	56.06	51.42	65.50
5	**May**	43.93	42.18	48.83	44.98
6	**June**	29.43	30.23	43.39	34.35
7	**July**	26.81	26.21	43.59	32.21
8	**August**	27.53	34.69	45.26	35.83
9	**September**	28.14	39.21	37.37	34.91
10	**October**	45.88	54.43	34.15	44.82
11	**November**	85.63	86.22	70.37	80.74
12	**December**	208.79	146.02	125.10	159.97

Appendix C. Trail User Count Expansion Factors

The final trail user week-to-year count expansion factors are shown in the right-hand column of Table C.1. The long-term multi-use trail counts used to develop the week-to-year expansion factors were taken from the following six automated counter locations in Milwaukee County: Kinnickinnic River Trail at Maple (July 2015 to June 2016), Kinnickinnic River Trail at Rosedale (January 2017 to December 2017), Marsupial Bridge under Holton Viaduct (January 2017 to December 2017), Oak Leaf Trail at Brady Street Bridge (January 2016 to December 2017), Oak Leaf Trail at South Shore Park (January 2016 to December 2017), and Oak Leaf Trail at Hartung Park (January 2016 to December 2017).

Table C.1: Trail User Week-to-Year Expansion Factors for a Typical Week in Each Month

Month		Proportion	Month to Year Expansion Factor	Week to Month Expansion Factor	Week to Year Expansion Factor
January	1	0.0220	45.4665	4.4286	201.3518
February	2	0.0375	26.6781	4.0000	106.7123
March	3	0.0500	20.0153	4.4286	88.6392
April	4	0.0765	13.0803	4.2857	56.0583
May	5	0.1050	9.5252	4.4286	42.1830
June	6	0.1418	7.0537	4.2857	30.2301
July	7	0.1690	5.9177	4.4286	26.2070
August	8	0.1277	7.8333	4.4286	34.6903
September	9	0.1093	9.1479	4.2857	39.2051
October	10	0.0814	12.2908	4.4286	54.4308
November	11	0.0497	20.1189	4.2857	86.2239
December	12	0.0303	32.9716	4.4286	146.0173

Appendix D: Geocoded Pedestrian Crashes

Table D.1: Geocoded Pedestrian Crashes by WisDOT Region

Region	Time Period	Total Crashes	With Coordinates	Without	% geocoded
NC	2000-2004	1206	392	814	33%
NC	2005-2009	1012	719	293	71%
NC	2010-2014	910	677	233	74%
NC	2015-2019	741	677	64	91%
NC	**Total**	**3869**	**2465**	**1404**	**64%**
NE	2000-2004	2624	661	1963	25%
NE	2005-2009	2484	1905	579	77%
NE	2010-2014	2292	1779	513	78%
NE	2015-2019	2019	1833	186	91%
NE	**Total**	**9419**	**6178**	**3241**	**66%**
NW	2000-2004	1032	306	726	30%
NW	2005-2009	933	669	264	72%
NW	2010-2014	837	602	235	72%
NW	2015-2019	711	641	70	90%
NW	**Total**	**3513**	**2218**	**1295**	**63%**
SE	2000-2004	7765	1620	6145	21%
SE	2005-2009	6871	5463	1408	80%
SE	2010-2014	6332	5126	1206	81%
SE	2015-2019	5948	5454	494	92%
SE	**Total**	**26916**	**17663**	**9253**	**66%**
SW	2000-2004	3516	804	2712	23%
SW	2005-2009	3265	2439	826	75%
SW	2010-2014	3146	2490	656	79%
SW	2015-2019	2893	2671	222	92%
SW	**Total**	**12820**	**8404**	**4416**	**66%**

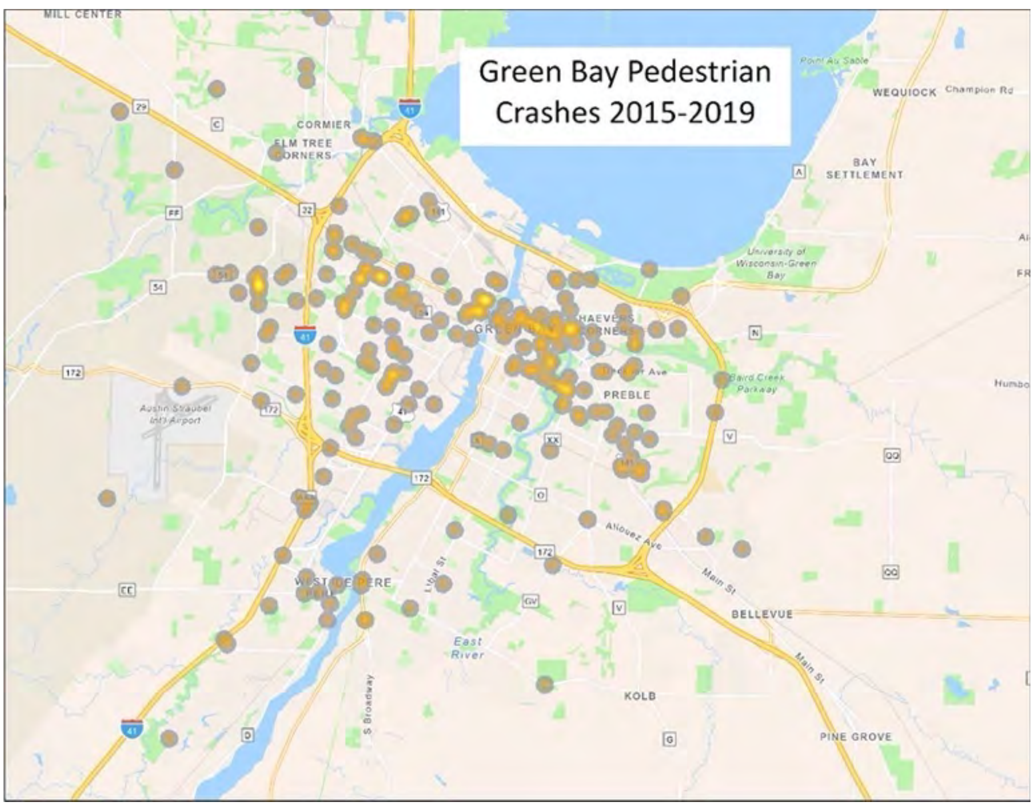
Table D.2: Geocoded Crashes by Time Period

Time Period	% Geocoded	Total Crashes
2000-2004	23%	16,143
2005-2009	77%	14,565
2010-2014	79%	13,517
2015-2019	92%	12,312

