Rustic Road Traffic and Crash Analysis

Based on GIS analysis performed April 25, 2022

Executive Summary

County Code section 49-78 item (b)(3) requires that rustic roads be "low volume [with] traffic volumes that do not detract significantly from the rustic character of the road." Item (5) under this section specifies that the crash history of the road "does not suggest unsafe conditions." County Code does not specify a traffic volume or crash rate above which a rustic designation would be inappropriate, but the 1996 *Rustic Roads Functional Master Plan* provides some guidance.

Due to low traffic volumes, the number of crashes along rustic roads is very low. However, crashes along rustic roads are likely to result in a fatality or serious injury at a higher rate than other roads in the county. Crashes occur disproportionately at intersections, signifying a potential issue with intersection geometry, sight distance, and/or the need for traffic controls, rather than an issue with the road alignment itself. Because of the low volume of these roads, signalization is rare at intersections.

Given the low number of overall vehicle miles travelled (VMT) and low number of crashes on any particular road, traditional crash rates should be treated with a high degree of uncertainty. It only takes a single crash on a low-volume, short road to dramatically increase the crash rate. This is more a function of the inherent randomness of statistically small numbers rather than road design. As such, a road's crash rate should not be considered the only measure to determine safety and adequacy of roads and individual crashes should be examined more closely.

None of the roads has a high enough crash rate that by itself would suggest a road be removed from or not added to the Rustic Roads Program. However, this analysis did lead to a recommendation that a section of one rustic road be removed from the program due to a combination of traffic volume and pattern of crashes. A few roads are suggested for further investigation due to higher-than-average traffic counts. The crash maps that accompany this report should also be examined for patterns in crash locations along individual roads.

All Montgomery County Crashes

Table 1 shows the total number of crashes reported in Montgomery County from January 2015 through December 2020 (six full years of data). Crashes have been categorized as fatal, serious injury, minor injury, and property-damage-only (or no injury) crashes. The analysis uses crashes that were "geolocated" using an algorithm developed by transportation planners in Montgomery Planning's Countywide Planning and Policy Division as part of Montgomery Planning's Vision Zero efforts.

Table 1. All Montgomery County Crashes (2015-2020)

	Crashes	Percent of All County Crashes
Total crashes	67,167	--
Fatal	188	0.3%
Serious Injury	1,452	2.2%
Total fatal and serious	1,640	2.4%
Minor Injury	22,327	33.2%
No Injury (Property Damage Only)	43,200	64.3%

67,167 crashes were reported on county roads in the six-year study period. One-third of these crashes resulted in injury while 2.4% were considered major crashes: either fatal or serious injury.

