Practical Application of Pedestrian Exposure Tools: Expanding Southeast Region Results Statewide

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Background
"Improve non-motorized safety," including pedestrian safety, is one of the priority areas within the Wisconsin State Highway Safety Plan. However, pedestrian volumes, which represent exposure to possible traffic crashes, have only been collected in a few locations throughout Wisconsin. Further, existing pedestrian counts are not contained in a single, consistently-formatted database across the state. This project made initial steps toward updating the Wisconsin State Highway System roadway database to incorporate pedestrian volume estimates.

Specifically, we applied a model that we had previously created in the WisDOT Southeast Region to provide initial annual pedestrian crossing volume estimates for all four-way intersections along the State Highway System. Ultimately, this new data could be used by safety analysts to prioritize intersections that have experienced the highest crash rates (e.g., pedestrian crashes per million crossings) and identify types of intersection designs that have higher levels of underlying risk. This could be helpful for traffic safety grant applications and roadway safety projects. However, these pedestrian volume estimates are preliminary, so the remaining portion of the project focused on collecting data for model validation and refinement.

This grant was titled, "Practical Application of Pedestrian Exposure Tools: Expanding Southeast Region Results Statewide," and was conducted between October 1, 2021 and September 30, 2022. The grant was a follow-up to "Pedestrian Exposure Data for the Wisconsin State Highway System: WisDOT Southeast Region Pilot Study," which was completed by the University of Wisconsin-Milwaukee for the Bureau of Transportation Safety in 2021.

The following sections describe the main phases of the project.

1. Collected Pedestrian Volume Model Input Data
The first phase of this project was to collect the inputs necessary to estimate the pedestrian intersection crossing volume model from the WisDOT Southeast Region at all four-way intersections throughout the Wisconsin State Highway System. The development of the initial Southeast Region model, including its inputs, are described in the 2021 project report (https://wisconsindot.gov/Documents/safety/education/pedestrian/wistudy-pedcount.pdf).

We created a GIS point layer of more than 7,000 intersections in the State Highway System. For each intersection point, we collected the following characteristics within the surrounding area: census tract population, census block jobs, bus stops, retail businesses, restaurant and bar businesses, schools, and census tract household vehicle ownership. The most challenging data to collect was bus stops since these data are kept separately by individual transit agencies throughout the state. Therefore, we requested bus stop data from each agency and created what we believe to be the statewide GIS layer of bus stops as a part of this project.

After compiling the raw GIS data, we conducted basic GIS queries on these data layers to generate the model inputs. Then we used the model equation to generate pedestrian volume estimates for all intersections statewide.

2. Estimated Pedestrian Crash Rates
Using the GIS layer of State Highway System intersections and police-reported crash data from the WisTransPortal database, we counted all pedestrian crashes that were reported between 2014 and 2018 within short distances of each intersection. We tested buffer radii of 10m, 30m, 50m and 70m to see

which distances would be the best representation of intersection-related pedestrian crashes. Combining the reported crash data with the model estimates, we estimated pedestrian crash rates (pedestrian crashes per million crossings) for all state highway intersections. This analysis is described in Appendix A.

3. Created an Interactive Online GIS Map of Pedestrian Volume and Crash Rate Estimates

We created an initial online GIS Map to display the statewide pedestrian volume estimates and pedestrian crash rate estimates (https://arcg.is/0T1Sun). Users can zoom in on any State Highway System intersection in the state to see the pedestrian volume model inputs and outputs (Figure 1). We developed this map using the ArcGIS Online platform and are currently housing it on the UW-Milwaukee map server.

Eventually, WisDOT should identify an appropriate public platform for this interactive pedestrian volume map. When it is posted, it should include appropriate caveats for public use. This will require close coordination with WisDOT staff since they have the best understanding of where tools are available on websites within the agency and through affiliated organizations.

We met with stakeholders at WisDOT central office and within the five WisDOT regions to review the usefulness of the proof of concept interactive pedestrian volume map.

4. Created a Two-Page Flyer Summarizing the Pedestrian Volume Model

We met with a pedestrian exposure stakeholder group consisting of staff from WisDOT central headquarters, WisDOT regional offices, metropolitan planning organizations, regional planning commissions, and local agencies several times throughout the project. We recognized that it would be helpful to have a simple description of the model and its inputs to introduce people to this new tool. The two-page flyer is shown as Figure 2.

Figure 1. Online Interactive Map Showing Pedestrian Volume Model Inputs and Estimates at Wisconsin State Highway System Intersections

The ArcGIS Online Map was created by Kaci Crowley

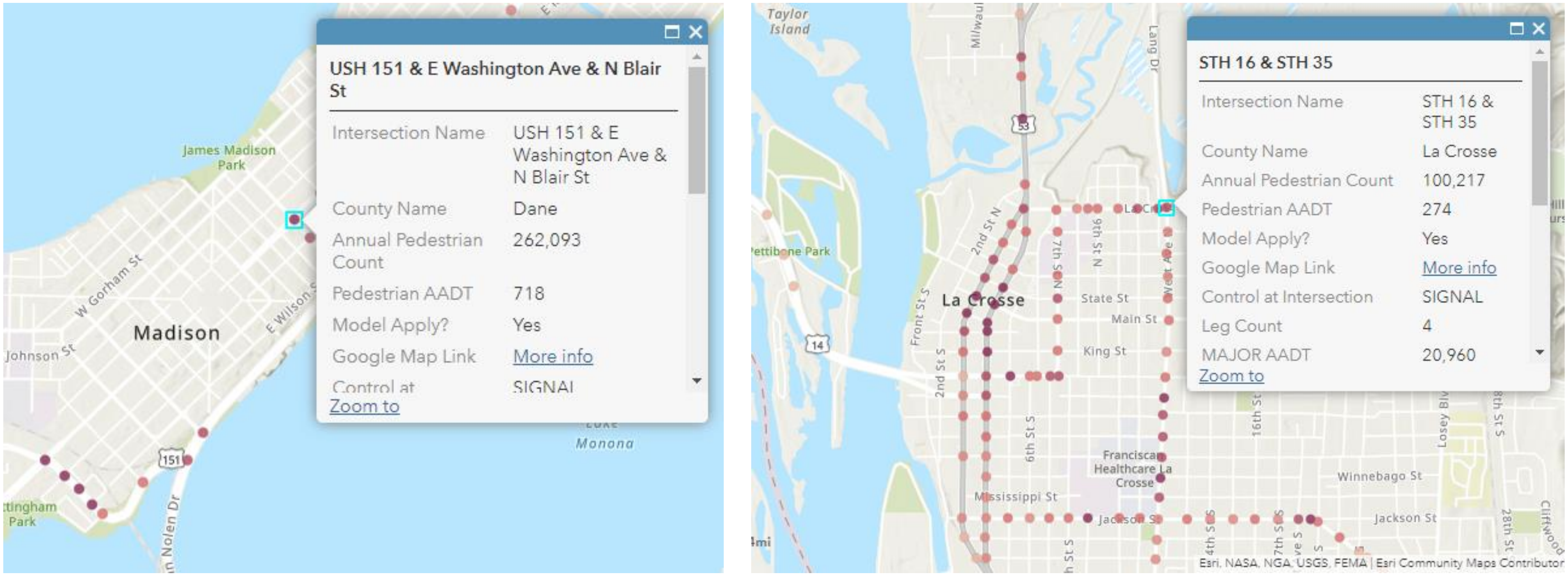

Figure 2. Two-Page Flyer Summarizing Wisconsin Pedestrian Volume Model

Wisconsin Pedestrian Volume Model

Contributors
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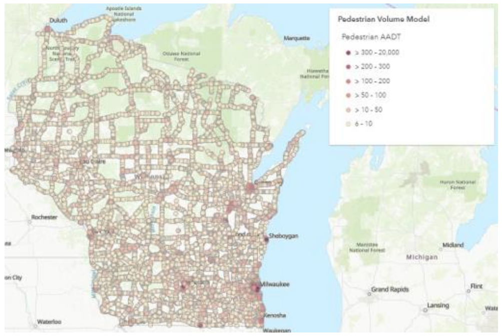
BOTS Grant: FG-2022-UW-MILWA-05845
March 2022