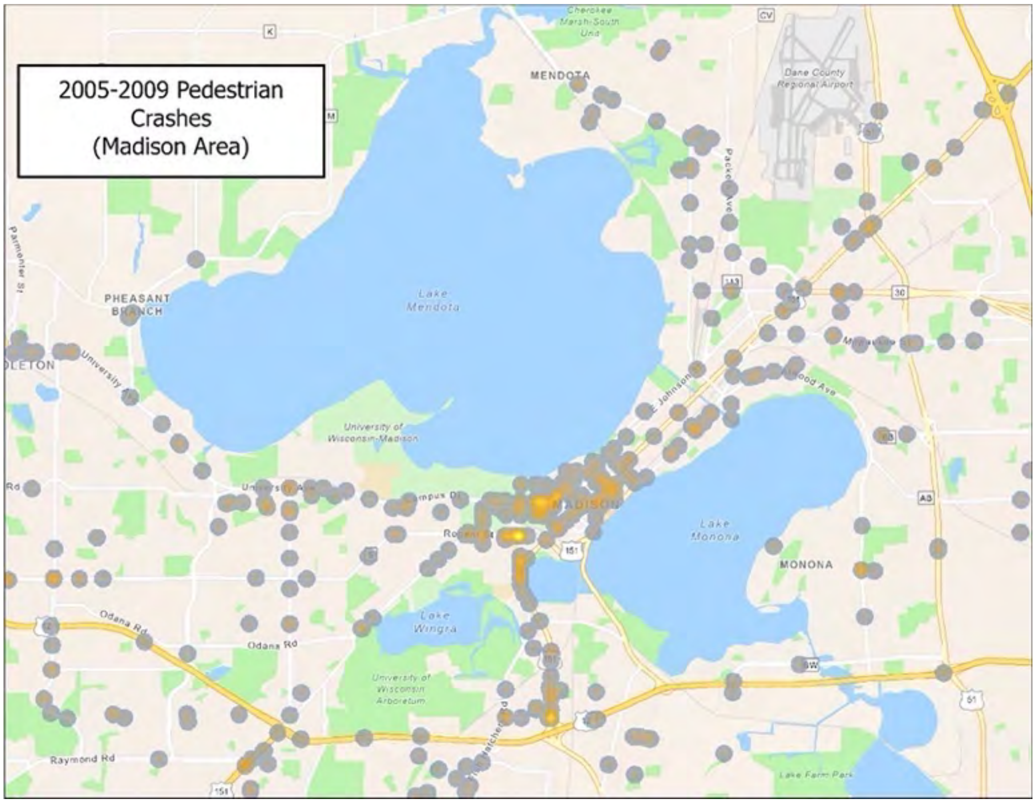
Appendix E: Heat Maps of Crashes

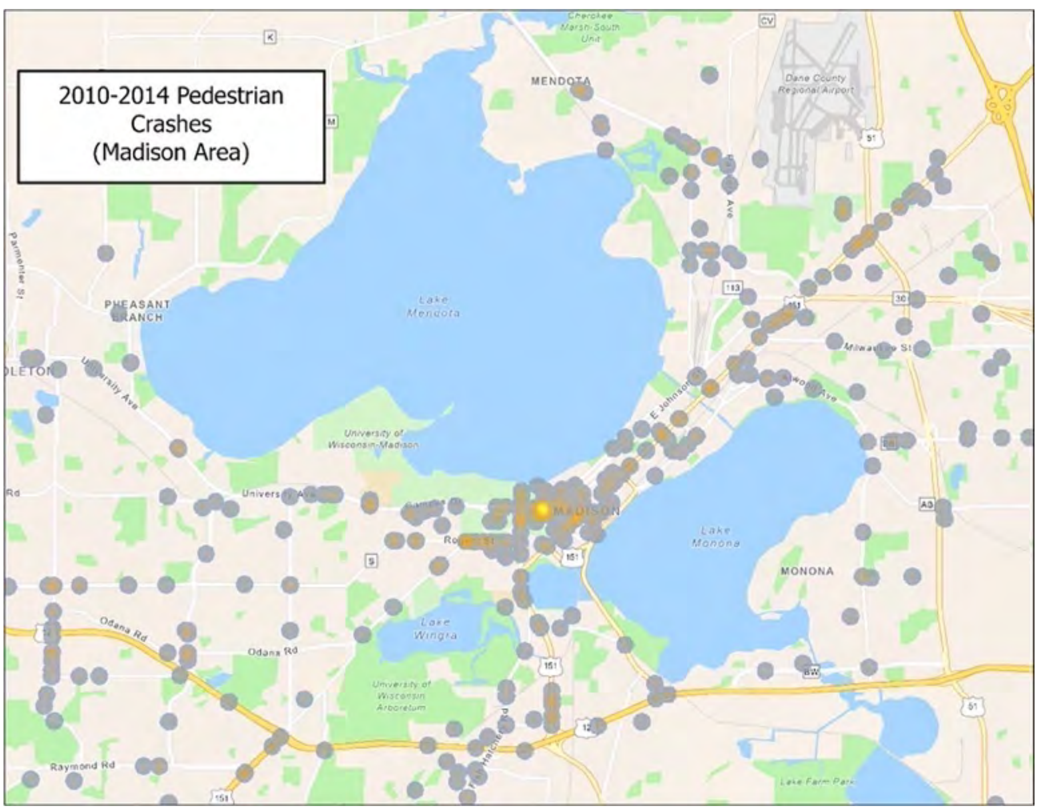
Green Bay

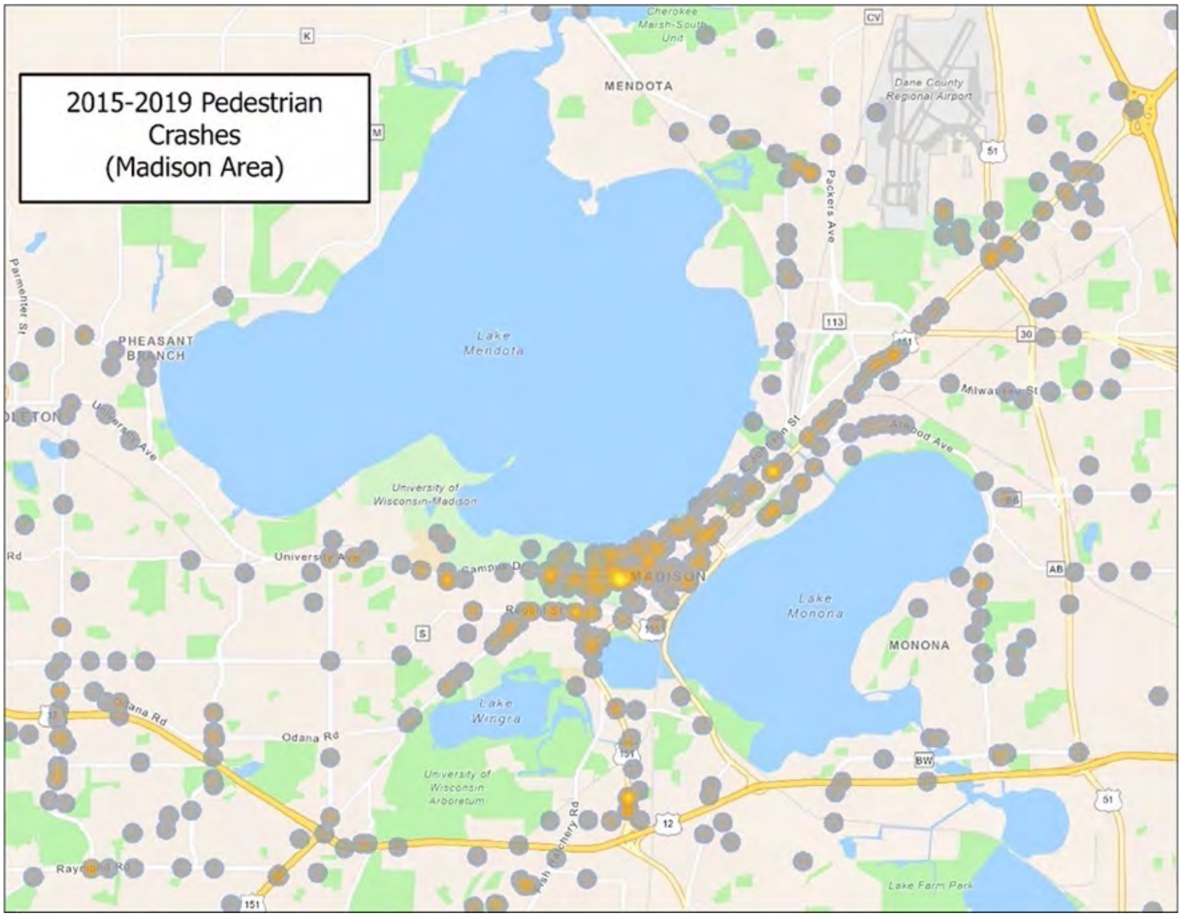

Green Bay Pedestrian
Crashes 2010-2014
MILL CENTER
CORMIER
ELM TREE CORNERS
WEQUIOCK
BAY SETTLEMENT
University of Wisconsin-Green Bay
HAEVERS CORNERS
PREBLE
Baird Creek Parkway
Austin Straubel Int'l Airport
Allouez Ave
Main St
BELLEVUE
East River
KOLB
PINE GROVE
Broadway


Green Bay Pedestrian
Crashes 2015-2019
MILL CENTER
CORMIER
ELM TREE CORNERS
WEQUIOCK
BAY SETTLEMENT
University of Wisconsin-Green Bay
HAEVERS CORNERS
PREBLE
Baird Creek Parkway
Austin Straubel Int'l Airport
Allouez Ave
Main St
BELLEVUE
East River
KOLB
PINE GROVE
S Broadway