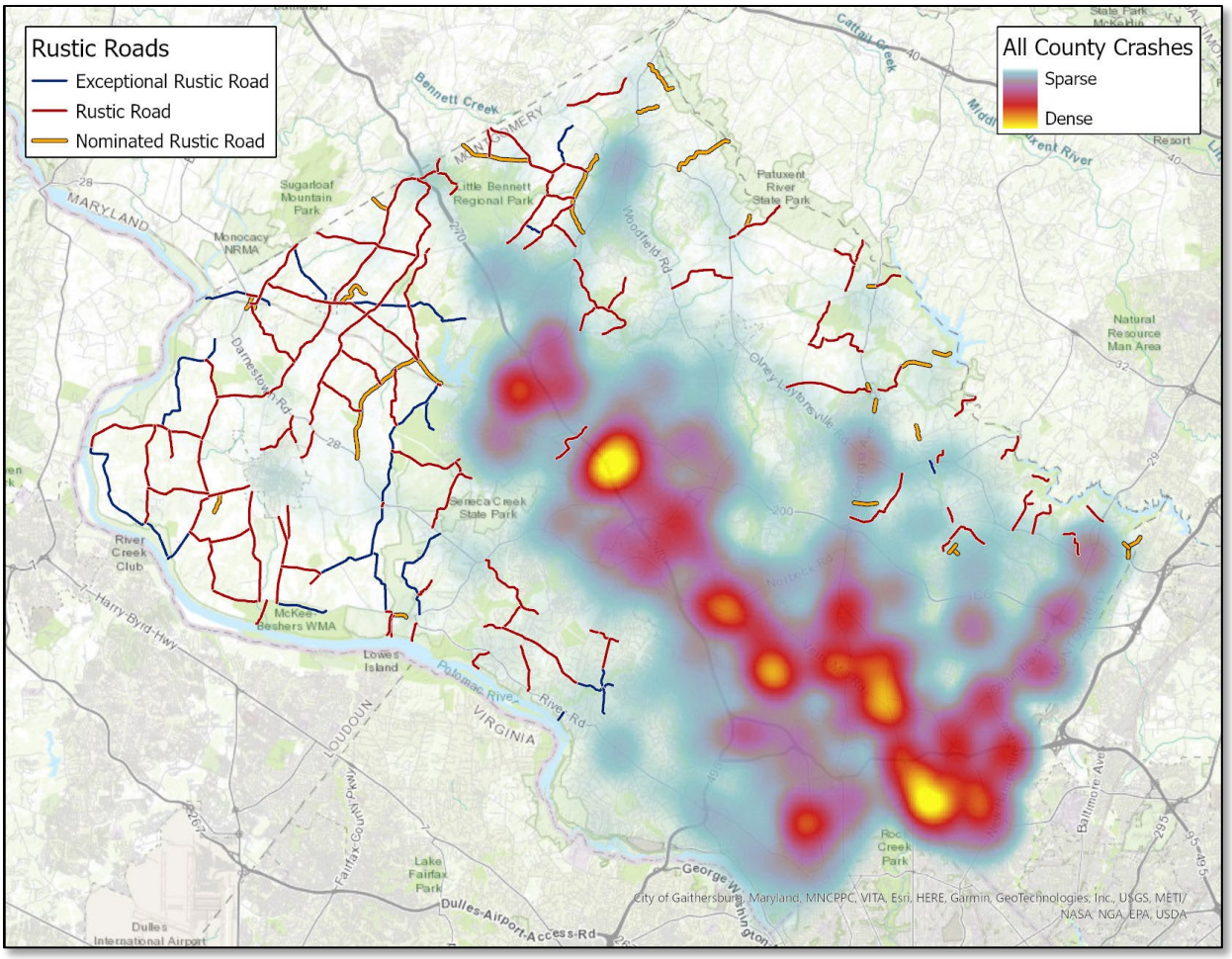


Figure 1. A heat map of all crashes in Montgomery County from 2015-2020. Not surprisingly, the crashes are clustered where there are major population centers and along major roads. The existing and nominated rustic roads do not appear to be particularly troublesome from a countywide perspective.

Crashes Along Existing and Nominated Rustic Roads

Crashes are considered "along" a rustic road if they are located within 100 feet of a rustic road centerline; this includes extending 100 feet from the center of an intersection with another road. (An additional half foot was added to the buffers around the roads to account for crashes that may have been geolocated slightly off from the intersections used in this analysis.) The crashes along rustic roads—both existing and those nominated for the program—are summarized in Table 2.

Table 2. Crashes Along Rustic Roads (2015-2020)

	Crashes	Percent of rustic road crashes	Percent of county crashes in category
Total crashes	1,141	--	1.7%
Fatal	7[a]	0.6%	3.7%
Serious Injury	54	4.7%	3.7%
Total fatal and serious	61	5.3%	3.7%
Minor Injury	382	33.5%	1.7%
No Injury (Property Damage Only)	698	61.2%	1.6%

[a] One fatality occurred in a parking lot immediately adjacent to a rustic road (White Ground Road), so has been removed as a crash that occurred along a rustic road. See below for more details on specific fatal crashes.

There were 939 total crashes along existing rustic roads and 238 total crashes along nominated rustic roads. These two together total higher than the 1,141 crashes shown above because crashes where existing and/or nominated rustic roads intersect are included in both totals.

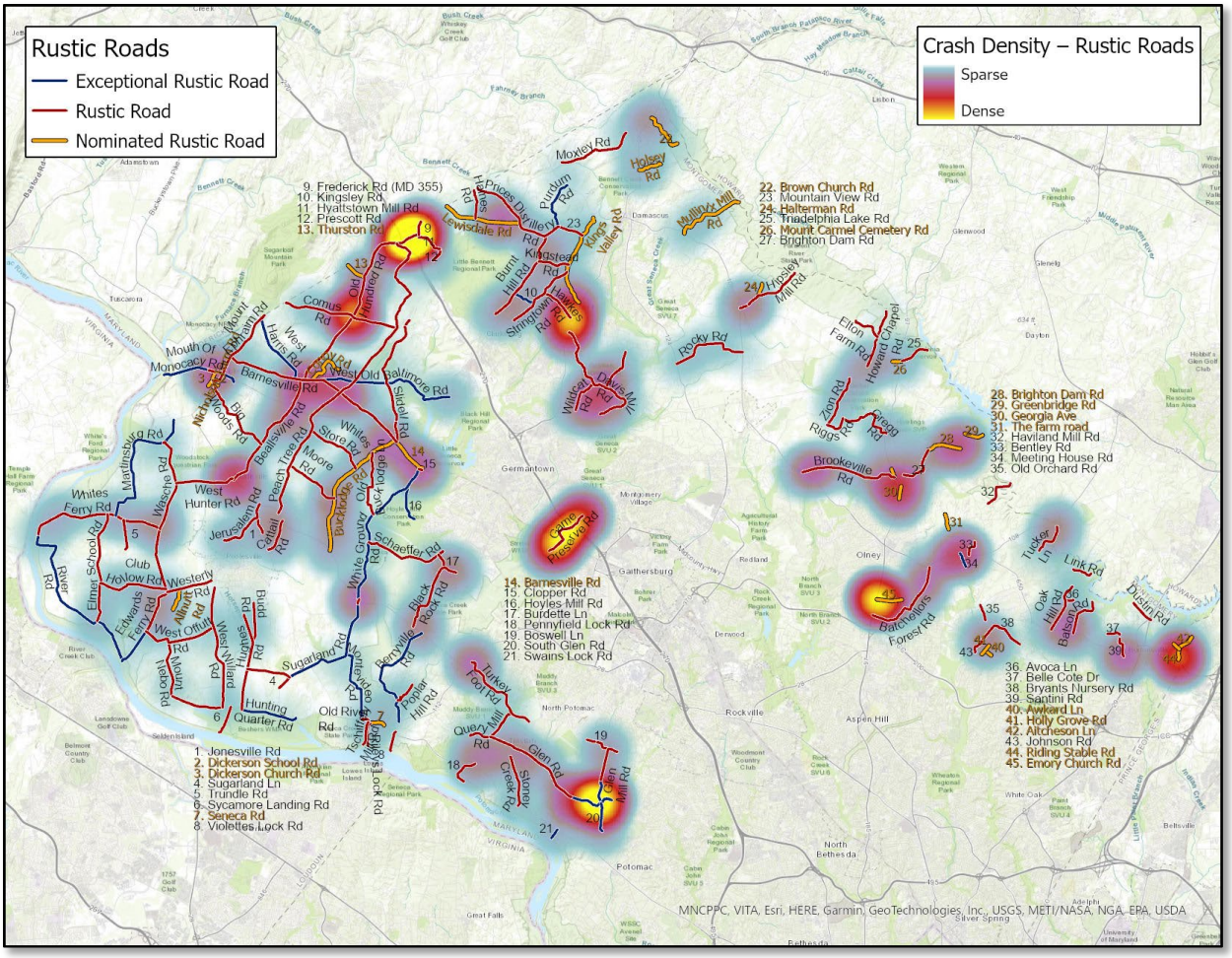


Figure 2. A heat map of crashes along rustic roads, including those at intersections.