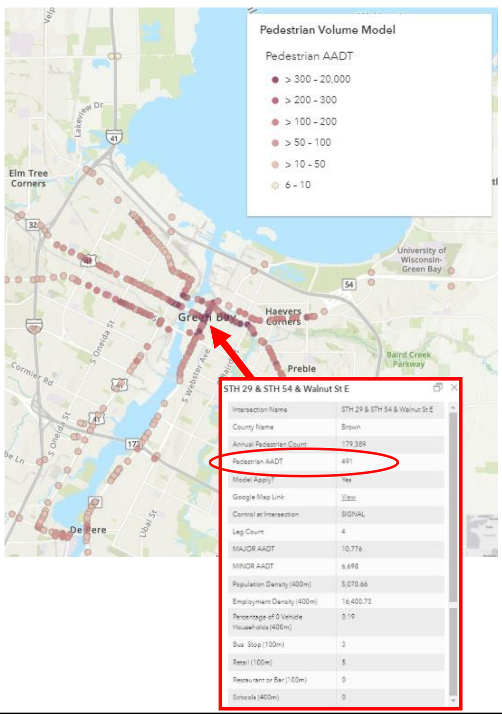
What is it?

Tool that WisDOT and local agencies can use to estimate current and future pedestrian intersection crossing volumes



What can it be used for?

Safety: Estimate pedestrian crash rates
Planning: Prioritize pedestrian safety treatments
Equity: Show where people with disabilities, without cars, and too old or young to drive cross intersections
Monitoring: Add pedestrian volumes to state databases



What inputs does it use?

- Population Density
- Job Density
- Bus Stops
- Retail Businesses
- Restaurants/Bars
- Schools
- Households without Cars

Wisconsin Pedestrian Volume Model

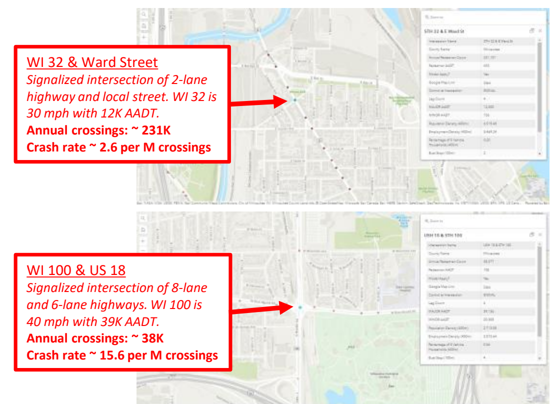
Original Research
Schneider, R.J., A. Schmitz, X. Qin. "Development and Validation of a Seven-County Regional Pedestrian Volume Model," Transportation Research Record, 2021

Model development

The model was created by relating approximately 300 intersection crossing counts to surrounding environment variables in the SE Region.

Crash rate application

Both intersections shown at right had 3 pedestrian crashes reported between 2014-2018. But one has a crash rate that is **6x** higher. Exposure-based rates can represent risk and be used for prioritization and systemic safety analyses.



Model refinement

The model will be validated using additional count data from across the state and can be refined using these new data. Additional counts can be compiled in a statewide pedestrian count database.

Online map is available at: https://arcg.is/0T1Sun. ArcGIS Online platform and base layers are provided by Esri.

5. Collected Existing Pedestrian Counts to Begin the Pedestrian Volume Model Validation Process

One of the key themes from our pedestrian exposure stakeholder group discussions was the importance of model validation and refinement. To assess the accuracy of the pedestrian volume model estimates, we needed additional pedestrian count data from throughout the state. Therefore, we requested existing pedestrian counts from all members of our stakeholder group, as well as other local contacts that were suggested by this group. Note that we also requested bicycle counts because it was efficient to ask for both types of count data at the same time. We will use the bicycle count data in future projects.

We collected more than 500 pedestrian and bicyclist counts from across the state. Since the counts were in separate files and stored in different formats, we developed a structure for a statewide pedestrian and bicycle count database. This data structure is based on the format described in the FHWA Traffic Monitoring Guide so that the counts can potentially be shared with other states and the federal government. The Wisconsin Statewide Pedestrian and Bicycle Count Database includes a metadata sheet and individual count files. The process used to develop this database is described in Appendix B. Eventually WisDOT's traffic count unit or demand modeling unit could compile and manage these types of counts, but we have started the process.

One challenge of using the existing pedestrian and bicycle counts is that they were collected at different times and for different durations in different parts of the state. Therefore, an important next step to make the counts comparable is to develop factors to expand short-term counts to a common time period, such as annual volume estimates.

Our initial work on the pedestrian and bicycle count database in 2022 has established the basis for a follow-up grant during 2023. This follow-up grant will focus on 1) collecting and analyzing long-term data from permanent count sites (in sidewalks and bike lanes) and potentially from crowdsourced data (e.g., Strava) to develop preliminary pedestrian and bicyclist count expansion factors, 2) estimating annual volumes at short-term count sites based on expansion factors, 3) comparing annual volume estimates from count sites with annual volume estimates from the pedestrian volume model, 4) suggesting how to refine the pedestrian volume model, and 5) continuing to meet with our pedestrian and bicyclist exposure data stakeholders,

Appendix A. Analysis of Intersection Crash Buffer Distance and Pedestrian Crash Rates

This appendix was written by Kaci Crowley

It has been a great opportunity to be a Research Assistant for the Statewide Pedestrian Volume Model project. As someone with interest in studying pedestrian behavior, this project aligns closely with my professional goals to achieve pedestrian safety through best planning practices. I appreciate the opportunity to help develop an infographic to share the importance of the Pedestrian Volume Model, an ArcGIS Online Application of the Model, and assist in the interpretation of crash data.