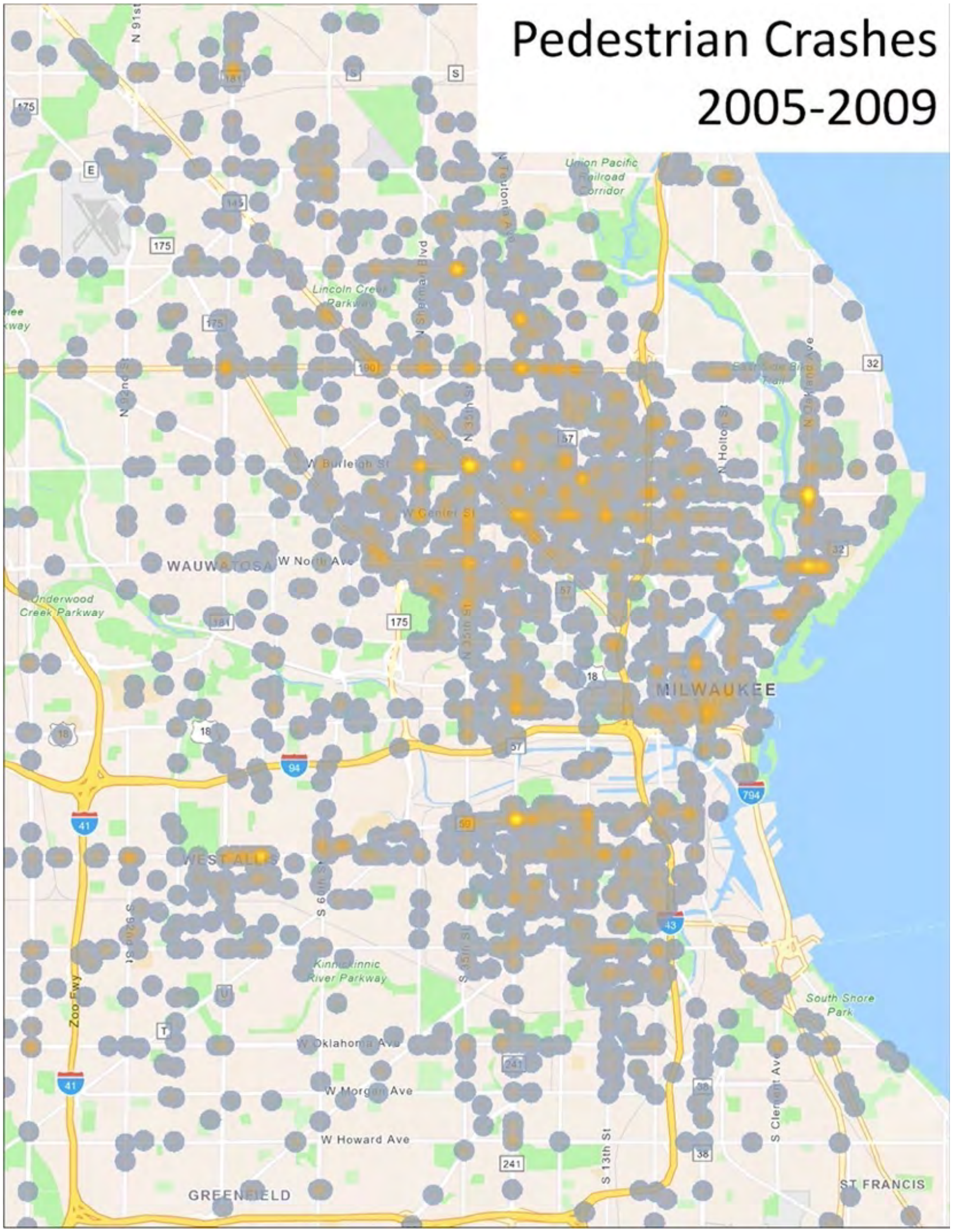
Madison


2005-2009 Pedestrian Crashes (Madison Area)
MENDOTA
Dane County Regional Airport
Lake Mendota
PHEASANT BRANCH
University of Wisconsin-Madison
MADISON
Lake Monona
MONONA
Lake Wingra
University of Wisconsin Arboretum
Odana Rd
Raymond Rd
Lake Farm Park

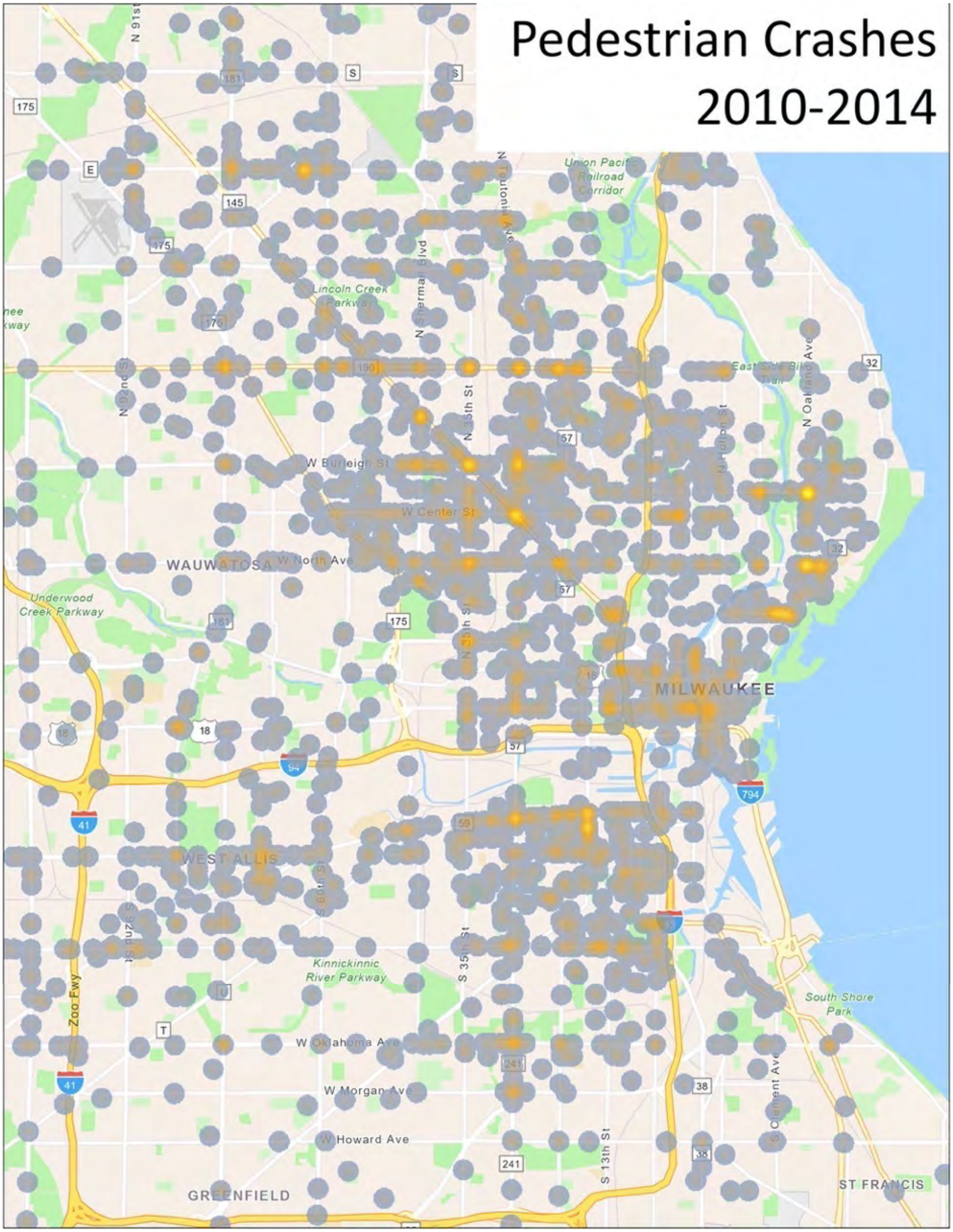

2010-2014 Pedestrian Crashes (Madison Area)
MENDOTA
Dane County Regional Airport
Lake Mendota
PHEASANT BRANCH
University of Wisconsin-Madison
MADISON
Lake Monona
MONONA
Lake Wingra
University of Wisconsin Arboretum
Odana Rd
Raymond Rd
Lake Farm Park