A heat map of these crashes is shown in Figure 2. The map highlights spots along existing and nominated rustic roads that may be particularly unsafe, even if an entire road is not unsafe overall. Areas of concern spotlighted in the map are along Old Hundred Road (MD 109) and Frederick Road (MD 355) in Hyattstown, Game Preserve Road near Gaithersburg, Emory Church Road near Olney, and the intersection of Glen, South Glen, and Glen Mill Roads in Potomac (a.k.a. “the Glen”).

Planning staff also analyzed crashes along rustic roads that were not within 100 feet of an intersection. The reasoning behind this analysis is that crashes at intersections might suggest safety issues that are unrelated to the characteristics of the road itself and would need to be addressed in a different manner than any improvements that might be required for the road between intersections. A summary of the non-intersection crashes along existing and nominated rustic roads are shown in Table 3. While the rate of crashes that resulted in no injury is similar to county averages, the rate of fatal and serious injury crashes is higher than the county average for non-intersection crashes, suggesting safety shortcomings along these roads.

Table 3. Non-Intersection Crashes Along Rustic Roads (2015-2020)

	Crashes	Percent of Non-Intersection RR Crashes	Percent of County Crashes in Category
Total crashes	441	--	0.7%
Fatal	4	0.9%	2.1%
Serious Injury	29	6.6%	2.0%
Total fatal and serious	33	7.5%	2.0%
Minor Injury	132	30.0%	0.6%
No Injury (Property Damage Only)	276	62.6%	0.6%

There were 388 total non-intersection crashes along existing rustic roads and 53 along nominated rustic roads. Fatal and serious-injury crashes account for 7.5% of non-intersection crashes along existing and nominated rustic roads, which is three times the overall rate of fatal and serious crashes in the county (2.4% of all county crashes). This may partially be the result of more frequent minor- and no-injury crashes that happen on congested urban streets during rush hour—a.k.a. "fender benders"—but it is a concerning number.