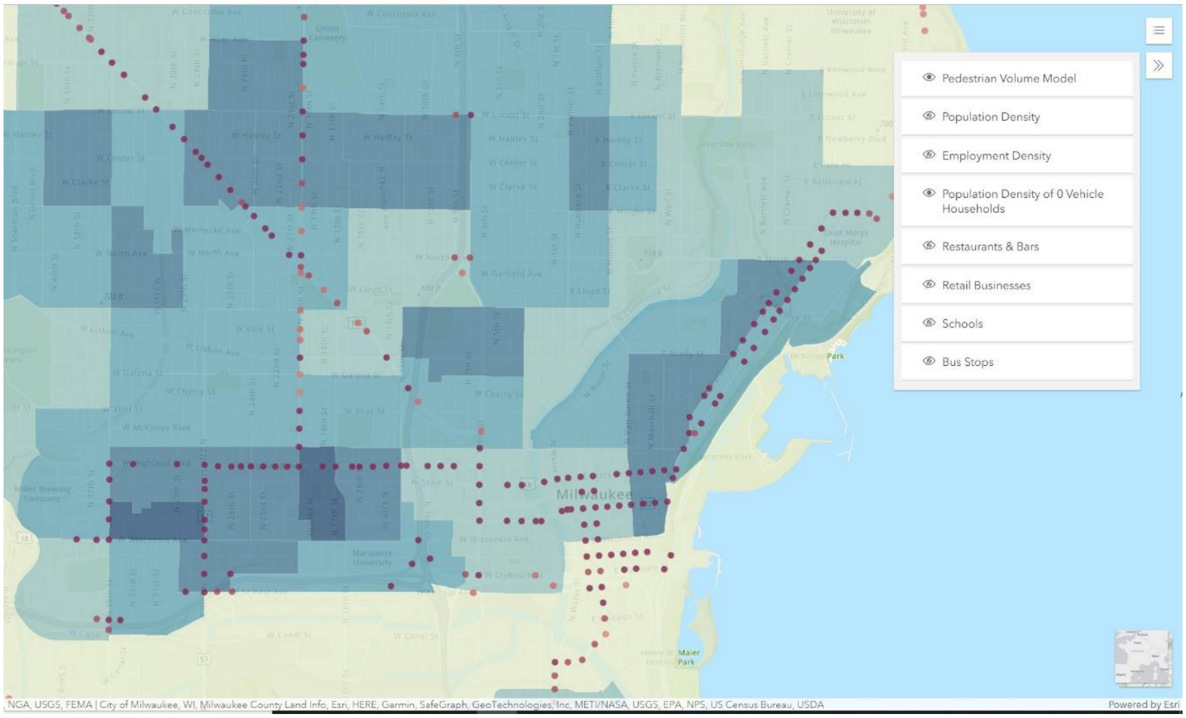
Purpose and Use of the Pedestrian Volume Model

As the Pedestrian Volume Model is made possible through funding through WisDOT, its intent is to help WisDOT, and other local agencies estimate current and future pedestrian intersection crossing volumes. The reason to develop the Pedestrian Volume Model fall into 4 categories: equity, planning, safety, and performance monitoring. Within equity, the model includes the percentage of households without a vehicle, therefore, the model shows potential crossing inequities due to persons without a car. The Pedestrian Volume Model can influence planning decisions when considering the prioritization of treatments to the roadway. The model's influence on planning treatments relates to safety in that the model along with crash data, can estimate the dangers of an intersection. Identifying through the model which intersections have the most crossings and a high crash rate provide great evidence for the need of pedestrian safety infrastructure. Finally, the model can assist in performance modeling in combination with other tools that depict statewide data like traffic and infrastructure. With the model's intention of equity, future planning, safety, and monitoring it is a worthwhile resource for WisDOT to have.

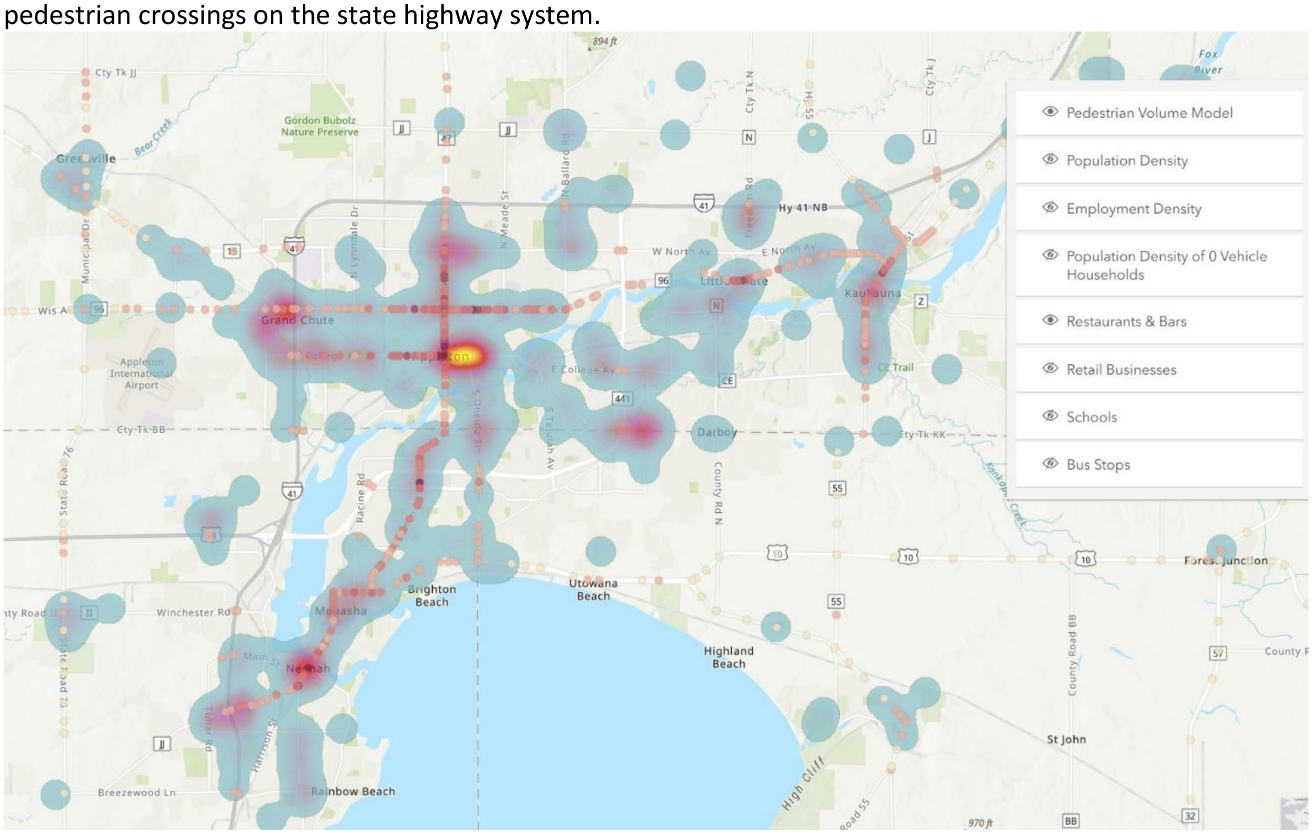
Online Pedestrian Volume Map Application

With hopes to make the Pedestrian Volume Model more accessible to WisDOT staff and other stakeholders, I developed a map application utilizing ArcGIS Online to highlight the 7 variables that developed the Pedestrian Volume Model. They are population density, employment density, number of bus stops, number of retail businesses, number of bars and restaurants, presence of schools and proportions of households without a motor vehicle. This map application can be used to determine which variables are most prominent to the Pedestrian Volume Model for each intersection. The application is available online at: https://uwm.maps.arcgis.com/apps/instant/basic/index.html?appid=ad03f7334f1e46199efcd44e0d74ca97.

The following are examples of how the map application can be utilized. As seen here, there are a higher number of crossings within census tracts with higher percentage of households without a vehicle in Milwaukee.



Additionally, I used a hot-spot analysis to show the presence of bars and restaurants. Around the Appleton area, the hot spot shows a high number of bars and restaurants along with increased pedestrian crossings on the state highway system.