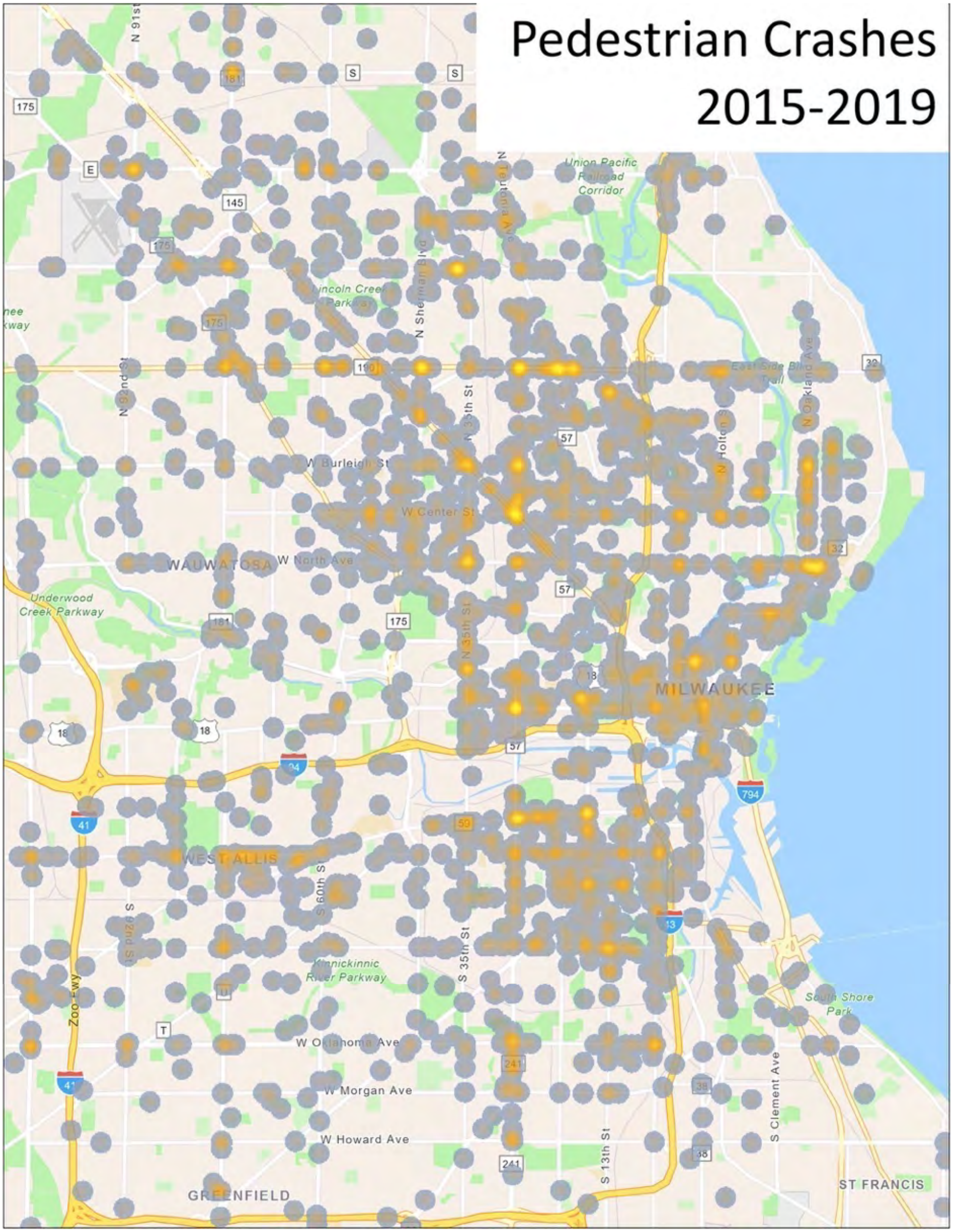

2015-2019 Pedestrian
Crashes
(Madison Area)
Cherokee
Marsh-South
Unit
MENDOTA
Dane County
Regional Airport
Packers Ave
Lake
Mendota
PHEASANT
BRANCH
Parmenter St
University of
Wisconsin-Madison
MADISON
Lake
Monona
MONONA
Lake
Wingra
Odana Rd
University of
Wisconsin
Arboretum
Lake Farm Park

Milwaukee


Pedestrian Crashes
2005-2009
Union Pacific Railroad Corridor
Lincoln Creek Parkway
N Sherman Blvd
N 35th St
W Burleigh St
W Center St
WAUWATOSA
W North Ave
Underwood Creek Parkway
N Holton St
N Oakland Ave
MILWAUKEE
WEST ALLIS
S 60th St
S 92nd St
Zoo Fwy
Kinnickinnic River Parkway
W Oklahoma Ave
W Morgan Ave
W Howard Ave
S 13th St
S Clement Ave
South Shore Park
ST FRANCIS
GREENFIELD