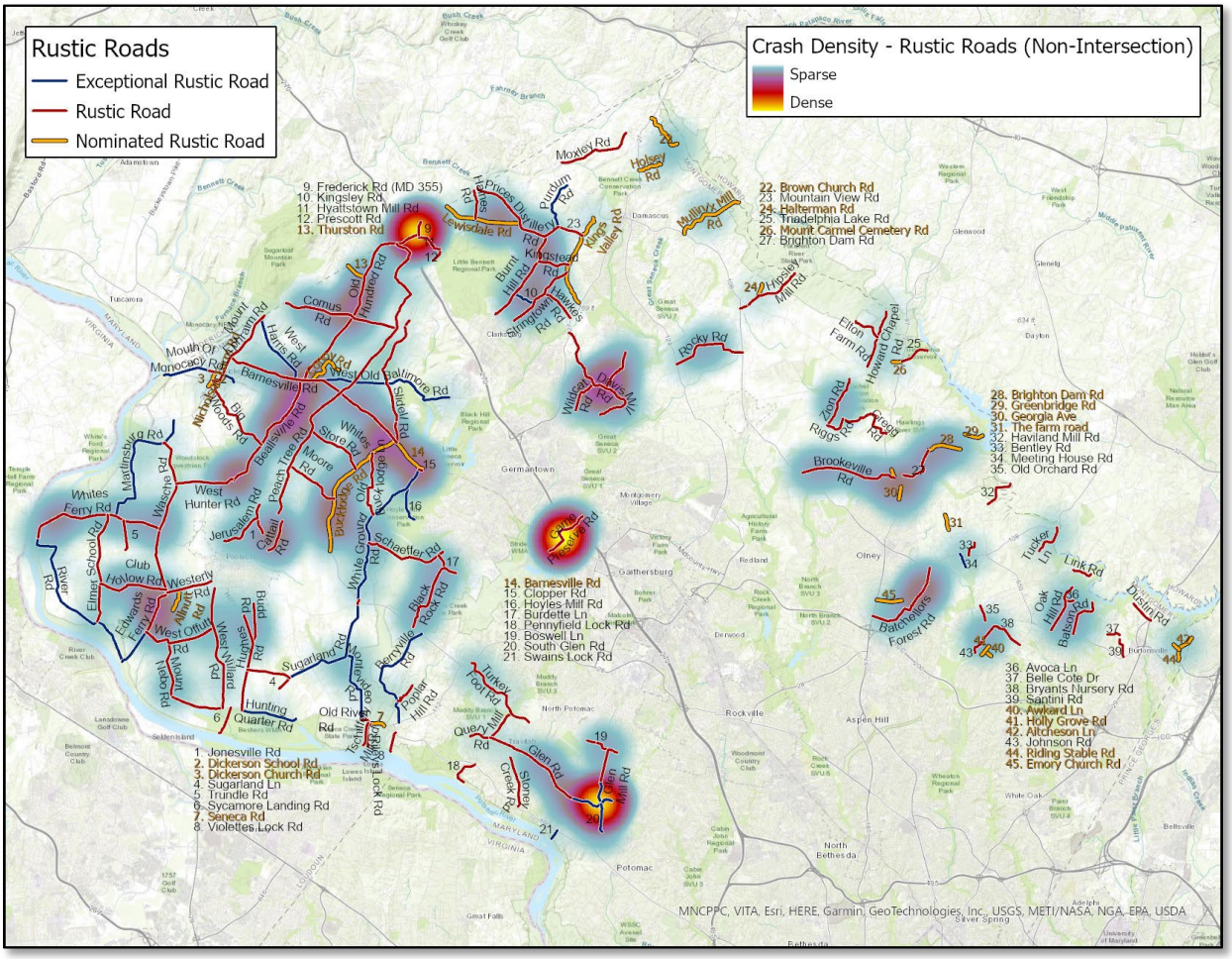


Figure 3. A heat map of crashes along rustic roads that did not occur within 100 feet of an intersection.

The heat map in Figure 3 shows areas with the highest concentrations of crashes along existing and nominated rustic roads that did not occur near an intersection. As in the heat map of all rustic road crashes, the Hyattstown area, Game Preserve Road, and the roads in the Glen still contain a higher proportion of crashes than other roads. And note that Emory Church Road near Olney (road 45 in the two maps) no longer appears to be an area of concern once intersection crashes are removed. Indeed, for this road, out of 41 total crashes, only 1 was not within Georgia Avenue.

Fatal Crashes Along Rustic Roads

Eight fatal crashes were located along existing and nominated rustic roads in the six-year study period and are shown in Table 4. Three of these crashes were at road intersections, including one at the intersection of two rustic roads.

Table 4. Fatal Crashes Along Rustic Roads (2015-2020)

Date and Time	Report Number	Rustic Road	Intersection	Notes
02/29/2016 03:04:00 PM	MCP2492000K	Sugarland Road	Whites Ferry Road (MD 107)	Straight movement angle; two-way stop sign; all-terrain vehicle (ATV)
06/07/2016 11:34:00 PM	MCP1227000J	Burnt Hill Road	NA	Single-vehicle crash; 3 teens from Clarksburg HS died
03/03/2017 09:30:00 AM	MCP2001000P	Old Hundred Road (MD 109)	I-270 ramp	Head-on left turn; T-intersection
07/15/2018 08:48:00 AM	MCP2563000R	White Ground Road	NA	Pedestrian killed in parking lot of 19620 White Ground Road (St Mark's United Methodist Church) when her vehicle rolled backwards and struck her
03/28/2019 09:58:00 AM	MCP1227000W	Hawkes Road	NA	Head-on crash
10/12/2019 02:30:00 PM	MCP13010016	Peach Tree Road/Barnesville Road	2 rustic roads	Straight movement angle; two-way stop sign
11/17/2019 09:51:00 PM	MCP25630011	Comus Road	NA	Single vehicle; alcohol present
02/29/2020 12:54:00 AM	MCP1301001B	South Glen Road	NA	Single vehicle; alcohol present

Looking more closely at the non-intersection crashes, one occurred in a parking lot next to White Ground Road, a situation that would not be changed by any alterations to the road; this crash has been removed from the crash counts for this road and from the total number of crashes along rustic roads. The presence of alcohol could have been a contributing factor in two of the non-intersection crashes (on Comus Road and South Glen Road). The fatal crash on Burnt Hill Road was determined to have been caused by a combination of speed and the inexperience of the vehicle's driver. According to a story in

the Washington Post[1], "In the half-mile preceding the crash site, the road descends through a series of increasingly tight S-curves. The wreck occurred at the base of a hill as the road bends." Changes to the roadway could decrease the severity of crashes such as these three. The fatal crash on Hawkes Road was a head-on crash between two vehicles; it is unknown why one of the vehicles departed its lane.

Vehicle Miles Traveled

Crash rates are generally calculated based on vehicle miles traveled, or VMT. By definition, the roads in the Rustic Roads Program are low-volume roads. Several are very short. Sometimes the low traffic volumes and short roads combine to skew crash rates because it only takes one or two crashes to make the rate appear to be very high. But these rates can still be informative, especially when compared against each other versus rates one might expect from long roads with much higher traffic volumes.

Average Annual Daily Traffic (AADT) figures come from several sources:

- A consulting firm, VHB, was engaged to conduct traffic counts on 69 roadway segments in April 2020. The traffic counts were conducted in October 2020 through February 2021. The counts were adjusted upwards by 7% to account for generally lower traffic volumes due to the Coronavirus pandemic.
- SHA traffic counts were used when available. Traffic figures from 2019 were used because the 2020 and 2021 numbers were lower due to the pandemic.[2]
- MCDOT included estimated traffic counts in their 2017 bridge inventory, so these numbers were used when no other numbers were available. These numbers tend to be higher than numbers from other sources, so likely represent an overcount, but were often the only number available.
- The "Master Plan Team" (MPT) estimated traffic counts on several roads which had no data available from other sources. These are almost always the shortest, often dead-end roads that have only a few houses. Some may provide access to a trailhead. The MPT erred on the side of caution by overestimating daily trips. In some cases, traffic count figures were deduced from the counts of nearby roads. Comments in the tables indicate the methodology used in the estimates.

Existing Rustic Roads

The traffic counts were evaluated separately for existing rustic roads and nominated rustic roads. The top ten highest traffic counts for the existing roads are shown in the table below.