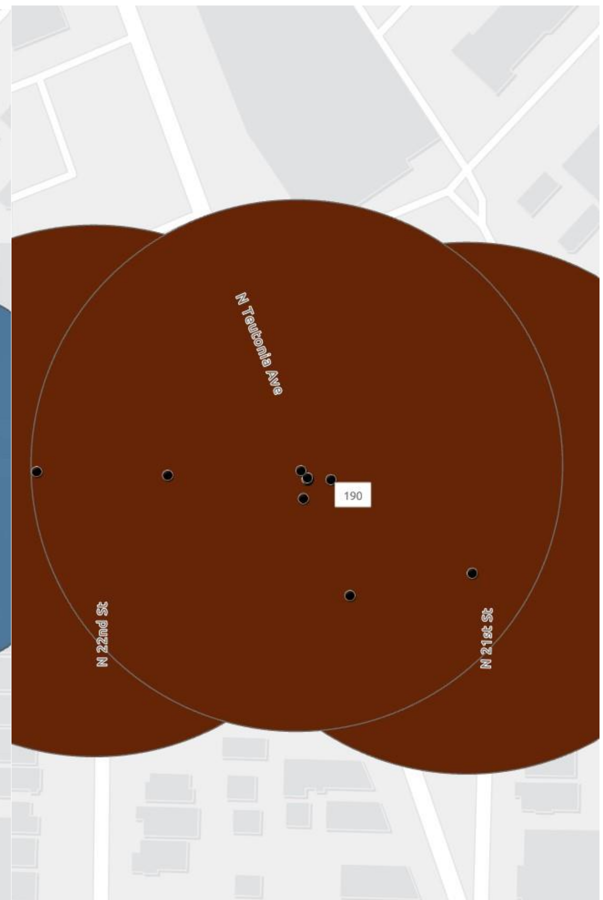


With utilizing statewide data in displaying the variables of the Pedestrian Volume Model, WisDOT may use this map application to determine why an intersection may have a high or low annual pedestrian crossing count at any state highway intersection in Wisconsin.

Crash Buffer Comparison

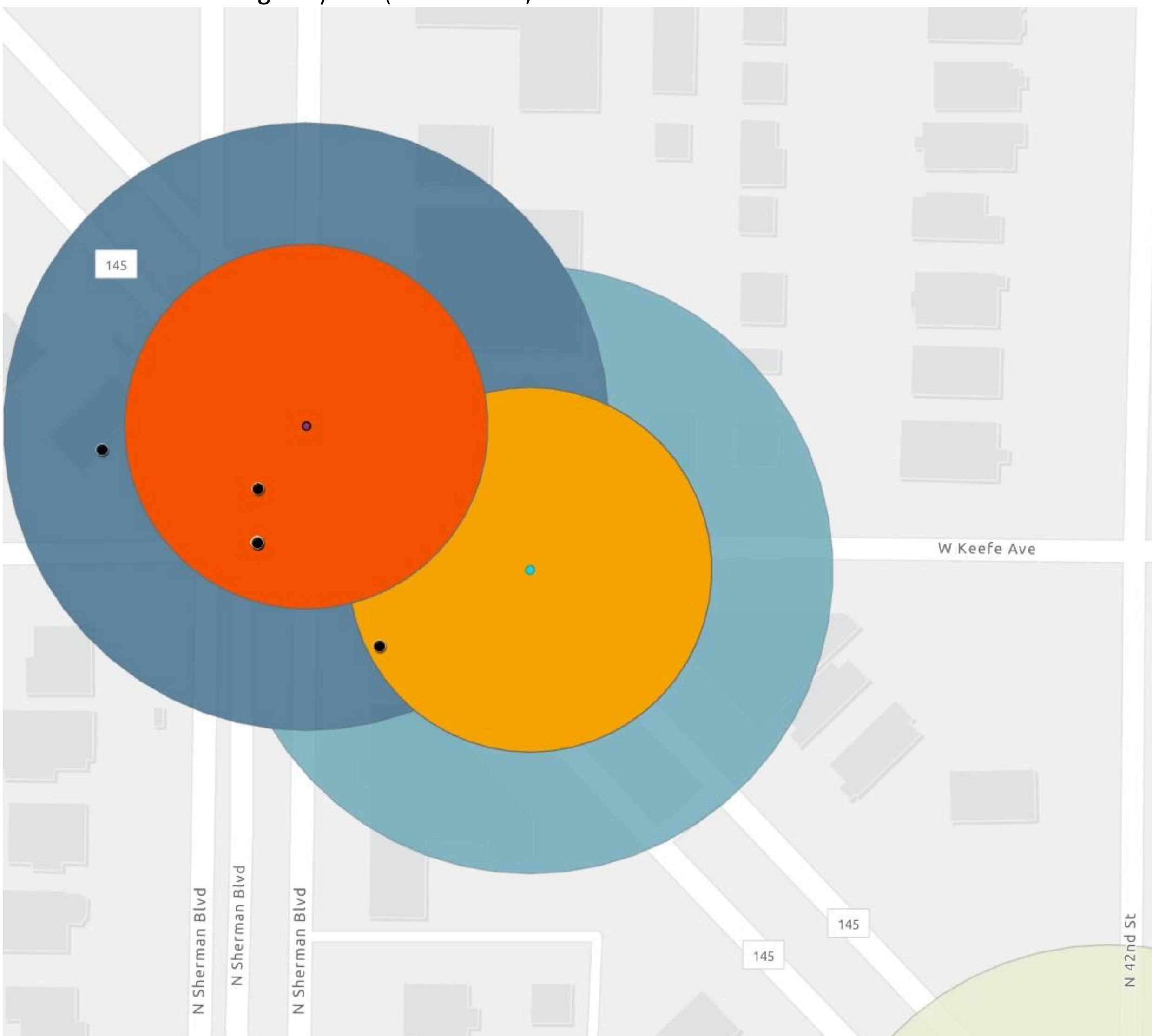
To take the model a step further in analysis capability, I was tasked to decipher the number of crashes from varying distances of state highway intersections. In 10, 30, 50, and 70m increments, I first created 4 different buffer layers from the Pedestrian Volume Model intersection points. Then, by including data of Wisconsin Pedestrian Crashes from 2014 to 2018, I completed an aggregation of the sum of crashes within each buffer distance layer to get a crash count. The most dangerous state highway intersection is State Highway 57 & Capitol Drive & N. Teutonia Ave in Milwaukee County with 14 crashes within 70m and 12 crashes within 50m of the intersection.