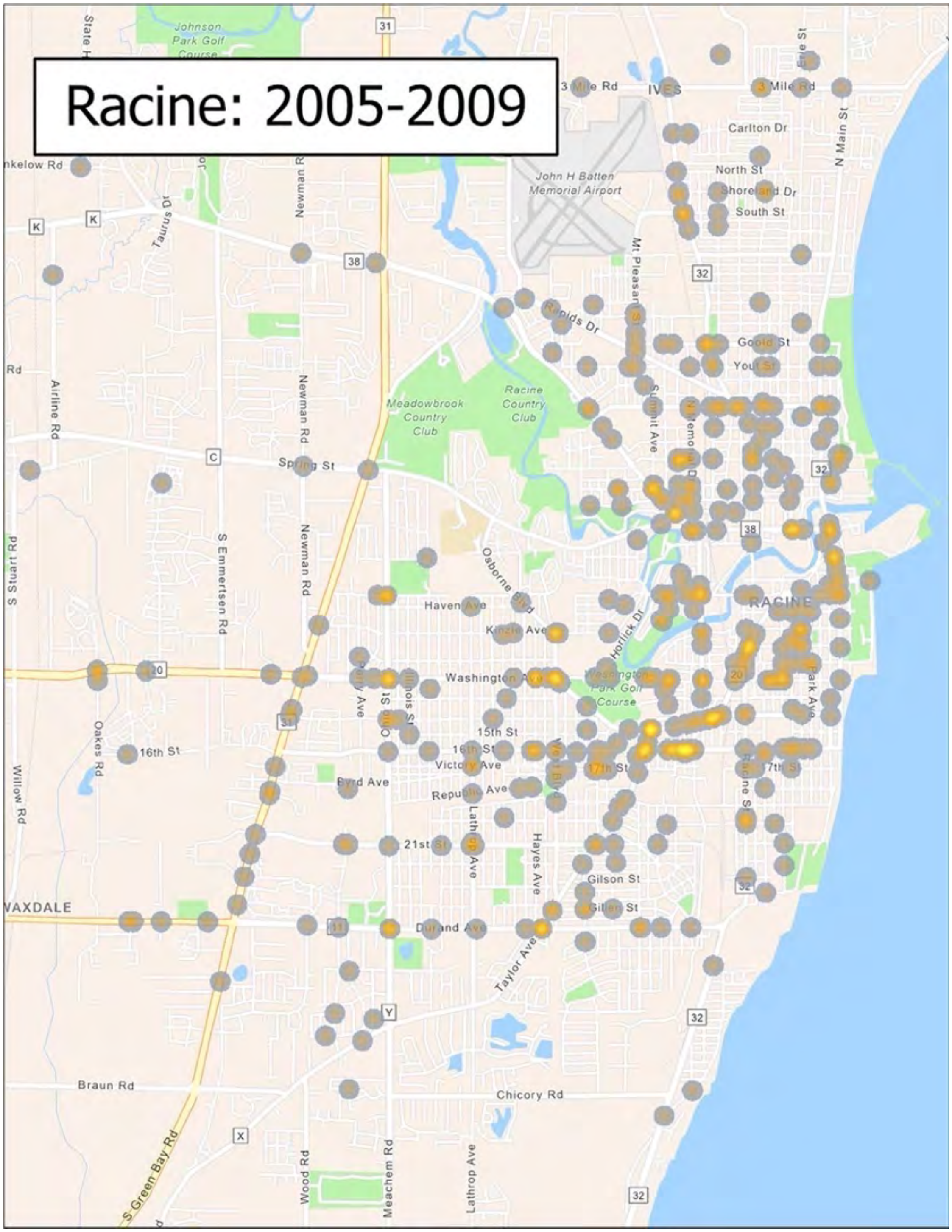
Pedestrian Crashes 2010-2014

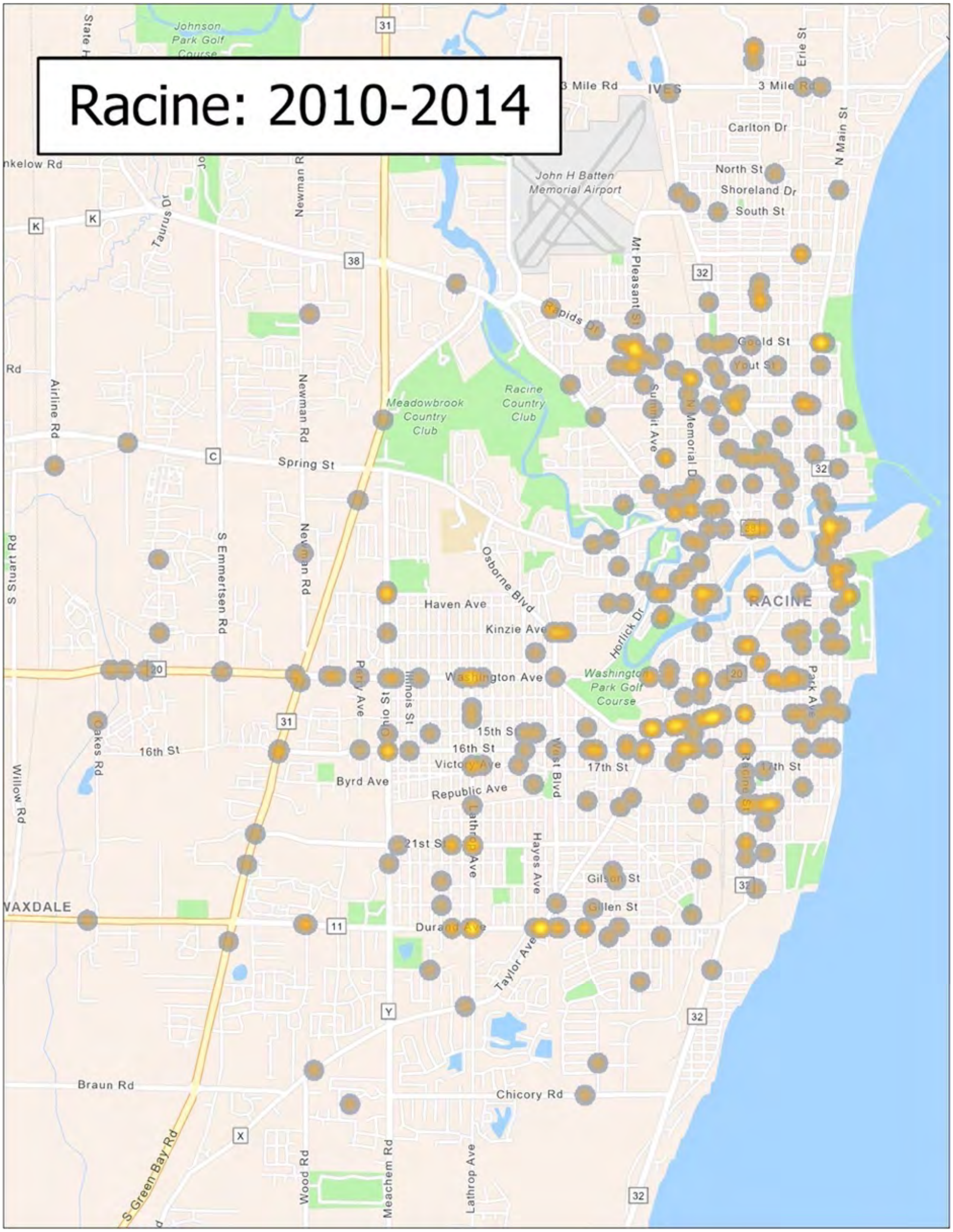


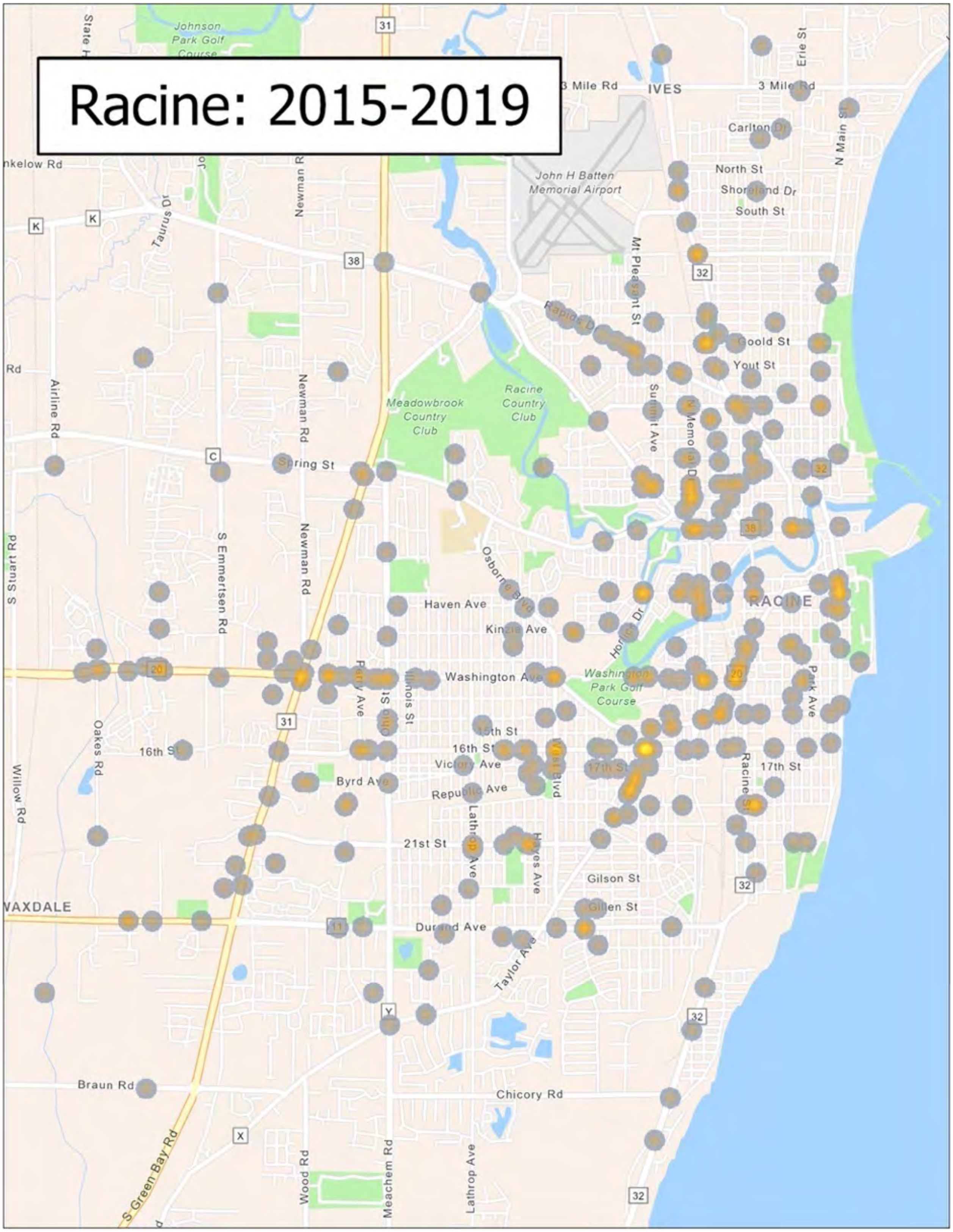


Pedestrian Crashes
2015-2019
WAUWATOSA
W North Ave
W Burleigh St
W Center St
MILWAUKEE
WEST ALLIS
W Oklahoma Ave
W Morgan Ave
W Howard Ave
GREENFIELD
ST FRANCIS
Underwood Creek Parkway
Kinnickinnic River Parkway
Union Pacific Railroad Corridor
South Shore Park
Zoo Fwy
N 35th St
S 35th St
S 60th St
S 13th St
S Clement Ave
N Holton St
N Oakland Ave
N Sherman Blvd
N 92nd St
S 92nd St