[1] https://www.washingtonpost.com/local/public-safety/three-teens-dead-after-crash-in-montgomery-county/2016/06/08/a5b64a4c-2d5c-11e6-9b37-42985f6a265c_story.html

[2] Use the Annual Average Daily Traffic (AADT) Locator map here: https://data-maryland.opendata.arcgis.com/pages/mdot-interactive-maps

Table 5. Average Annual Daily Traffic – Existing Rustic Roads (Top 10) (2015-2020)

Road Name	AADT
Frederick Road (MD 355) in Hyattstown	15,996
Old Hundred Road (MD 109)	8,200
Glen Road (Rustic Segment)	5,031
Brookeville Road	3,715
Barnesville Road	3,481
Schaeffer Road	2,964
Glen Road (Exceptional Rustic Segment)	2,393
Cattail Road	2,375
Zion Road	2,230
South Glen Road	2,095

The 1996 *Rustic Roads Functional Master Plan* considered a road to be "low volume" (a necessary criterion for classification as a rustic or exceptional rustic road) if there were fewer than approximately 3,000 average weekday trips per day on the road. (Note that this analysis uses average daily traffic from the full seven-day week and not just the average weekday counts due to the available data. Including the two weekend days typically results in a lower AADT than the weekday only count, but on rustic roads, where travel may be more recreational on the weekends, the weekend rate can be higher. The difference between the two is typically minor.) The two rustic roads with the highest daily counts, Frederick Road (MD 355) in Hyattstown and Old Hundred Road (MD 109) are both state highways with counts well over 3,000 AADT. These roads were both designated rustic in the 1994 *Clarksburg Master Plan and Hyattstown Special Study Area*. The 1994 plan—still in effect in this area—made two recommendations to justify the rustic classification:

1) The 1994 plan recommends closing the I-270 interchange with MD 109 and building a new interchange further north in Frederick County to align with MD 75, which intersects MD 355 just north of Hyattstown. This would minimize traffic volumes along Frederick Road as well as along Old Hundred Road.
2) If the MD 109 interchange is maintained or improved, the 1994 plan recommends a bypass of the Hyattstown Historic District from an eastward extension of MD 109 past MD 355 that would then turn northward to intersect with MD 355 north of the county line.

The next highest traffic count along an existing rustic road is that of the rustic segment of Glen Road (from Query Mill Road to Piney Meetinghouse Road). The AADT of approximately 5,000 is also considerably higher than the 3,000-trip threshold used in the 1996 plan. Glen Road and several other roads were classified as rustic in the 2002 *Potomac Subregion Master Plan*. When evaluating roads for rustic classification, the 2002 plan noted that the traffic volumes and crash counts of many of the Subregion's roads were higher than might otherwise be expected due to the two-lane road policy that prevented the expansion of other roads in the Subregion. The 2002 plan therefore recommended a minor change in the legislation to redefine the traffic volume and crash history criteria as guidelines, allowing the other rustic road criteria to be weighted more heavily to account for unique local situations. The current traffic volume does not appear to detract from the rustic character of the road.

The only other rustic roads with an AADT that exceeds 3,000 are Barnesville Road and Brookeville Road. For Barnesville Road, the 2019 count is 3,931 AADT at the eastern end of the current rustic segment (just west of Bucklodge Road—MD 109 and Slidell Road). Near its western terminus at Mount Ephraim Road, the 2019 count is 3,031 AADT. (The figure in Table 5 is an average of these two.) The non-rustic segment of Barnesville Road (MD 117) between Bucklodge Road and Clarksburg Road had an AADT of 5,250 trips in 2019, so the traffic clearly diminishes along this road as one travels west, while increasing with travel to the southeast towards Germantown (see Figure 1).