50m Buffer

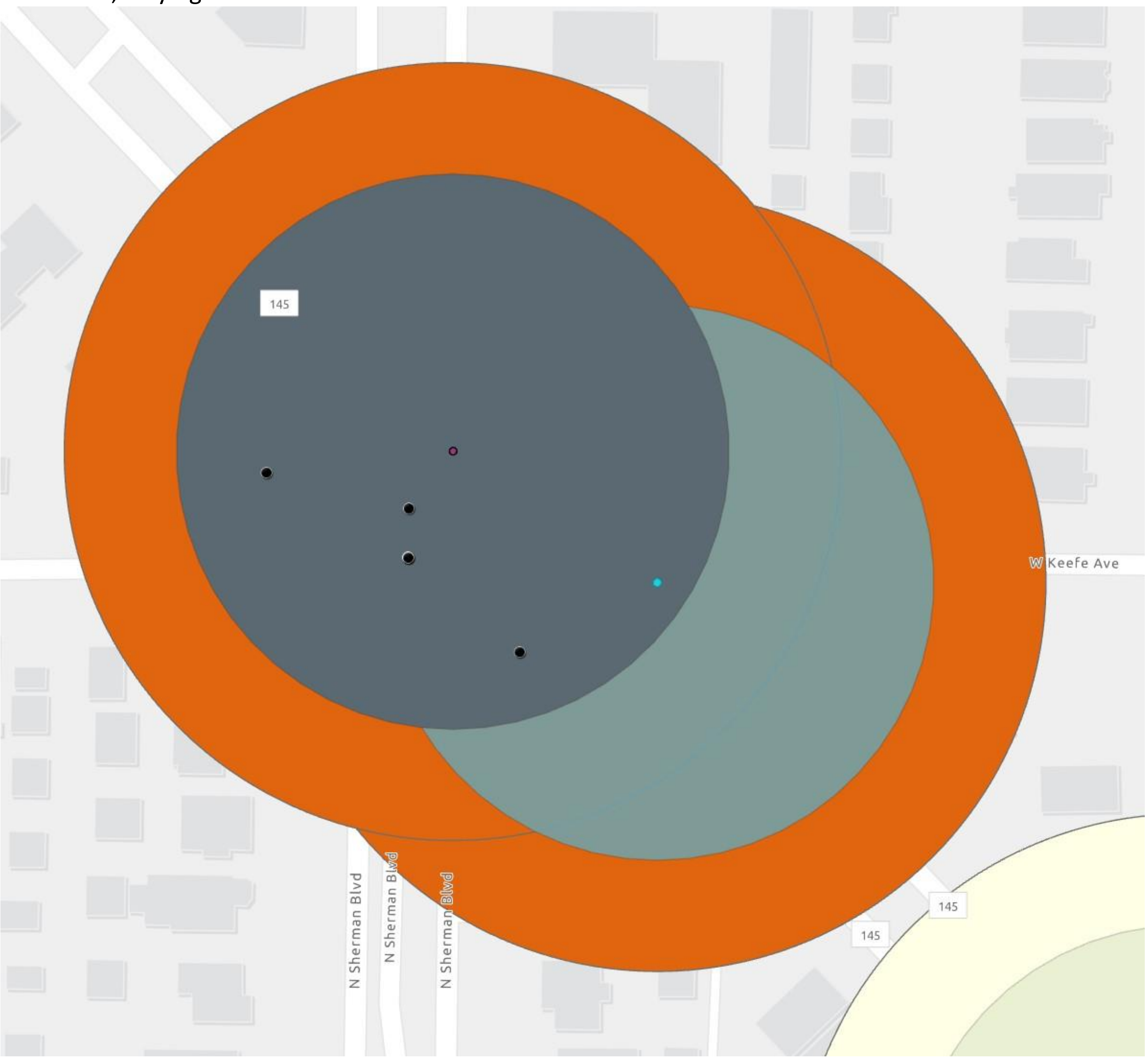


70m Buffer

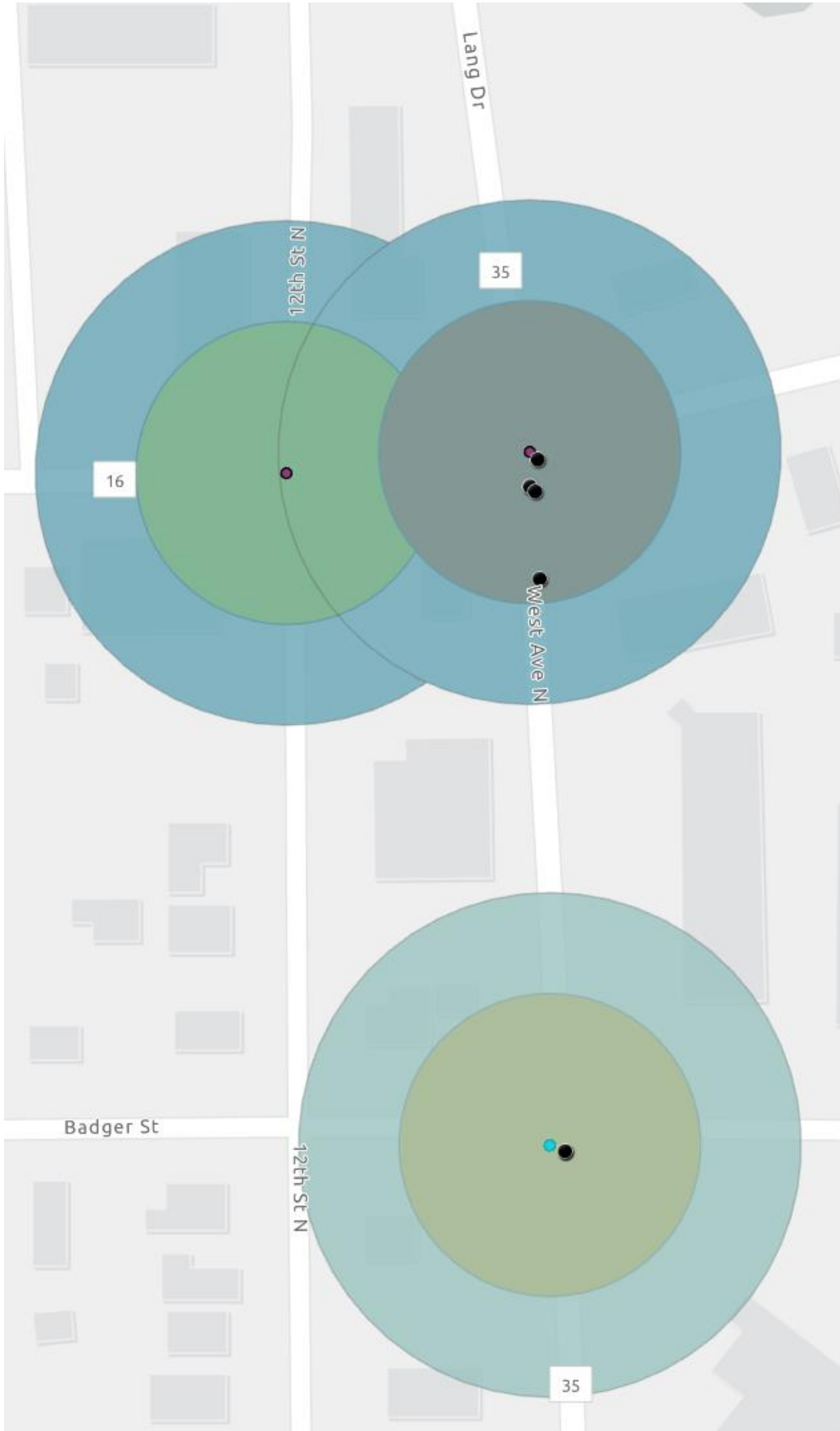
To decide which distance buffer would be most advantageous for crash rate data, I used field calculations to see the difference in crashes between each buffer distance. In doing so, I subtracted each buffer distance from the one larger than it (70m-50m, 50m-30m, and 30m-10m). In my analysis, I focused on the differences between 70m and 50m, and 50m-30m. The difference between 30m and 10m crashes were too large compared to 70m-50m and 50m-30m which have smaller differences between them. The decision to pursue a crash rate of 30m is due to three factors, the largest difference in crashes, the number of instances where there is a difference in crashes, and cases where there are more crashes in 30m than 50m. For example, the largest difference in 70m-50m is 10 crashes at the intersection of State Highway 57 & Capitol Drive & N. Teutonia Ave in Milwaukee County, as seen in the 50m and 70m pictures above. The largest difference in crashes between 50m-30m is 5 crashes at the intersection of State Highway 145 (Fond du Lac) and W. Keefe Avenue shown below.



The intersection of State Highway 145 (Fond du Lac) and W. Keefe Avenue does not differ in the number of crashes, staying constant with 6 crashes within the 70m and 50m buffer shown below.