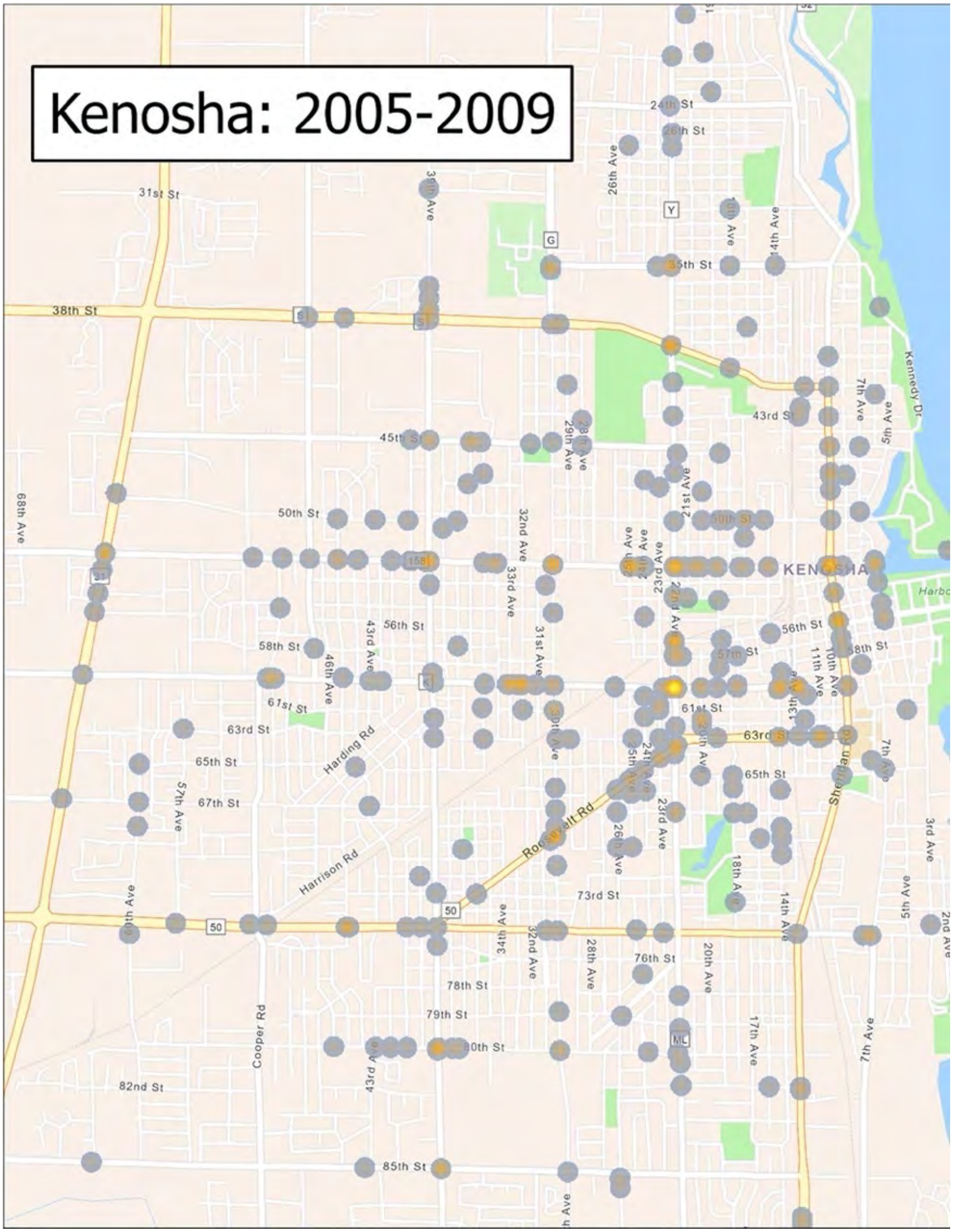
Racine (Pedestrian and Bicycle Crashes)