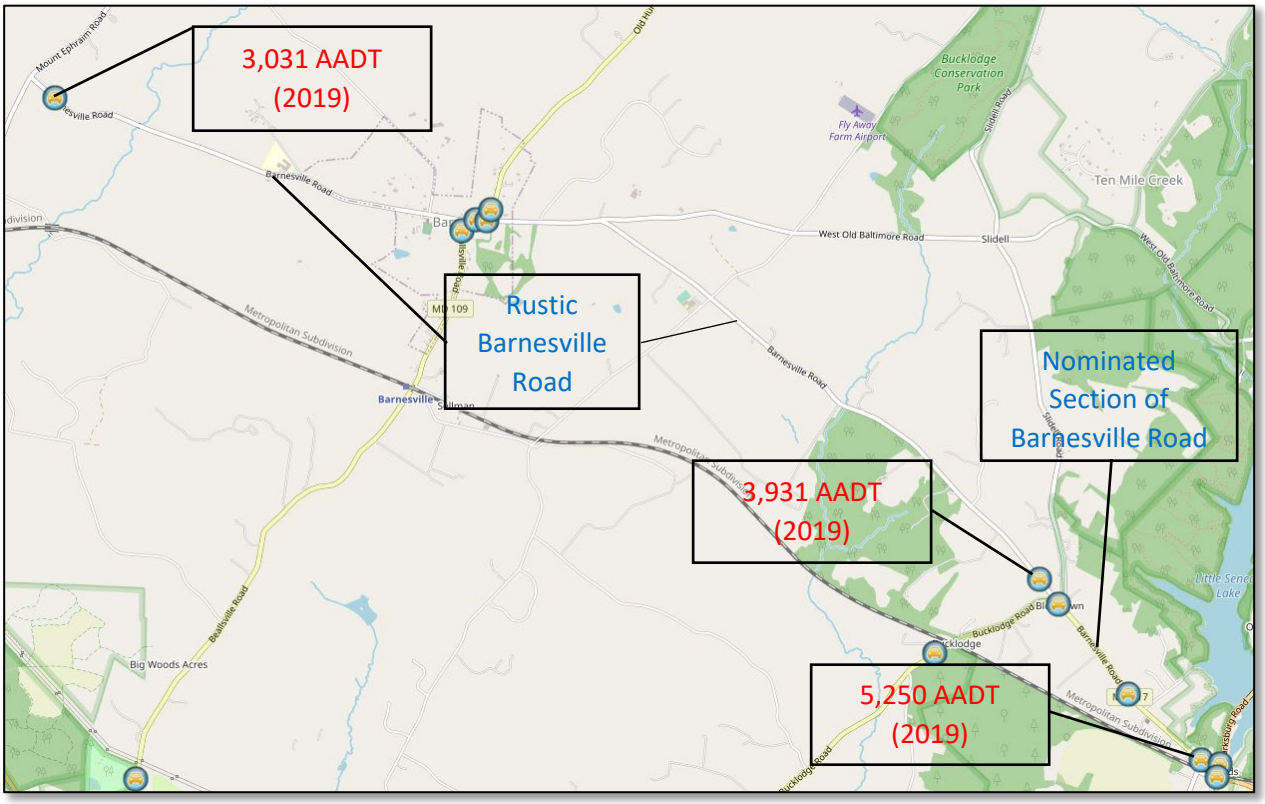


Figure 4. Barnesville Road showing traffic measuring spots. The traffic volume at its east end near Clarksburg Road is about 2,000 trips more than at the west end near Mount Ephraim Road. (Source: https://maps.roads.maryland.gov/itms_public/?)

The traffic count for Brookeville Road, reported as 3,715 AADT, is on the segment between MD 108 and Zion Road, which only accounts for about 20% of the road's length (see Figure 2). The traffic counts are lower east of Zion Road according to the state's 2014 turning movement summary at the intersection of Brookeville Road with Zion Road, which shows that the eastern leg of the road has over one-third less traffic than the western leg (1,948 trips vs. 3,203 trips from 6 a.m. to 7 p.m.). [Note, however, that even though this analysis used 2019 counts from SHA because the 2020 and 2021 counts have generally been lower during the pandemic, the AADT for Brookeville Road between MD 108 and Zion Road increased from 3,715 trips in 2019 to 4,561 trips in 2021.]

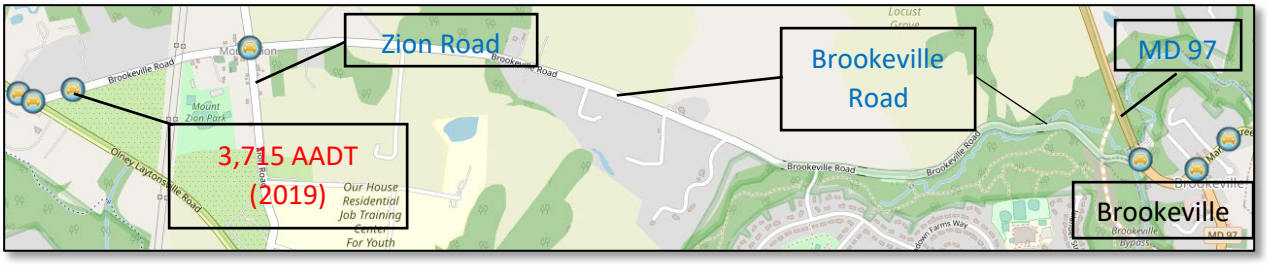


Figure 5. Brookeville Road showing traffic monitoring spot. Traffic volumes are about one-third lower east of Zion Road than to the west. (Source: https://maps.roads.maryland.gov/itms_public/?)

The traffic counts on these five road segments may be too high for the roads to remain in the Rustic Roads Program and should be further discussed.

Nominated Rustic Roads

Because only 22 nominated roads were evaluated, only the top five roads are shown in this category. AADT is below 1,000 for all other nominated roads.

Table 6. Average Annual Daily Traffic – Nominated Rustic Roads (Top 5) (2015-2020)

Road Name	AADT
Georgia Avenue (MD 97)	12,251
Barnesville Road (MD 117)	5,250
Riding Stable Road	2,166
Brighton Dam Road	1,384
Bucklodge Road (MD 117)	1,371

The two roads with significantly high traffic counts, Georgia Avenue (MD 97) both north and south of the Town of Brookeville and Barnesville Road (MD 117) between Slidell Road / Bucklodge Road (MD 117) and Clarksburg Road (MD 121) (also shown in Figure 1) were not further studied and are not recommended as rustic roads.

Crash Analysis – All Crashes

Because each road has a different combination of traffic count, road length, and number of crashes, the data has been normalized to make valid comparisons. The federal standard[3] of crashes per 100 million vehicle miles traveled is typically used; the formula is:

$$R = \frac{100{,}000{,}000 \times C}{365 \times N \times V \times L}$$

Where:

R = Crash rate for the road segment expressed as crashes per 100 million vehicle-miles of travel (VMT)

C = Total number of crashes in the study period

[3] https://safety.fhwa.dot.gov/local_rural/training/fhwasa1210/s3.cfm

N = Number of years of data
V = Number of vehicles per day (both directions)
L = Length of the roadway segment in miles

This formula was devised with much higher traffic volumes and much longer roads than are found in the Rustic Roads Program, which makes the crash rates appear shockingly high. As explained above, this is merely an artifact of applying a formula designed for a very different type of road and should only be used to compare like roads.

Existing Rustic Roads

Although there are currently 99 rustic roads in the program, crashes were analyzed along 102 road segments: the rustic and exceptional rustic segments of Glen Road and River Road were analyzed separately, and Sugarloaf Mountain Road was evaluated separate from Mount Ephraim Road, which it had been combined with in the 1996 plan.