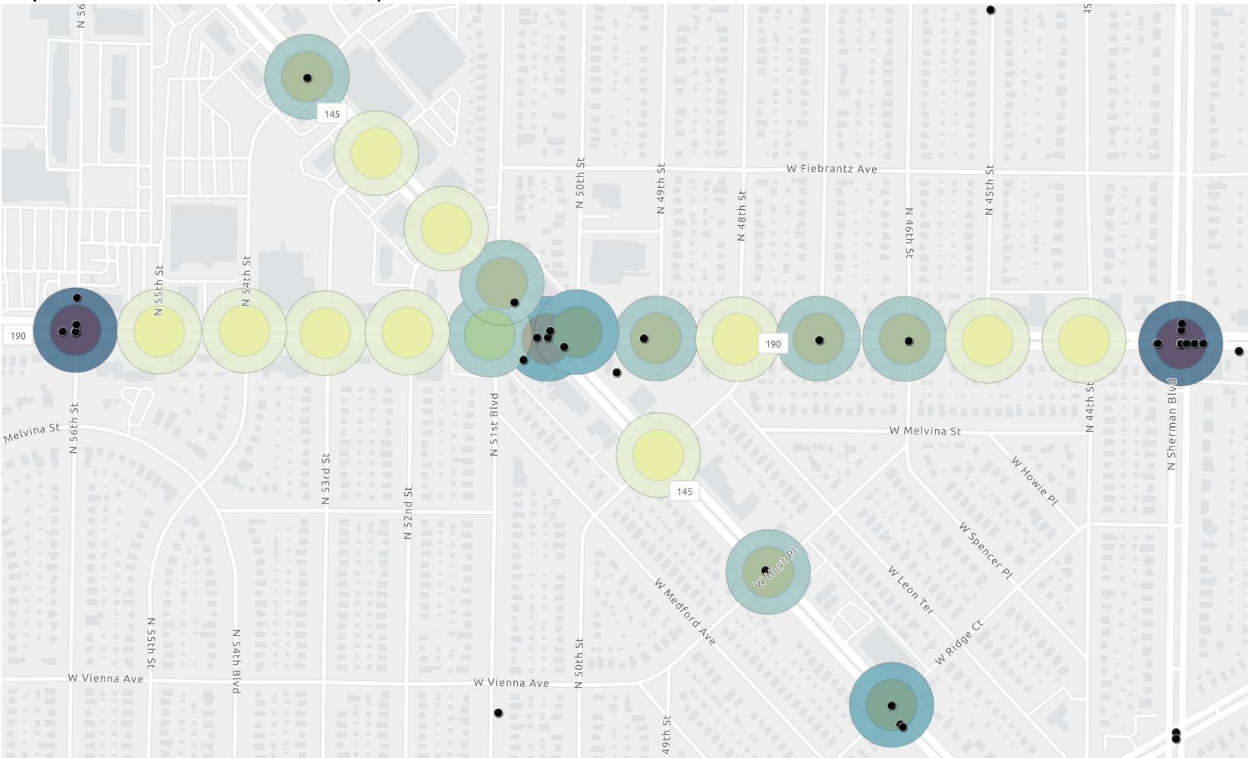


Secondly, I decided on a 30m crash rate buffer since there are more instances of difference between the 70m-50m buffer than there are in instances of difference between the 50m-30m buffer. To compute this, I filtered the number of differences in each buffer field by descending numbers. In doing so, I found there are 260 intersections with instances of difference in the 70m-50m field, and only 213 instances of difference in the 50-30m field. I also found that in some cases, the 30m buffer encapsulates more crashes than the 50m buffer. An example of this case is found in La Crosse, at the intersection of State Highway 35 and Badger Street (shown below), where the bottom-most circle has two more crashes within 30m than 50m.



Therefore, I believe that 30m around the state highway intersections will be the most accurate count for crash data. Below are examples of crashes with 30m and 50m buffer overlay in Milwaukee and Dane County.