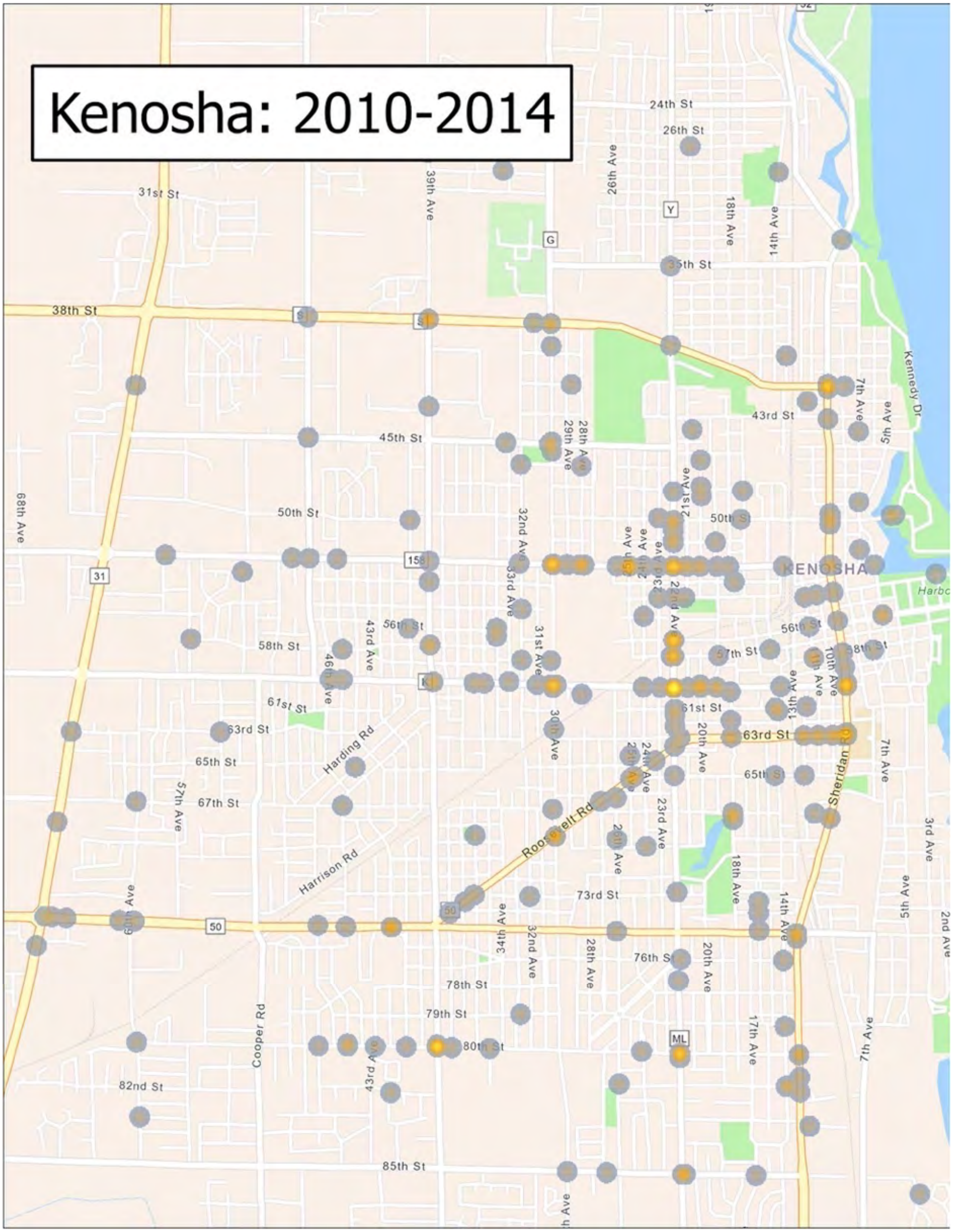


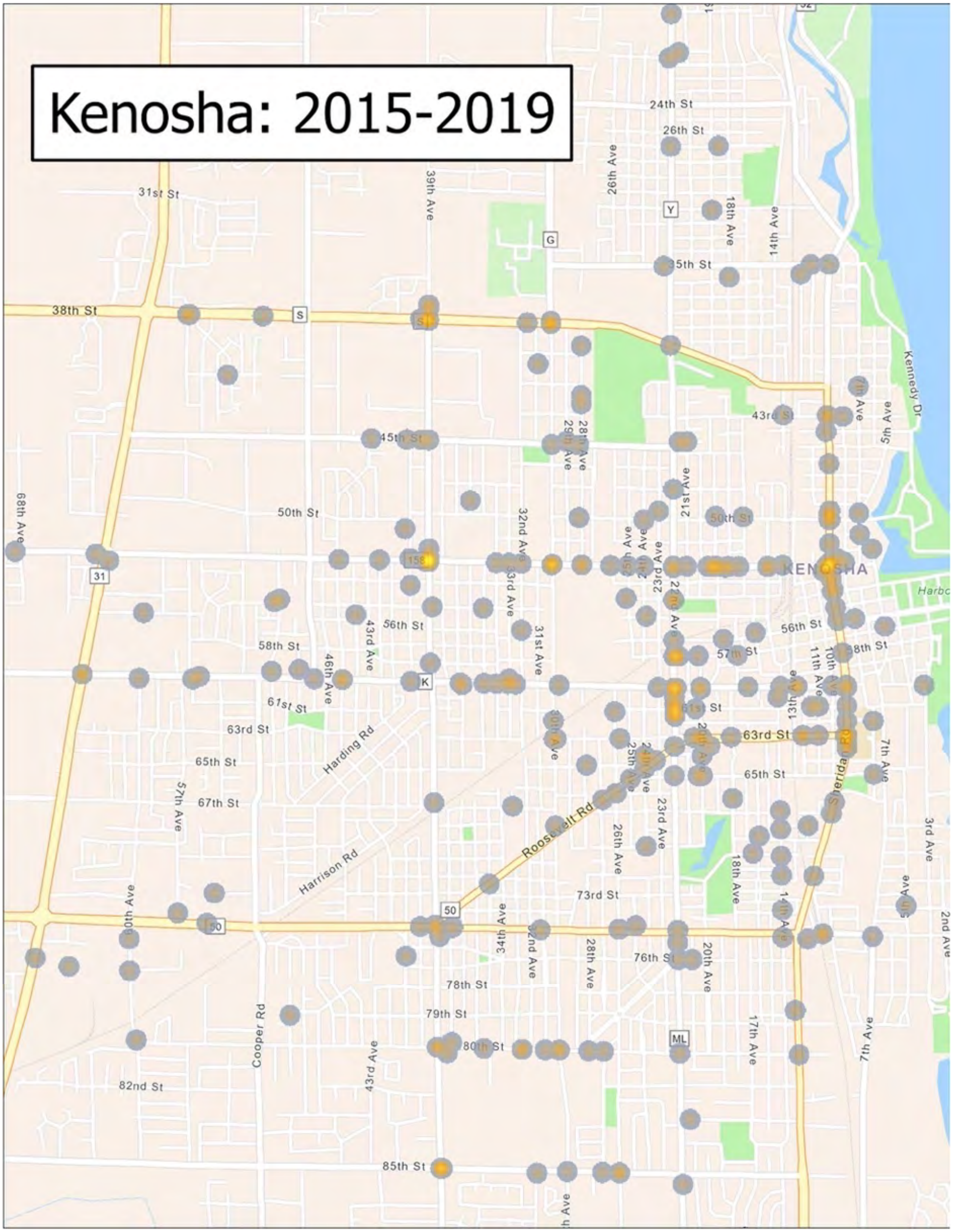

Racine: 2010-2014
RACINE
John H Batten Memorial Airport
Meadowbrook Country Club
Racine Country Club
Washington Park Golf Course
Johnson Park Golf Course
WAXDALE
IVES
Spring St
Washington Ave
Durand Ave
16th St
17th St
21st St
Braun Rd
Chicory Rd
3 Mile Rd
Carlton Dr
North St
Shoreland Dr
South St
Goold St
Yout St
Rapids Dr
Haven Ave
Kinzie Ave
15th St
Victory Ave
Byrd Ave
Republic Ave
Gilson St
Gillen St
Taylor Ave
Osborne Blvd
Horlick Dr
Mt Pleasant St
Summit Ave
N Memorial Dr
N Main St
Erie St
Park Ave
Racine St
West Blvd
Hayes Ave
Lathrop Ave
Meachem Rd
Wood Rd
Ohio St
Illinois St
Newman Rd
S Emmertsen Rd
Airline Rd
S Stuart Rd
Willow Rd
Oakes Rd
Taurus Dr
S Green Bay Rd


Racine: 2015-2019
Johnson Park Golf Course
3 Mile Rd
IVES
John H Batten Memorial Airport
Carlton Dr
North St
Shoreland Dr
South St
Erie St
N Main St
Newman Rd
Taurus Dr
Mt Pleasant St
Rapids Dr
Goold St
Yout St
Meadowbrook Country Club
Racine Country Club
Summit Ave
N Memorial Dr
Airline Rd
Spring St
S Stuart Rd
S Emmertsen Rd
Osborne Blvd
Haven Ave
Kinzie Ave
Horlick Dr
RACINE
Washington Ave
Washington Park Golf Course
Park Ave
Illinois St
Ohio St
Perry Ave
Oakes Rd
16th St
Willow Rd
Victory Ave
Byrd Ave
Republic Ave
West Blvd
17th St
Racine St
21st St
Lathrop Ave
Hayes Ave
Gilson St
Gillen St
WAXDALE
Durand Ave
Taylor Ave
Braun Rd
Chicory Rd
S Green Bay Rd
Wood Rd
Meachem Rd

Kenosha (Pedestrian and Bicycle Crashes)



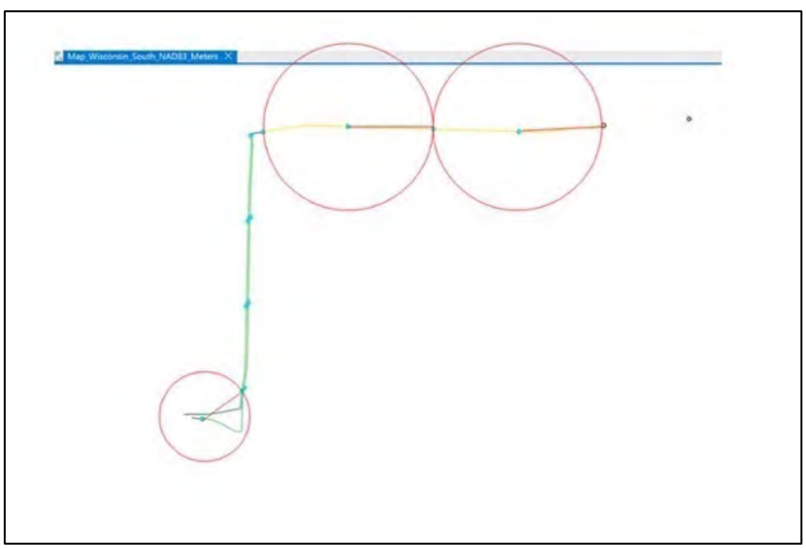

Kenosha: 2010-2014
24th St
26th St
31st St
35th St
38th St
43rd St
45th St
50th St
58th St
61st St
63rd St
65th St
67th St
73rd St
76th St
78th St
79th St
80th St
82nd St
85th St
KENOSHA
Roosevelt Rd
Harding Rd
Harrison Rd
Cooper Rd
Sheridan Rd
Kennedy Dr
68th Ave
57th Ave
39th Ave
43rd Ave
32nd Ave
33rd Ave
31st Ave
30th Ave
28th Ave
29th Ave
26th Ave
22nd Ave
21st Ave
20th Ave
18th Ave
17th Ave
14th Ave
10th Ave
7th Ave
5th Ave
3rd Ave
2nd Ave


Kenosha: 2015-2019

Appendix F. Application: Analysis of State Highway System Pedestrian and Bicyclist Crash Rates

Appendix F.1. Map of Dissolved Interstate Highways, US Highways, and State Trunk Highways

Appendix F.2. An Example of ArcGIS Pro Failed to Create ½ Mile Segments



When using the common method to generate polylines of a certain length in ArcGIS Pro (Generate Points along Lines with a specific distance and Split Line at Point to split polylines), the tools do not work well for networks. For single-strand and straight polylines, the tools were able to search the nearest point on the polyline to split them into shorter segments of the set distance (the two examples above in the top middle section). For polylines that had curves or had other polylines near them, the Split

Line at Point tool searched for the nearest point possible instead of the nearest point on the polyline to split polylines (the example above in the lower left section).