Table 7. Crash Rates Per 100,000,000 VMT – Existing Rustic Roads (Top 10) (2015-2020)

Road Name	Length (Miles)	AADT	Number of Crashes	Crashes per Mile per Year	Crash Rate
Swains Lock Road	0.30	80	6	3.4	11,570
Santini Road	0.58	174	14	4.0	6,344
Hyattstown Mill Road	0.77	50	3	0.6	3,554
Riggs Road	0.69	20	1	0.2	3,308
Kingsley Road	0.64	54	2	0.5	2,640
Meeting House Road	0.41	800	16	6.4	2,207
Game Preserve Road	1.66	888	71	7.1	2,198
Clopper Road	0.10	912	4	7.0	2,103
Poplar Hill Road	0.71	100	3	0.7	1,939
Bryants Nursey Road	1.46	135	7	0.8	1,624

The average crash rate across all existing rustic roads is 221 per 100M VMT ([100M x 939 crashes] / [365 x 6 x 194,408 daily VMT]). This means that there would be 221 crashes in total across all existing rustic roads after all combined traffic has cumulatively traveled 100,000,000 miles, which would take a considerable amount of time given the total length of existing rustic roads is 191.37 miles (an average of 1.88 miles per road). An average of 0.8 crashes per mile per year (939 crashes over the six-year period on 191.37 total roadway miles) occurs across all existing rustic roads over the six-year study period.

Riggs Road in the table above serves as an excellent example of how the low numbers in this study skew the results. There was only one crash in a six-year period, but the road has the fourth highest crash rate among all studied road segments because there are so few cars using it. If there were 50 trips a day instead of 20 and the number of crashes remained at one, the road would fall out of the top 10.

A similar analysis of the 39 roads in the county classified as “country road” or “country arterial” was also performed. These two classifications are the nearest to the rustic and exceptional rustic classifications. While traffic volumes were not readily available for all country and country arterial roads, for the 35 roads that did have SHA data available or for which reasonable assumptions could be made, the average

crash rate is 359 per 100M VMT, almost exactly half the rustic road rate. The average number of crashes per mile per year is 1.9 (1,037 crashes over the six-year period on 89.49 roadway miles) for the country roads versus only 1.8 for the rustic roads. This is primarily due to much higher traffic volumes on roads with the two country classifications: the traffic volume on the rustic roads was 866 AADT versus 4,586 AADT on the country roads.

Nominated Rustic Roads

25 road segments were evaluated for crashes along nominated rustic roads.

Table 8. Crash Rates per 100,000,000 VMT – Nominated Rustic Roads (Top 5) (2015-2020)

Road Name	Length (Miles)	AADT	Number of Crashes	Crashes per Mile per Year	Crash Rate
Dickerson Church Road	0.21	31	6	4.7	41,134
Emory Church Road	0.72	351	41	9.5	7,402
Mount Carmel Cemetery Road	0.28	141	5	3.0	5,874
Nicholson Farm Road	0.21	38	1	0.8	5,703
Aitcheson Lane	0.22	112	3	2.3	5,579

The average crash rate across all nominated rustic roads is 394 per 100M VMT ([100M x 238 crashes] / [365 x 6 x 27,591 daily VMT]). This is nearly twice as high as the crash rate for existing rustic roads. The nominated rustic roads total 23.18 miles for an average length of 0.93 miles. The average number of crashes per mile per year along the nominated roads—1.7 (238 crashes over the six-year period on 23.18 roadway miles)—is also about twice as high as the average along the existing rustic roads over the six-year study period. The crash rates along the nominated roads are skewed higher than along the existing rustic roads by the small number of crashes, relatively short roads, and low traffic counts. Again, when normalized based on 100,000,000 vehicle miles traveled, the rates become exaggerated by a very small number of crashes. For example, Nicholson Farm Road, with only 1 crash over a 6-year period, has the fourth highest rate of the 25 nominated roads in the study.

Drilling down into the individual road data, most of the crashes along the roads in Table 8 are at their intersections with other roads. As an example, there were six total crashes along Dickerson Church Road, and all of them were at its two intersections with Dickerson Road (MD 28), a much busier road. Emory Church Road had 41 total crashes, but only 1 was not at its intersection with Georgia Avenue (MD 97).

Overall Crashes Per Mile Per Year

Because some rustic roads and/or nominated rustic roads intersect each other, some crashes are attributed to two or more roads, so the number of crashes shown in the table would yield a higher total if added together than the actual total number of crashes. There was a total of 1,141 crashes along all existing and nominated rustic roads over the 6-year period. Divided by the combined total of 214.55 miles, the roads average 0.9 crashes per mile per year. As mentioned above, the existing rustic roads averaged 0.8 crashes per mile per year, while for nominated rustic roads it is 1.7. While these numbers are useful for comparing rustic roads against each other, they don't take into account traffic volume like

the crash rate in the tables does, so aren't as instructive. The roads with the highest crash rates per mile per year are highlighted in the attached tables.

Crash Analysis – Non-Intersection Crashes

As discussed above, a separate analysis was done that excluded the crashes at intersections. Although occasionally two or more existing or nominated rustic roads intersect, it is far more common for a rustic road to intersect with a non-rustic road. The non-rustic road is almost always going to have a higher traffic count than the rustic road. Regardless, intersection crashes indicate improvements to an intersection are warranted. Such improvements may not require any changes to the roads leading to a troublesome intersection.

There were 441 crashes along existing and nominated rustic roads that were not within 100 feet of an intersection during the 6-year study period. Divided by the combined total of 214.55 miles, the roads average 0.34 crashes per mile per year. The crash rates per 100 million VMT are shown in the tables below.