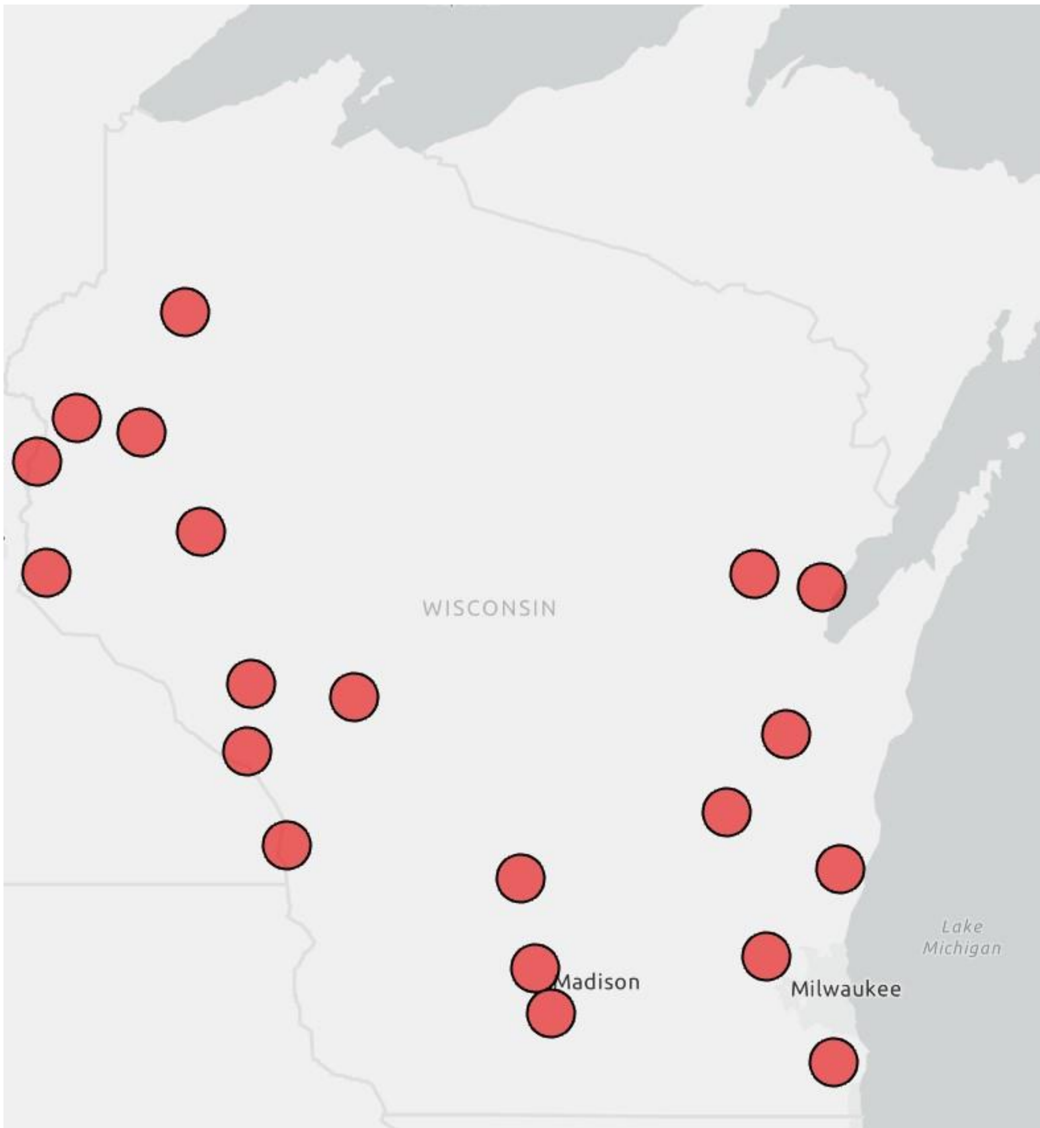
Capitol Drive-Milwaukee County



State Highway 151, Buick St, Hughes Pl, Dane County

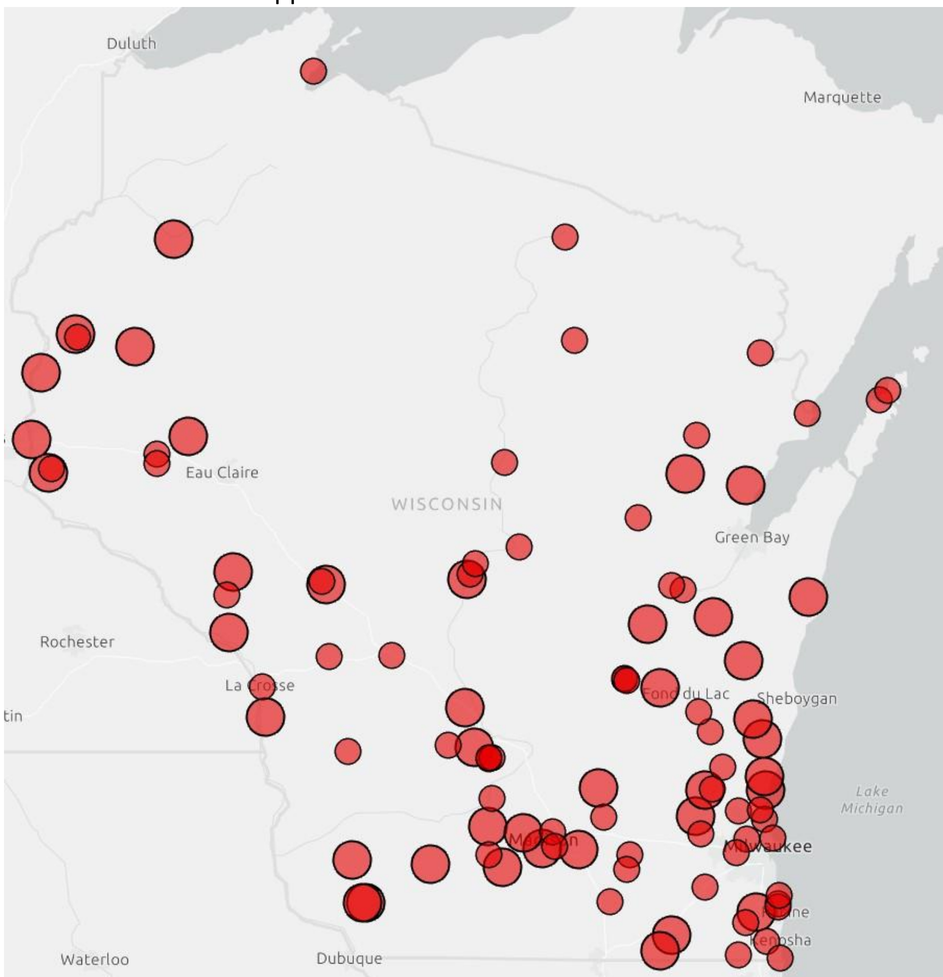
Crash Rate Analysis
To determine the crash rate of crashes within 30m of state highways, I took the number of crashes within the 30m buffer of the Pedestrian Volume Model divided by the estimated annual pedestrian volume multiplied by 5. I multiplied by 5 because the crash data is over a 5-year period. I then multiplied those figures by 1,000,000 to get the rate of crashes within 30m of a state highway per million crossings.

The top 20 crash rates belong to intersections in more rural locations of Wisconsin as seen in the figure below.



The highest crash rate at 96.46 pedestrian crashes per million crossings is found at the intersection of State Highway 54, Holiday Dr., and Oasis Rd. between Black River Falls and Vaudreuil. It is not surprising that high crash rates are seen in more rural areas as vehicles are less perceptive to pedestrians and there is less investment in pedestrian crossing infrastructure in areas of lower density. It is a hope that research in pedestrian crashes may change that narrative.

The 100 intersections with the highest crash rates in Wisconsin have rates above 30%. These intersections are dispersed in more dense areas of Wisconsin compared to the top 20 intersections, as seen below. The symbols are graduated circles with the smaller of the two circles being crash rates between 30-50% and the largest circles are intersections between 50-96%. A detailed table of the top 100 intersections can be found in the Appendix.



Reflections

I enjoyed working on this project as it has real applications to intersections around the state. I believe that working on this project set me apart from other candidates while interviewing with my future employer. I was able to explain the importance of this project and how I used GIS in my analysis- so I am incredibly grateful! I do, however, wish that there were more opportunities for me to share this project with WisDOT. I think that it would have been a great experience to get feedback from a government agency as I will work closely with IDOT in the future. Overall, I am excited to see how this project develops as I hope a Pedestrian Volume Model is streamlined in the future for the pedestrian planning field!

Top 100 Highest Pedestrian Crash Rate Intersections in Wisconsin (2014-2018)

Intersection Name	Annual Pedestrian Volume	Number of Crashes (30m)	Crash Rate (crashes per 1M crossings)
STH 54 & Holiday Dr & Oasis Rd	4147	2	96.46
STH 40 & 5th Ave	4498	2	88.93
STH 35 & Badger St	4697	2	85.16
STH 23 & Crescent Rd & Rose-Eld Rd	2471	1	80.94
STH 78 & Canal St	5028	2	79.55
STH 35 & Todd Rd	2605	1	76.78
STH 20 & 53rd Dr	2629	1	76.07
STH 22 & CTH R	2638	1	75.82
CTH D & Ramp CTH D to USH 41 (1) & Ramp USH 41 to CTH D (1) & Sampson Rd	2669	1	74.93
USH 63 & 3rd St & Wagon Bridge Rd	2710	1	73.80
STH 114 & Kees Rd	2715	1	73.66
STH 33 & Mirror Lake Rd	2758	1	72.52
USH 8 & 3 3/4 St	2818	1	70.97
STH 46 & 180th Ave	2838	1	70.47
STH 83 & County Line Rd	2865	1	69.81
STH 35 & 55th Ave	2886	1	69.30
STH 29 & CTH E	2912	1	68.68
STH 57 & STH 144	2946	1	67.89
STH 92 & CTH G & Davis St	3111	1	64.29
STH 93 & 7th St & Tracy St	3160	1	63.29
STH 67 & Palmer Rd & Town Hall Rd	3231	1	61.90
USH 14 & Brick Church Rd & Six Corners Rd	3296	1	60.68
USH 12 & CTH BN & Nora Rd (1)	3302	1	60.57
STH 32 & Fur Farm Rd	3304	1	60.53
STH 60 & Kettle Moraine Rd	3310	1	60.42
STH 35 & Vine St	16745	5	59.72
STH 73 & 6th St	3410	1	58.65
STH 89 & Poet St	3429	1	58.33
STH 116 & N 9th Ave	3440	1	58.14
STH 81 & Jentz-Baker Dr	3465	1	57.72