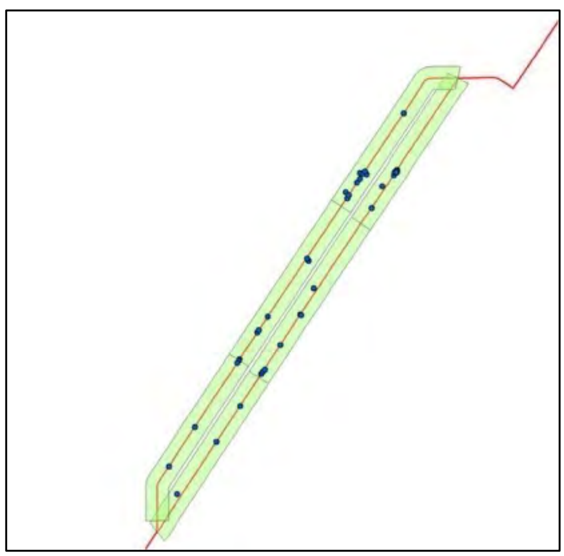
Appendix F.3. Scenarios of Highway Segments that are Shorter than ½ Mile

(a) One scenario of generating highway segments that are shorter than ½ mile is when highways divide and remerge. In this case, QGIS would consider one of the divided polylines as the continuous part of the highway while the one as an independent polyline. This is an example of when US Highway 41 divides into two, the upper polyline was considered as the independent polyline, the highlighted line is the short remainder of the upper polyline that is less than ½ miles long.

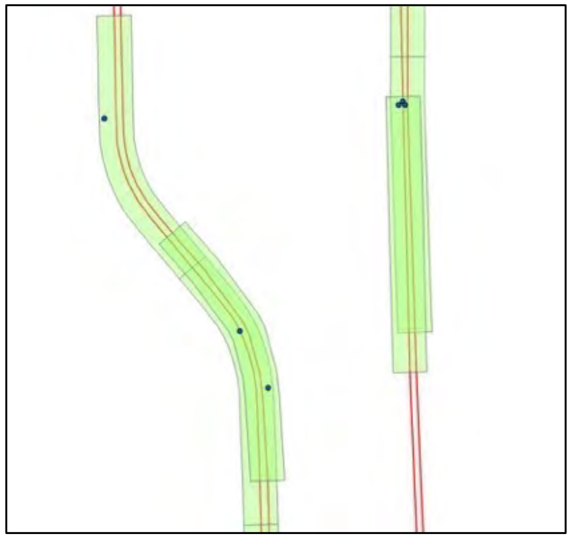
(b) Another scenario of generating highway segments that are shorter than ½ mile is when different highways meet at roundabouts. In this case, QGIS would select one highway to be continuous and cut the other one into short segments. Given the size of most roundabouts, the segments that are cut short are usually shorter than ½ mile. This is an example of STH 167 and STH 175 meeting at a roundabout, STH 167 was considered by QGIS as the continuous highway while STH 175 (the highlighted lines) was cut into short segments at the roundabout.

(c) Another scenario of generating highway segments that are shorter than ½ mile is when we manually redissolved neighboring polylines that were shorter than ½ mile and then split them. In this case, most of the redissolved polylines were not an integer multiple of ½ mile, and thus resulted in a segment that were ½ mile and the other as a shorter remainder. This is an example of when a redissolved segment of US Highway 2 divided into one ½ mile section and a shorter remainder (the highlighted segment in the circle).

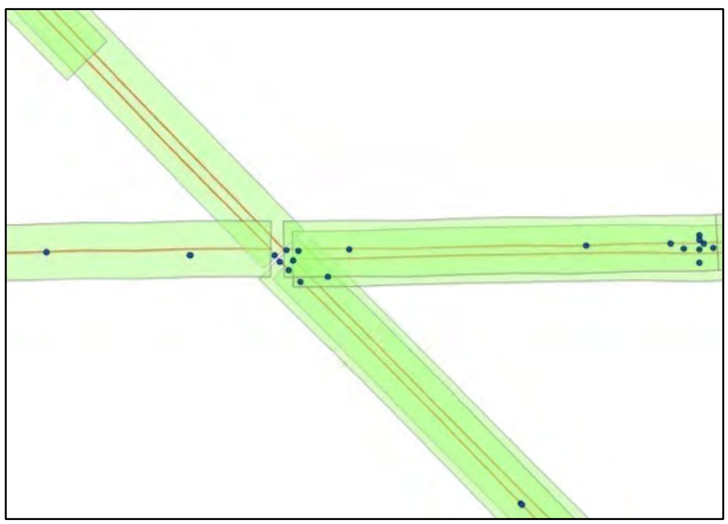
Appendix F.4. Scenarios of Overlapping Areas and Their Impacts on the Number of Crashes per segment



(a) One of the scenarios was that there were highway segments that share overlapping areas but there were no pedestrian or bicyclist crashes in the overlapping areas. For example, the figure above shows a highway section where it divided into two road segments and then remerged back to one road segment. The 50-meter buffer of the divided road segments overlapped at both ends of the segments, however, the crashes within the buffers were not in neither of overlapping areas. In this case, we took the number of crashes per segment calculated by Spatial Join as the number of crashes on those segments for they were accurate and not inflated.

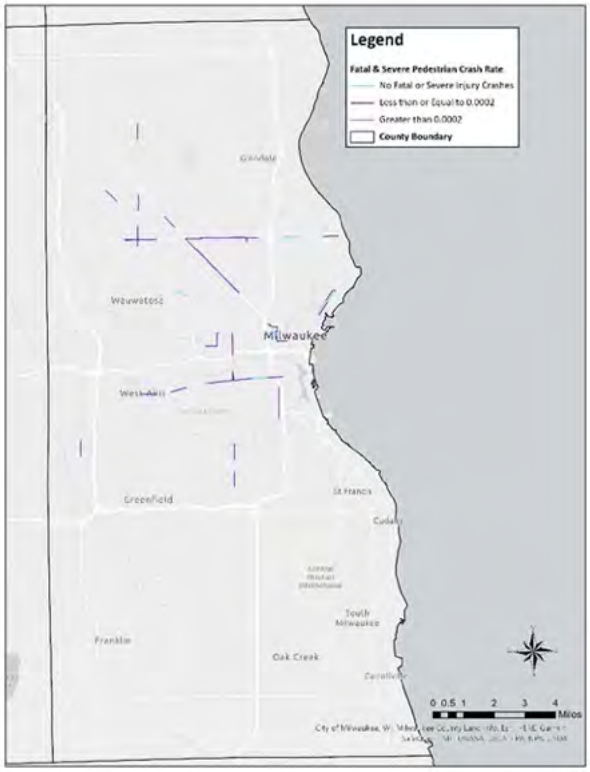


(b) Another scenario was when the divided highway segments were too close to each other and there were pedestrian or bicyclist crashes in the overlapping areas. For example, the figure above shows two highways with divided road segments that were too close to each other and had crashes in the overlapping areas (lower left and upper right). In this case, we assigned the crashes to one of overlapping highway segments and removed the number of crashes from the other calculated by Spatial Join to avoid potential inflation of the number of crashes.



(c) A more complex scenario was when the divided highway segments were very close to each other with pedestrian or bicyclist crashes in the overlapping areas, they also met at intersections. For example, the figure above shows several overlapping highway segments with crashes in the overlapping areas. In this case, we assigned non-intersection crashes in overlapping buffers only to segments that had the highest number of crashes. If there were overlapping segments with the same number of total crashes, we assigned non-intersection crashes in the overlapping buffers to the segments that were the closest to the crashes. For intersection crashes, we assigned them to all segments that met at at-grade junctions.

Appendix F.5. Maps for Fatal & Severe Pedestrian Crash Rates for Selected Counties



(a) Map of fatal plus severe pedestrian crash rate of segments in Milwaukee County.

(b) Map of fatal plus severe pedestrian crash rate of segments in Dane County.

Appendix F.6. Maps of Bicyclist Crashes by Injury Severity Level per Mile for Selected Counties

(a) Map of Bicyclist Crashes by Injury Severity Level per Mile in Milwaukee County.

(b) Map of Bicyclist Crashes by Injury Severity Level per Mile in La Crosse County.