STH 81 & Jentz-Baker Dr	3465	1	57.72
USH 18 & Marsden Park Rd	3476	1	57.54
STH 147 & N Rockway St & S Rockway St	3502	1	57.11
STH 28 & E Water St	3714	1	53.85
STH 60 & Ramp STH 60 to IH 43 & Connector IH 43 to STH 60 (2) & Connector STH 60	3860	1	51.81
USH 151 & Hughes Pl	15519	4	51.55
STH 33 & Ramp STH 33 to IH 43 (1) & Connector IH 43 to STH 33 (1)	3900	1	51.28
Airport Rd & Connector USH 12 to CTH M	3927	1	50.93
USH 12 & Rose St	3939	1	50.77
STH 23 & N Main St	7928	2	50.45
USH 12 & Connector IH 94 to USH 12 (2)	4002	1	49.98
STH 23 & Locust St	4018	1	49.78
STH 60 & Washington Ave	4026	1	49.68
STH B51 & Eagle Nest Blvd	4042	1	49.48
STH 158 & CTH H	4056	1	49.31
STH 23 & Union St N & Union St S	4079	1	49.03
STH 42 & Anderson Ln	4164	1	48.03
STH B51 & Roberts Rd	4221	1	47.38
STH 54 & 6th St	4237	1	47.20
USH 51 & USH 151	12937	3	46.38
STH 83 & CTH C	4313	1	46.37
STH 33 & 18th Ave	17509	4	45.69
STH 60 & STH 175	4382	1	45.64
USH 45 & Owano St	4529	1	44.16
STH 113 & 2nd Ave	13599	3	44.12
STH 113 & STH 123	9263	2	43.18
STH 42 & Beach Rd & Waters End Rd	4642	1	43.08
STH 100 & Menomonee River Pkwy	9313	2	42.95
USH 45 & 2nd St	4694	1	42.61
STH 64 & Park St	4851	1	41.23
STH 145 & STH 167 & Montgomery Dr	4890	1	40.90
STH 67 & Martin St & Mill St	4950	1	40.40
USH 18 & N High Ave & S High Ave	4977	1	40.18
STH 33 & Lincoln Ave	5008	1	39.94
STH 100 & N Spruce Rd	5053	1	39.58
STH 25 & Ramp IH 94 to STH 25 (2) & Ramp STH 25 to IH 94 (2)	5072	1	39.43
STH 56 & STH 131 & N Washington St	5117	1	39.09
STH 31 & Three Mile Rd	5194	1	38.51
STH 57 & Riverland Ct & Riverland Rd	5212	1	38.37
STH 29 & S Main St & W Cemetery Rd	5219	1	38.32

STH 89 & E Cramer St & W Cramer St	5227	1	38.26
STH 89 & Porter St	5233	1	38.22
STH 32 & 116th St	5253	1	38.07
STH 32 & Jackson St & N Center St	5296	1	37.76
STH 96 & Westhill Blvd	10622	2	37.66
STH 83 & Ramp IH 43 to STH 83 (2) & Ramp STH 83 to IH 43 (2) & Connector IH 43 to STH 83 (2)	5318	1	37.61
STH 78 & Orchard Ln	5411	1	36.96
STH 13 & 5th Ave W	5438	1	36.78
USH 12 & Hefner St	5647	1	35.42
STH 21 & Jane Dr (1)	5689	1	35.16
USH 45 & S 7th St	5724	1	34.94
USH 141 & Fairgrounds Rd	5742	1	34.83
STH 76 & Greenridge Dr	5776	1	34.63
STH 31 & STH 38	5808	1	34.44
STH 23 & Blossom St	5839	1	34.25
STH 93 & Wanek Ave	6010	1	33.28
STH 25 & 17th Ave E & 17th Ave W	6025	1	33.20
USH 45 & 16th Ave	6038	1	33.12
STH 59 & Northside Dr	6058	1	33.01
STH 59 & Coachlight Dr	6063	1	32.99
STH 23 & N Webb Ave & S Webb Ave	18238	3	32.90
STH 35 & Vine St	30536	5	32.75
USH 45 & N Elizabeth St & S Elizabeth St	6123	1	32.66
CTH E & Hartbrook Dr & Ramp CTH E to STH 16	6186	1	32.33
STH 46 & Second Ave E & Second Ave W	6252	1	31.99
STH 13 & STH 73 & Grand Ave W	6447	1	31.02
STH 32 & CTH G & Six Mile Rd	6456	1	30.98
STH 32 & STH 190	12922	2	30.95
STH 113 & 7th Ave	6509	1	30.73
USH 51 & CTH BW & E Broadway	6510	1	30.72

Appendix B. Wisconsin Pedestrian and Bicycle Database Development Process

This appendix was written by Natalie Marshall

This memo describes the process for compiling pedestrian and bicycle count data into an initial Statewide Pedestrian and Bicycle Count Database. This was done primarily by one graduate student at the University of Wisconsin-Milwaukee and took approximately 55 hours.

The process 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 OneDrive and numbered and labeled them. The format for count titles 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 are in a geodatabase, which was uploaded to the 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 in order to ensure access and consolidation.

Once all of the counts were (mostly) compiled into the OneDrive folder, their attributes were entered into a metadata spreadsheet. Short-term and long-term counts were divided into separate tabs. All counts that lasted less than 24 hours are in the short-term tab, and counts that are greater than 24 hours are in the long-term tab. When possible, the metadata spreadsheet follows the requirements outlined in the Federal Highway Administration's Traffic Monitoring Guide.[1]

The metadata sheet has the following fields:

1. Unique ID
2. Document location
3. Location name
4. City
5. WisDOT region
6. Year
7. Type
8. Time
9. Time of day
10. Interval
11. State FIPS code
12. County FIPS code
13. Station ID
14. Roadway classification
15. Direction of route
16. Location relative to roadway
17. Direction of movement
18. Facility type
19. Type of count
20. Method of counting
21. Latitude
22. Longitude
23. Month
24. Date
25. Time of week
26. Weather
27. Average daily count (raw data)
28. Precipitation

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[1] Section 7.9: Nonmotorized Count Station Description Data Format in *Traffic Monitoring Guide,* U.S. Department of Transportation Federal Highway Administration, October 2016.

Below is a description of each field and how it was determined and entered.

Unique ID
This unique 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 the unique ID. The ECWRPC geodatabase only has one unique ID. Future iterations of the metadata sheet may need to break the counts in this geodatabase down into separate entries, although ideally the final count database as a whole will take a geodatabase format.

Document Location
This denotes whether the count document is located in the UWM OneDrive folder or in the WisDOT Box account.

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.

Type
- 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)

Time
Length of time the count was conducted for.

Time of Day (Short-Term Only)
Time of day the count was conducted

Interval (Long-Term Only)
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 who moved through in those 15 minutes.

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 shows the roadway classification codes.

Table 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 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 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 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 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

This denotes the same information as the “count type” field but shown numerically and in the format recommended in the FHWA Traffic Monitoring Guide.

Table 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 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.

Month
Listed numerically.

Time of Week (Short-Term Only)
Weekday or weekend

Weather (Short-Term Only)
Taken from original count document.

Precipitation (Short Term Only)
Listed as either 0 or 1.

Average daily count (Long Term Only)
An average of the raw count data—total count divided by the number of days count was done for.

Pedestrian Total Count (Short Term Only)
The total number of pedestrians observed during the count period.

Cyclist Total Count (Short Term Only)
The total number of cyclists observed during the count period.

Summary of Count Characteristics

- 554 counts
    - 282 short-term (2 hour, 6 hour, 13 hour) intersection
    - 272 long-term (2 week, 3 week, 3 month) counts
- 295 bicycle counts
- 326 pedestrian counts
- 206 combined counts

Next Steps

- Continue pulling WisDOT counts into the UWM OneDrive
    - Label them with correct Unique ID during this process
- Fill in any missing information
    - Time of day
    - Total ped/bicycle count