Table 9. Non-Intersection Crash Rates per 100,000,000 VMT – Existing Rustic Roads (Top 10) (2015-2020)

Road Name	Length (Miles)	AADT	Number of Crashes	Crashes per Mile per Year	Crash Rate
Swains Lock Road	0.30	80	1	0.6	1,928
Johnson Road	0.42	71	1	0.4	1,537
Kingsley Road	0.64	54	1	0.3	1,320
Game Preserve Road	1.66	888	34	3.4	1053
Budd Road	1.12	155	3	0.4	791
Bryants Nursery Road	1.46	135	3	0.3	696
Rocky Road	2.31	151	5	0.4	656
Wildcat Road	2.32	389	12	0.9	608
Black Rock Road	2.46	245	8	0.5	605
River Road (Exceptional Rustic Segment)	5.06	60	4	0.1	601

Table 10. Non-Intersection Crash Rates per 100,000,000 VMT – Nominated Rustic Roads (Top 5) (2015-2020)

Road Name	Length (Miles)	AADT	Number of Crashes	Crashes per Mile per Year	Crash Rate
Aitcheson Lane	0.22	112	1	0.8	1,860
Mount Carmel Cemetery Road	0.28	141	1	0.6	1,175
Holsey Road	0.68	203	1	0.2	331
Lewisdale Road	2.24	711	7	0.5	201
Mullinix Mill Road	1.99	246	2	0.2	186

Removing intersection crashes shows that the crash rates are substantially lower along the roadways than at the intersections. For existing rustic roads, the average crash rate drops from 221 to 91 per 100M VMT ([100M x 388] / [365 x 6 x 194,408 daily VMT]). For nominated roads, the average drops from 394 to 88 per 100M VMT ([100M x 53] / [365 x 6 x 27,591 daily VMT]). Still, the tables above indicate roads with the highest non-intersection crash rates and should be used as a guide to prioritize which roads should be more closely studied for possible safety improvements. The separate crash maps should be consulted for the locations of the crashes.

Crash Analysis – Serious and Fatal Crashes

A final analysis only considered serious and fatal crashes along the existing and nominated rustic roads. Montgomery County has adopted a Vision Zero initiative, with the aim of zero crashes resulting in fatalities or serious injuries by 2030. Although minor-injury crashes and property-damage-only crashes are not trivial matters, the Vision Zero plan aims to eliminate fatalities and serious injuries, so special attention has been paid to these much more serious crashes. Safety is the top priority for all the county's roadways.

There were 61 fatal and serious crashes along existing and nominated rustic roads in the 6-year study period; 33 of these were not at intersections. The fatal and serious crash rates per 100 million VMT are shown in the tables below.

Table 11. Non-Intersection Fatal and Serious Crash Rates per 100,000,000 VMT – Existing Rustic Roads (Top 10)[4] (2015-2020)

Road Name	Length (Miles)	AADT	Fatal Crashes	Serious Injury Crashes	Crash Rate
Clopper Road	0.10	912		1	526
Edwards Ferry Road	4.34	250		4	169
Mount Nebo Road	1.60	201		1	142
Burnt Hill Road	2.77	389	1	1	85
Batson Road	1.27	1,024		2	70
Hawkes Road	1.04	705	1		62
South Glen Road	0.82	2,095	1	1	53
Brighton Dam Road	1.28	682		1	52
Slidell Road	3.65	247		1	51
Wildcat Road	2.32	389		1	51

The highest crash rate for non-intersection fatal and serious crashes along existing rustic roads is along Clopper Road. Clopper Road had one serious crash during the six-year study period, but the relatively short road segment (0.1 mile) and slightly higher than average AADT (912) skew the rate high. Edwards Ferry Road has the most fatal and serious crashes (4), but the road is relatively long at 4.34 miles.

[4] Table excludes parking lot fatality along White Ground Road.

Table 12. Non-Intersection Fatal and Serious Crash Rates per 100,000,000 VMT – Nominated Rustic Roads (Top 3)[5] (2015-2020)

Road Name	Length (Miles)	AADT	Fatal Crashes	Serious Injury Crashes	Crash Rate
Brown Church Road	1.21	419		1	90
Barnesville Road (MD 117)	1.07	5,250		1	8
Bucklodge Road (MD 117)	4.11	1,371		1	8

The highest crash rate for non-intersection fatal and serious crashes along nominated rustic roads is along Brown Church Road. However, there was only one serious injury crash along the road in the six-year study period, showing how the small number of crashes on relatively short roads with low traffic volumes can skew the rates when normalized to 100,000,000 vehicle miles traveled. Indeed, it would take approximately 500 years for this many miles to be traveled given today's traffic volume. In fact, all three of the nominated rustic roads in the table above have exactly one serious crash each. Note also that the nominated section of Barnesville Road is not recommended as a rustic road. There were no fatal crashes along the nominated rustic roads.

Bicycle and Pedestrian Crashes

The roads in the following table had crashes that involved a bicycle or pedestrian. The number of crashes involving these modes of travel over the six-year study period are shown in the table.

[5] Only the three roads listed had non-intersection fatal or serious crashes.

Table 13. Crashes Involving Bicycles or Pedestrians – Existing Rustic Roads (2015-2020)

Road Name	All Crashes		Non-Intersection Crashes	
	Bicycle Involved	Pedestrian Involved	Bicycle Involved	Pedestrian Involved
Barnesville Road	3			
Batchellors Forest Road	1			
Beallsville Road (MD 117)		1		
Brookeville Road	2			
Clopper Road	1		1	
Comus Road	1		1	
Davis Mill Road	1	1	1	1
Edwards Ferry Road		1		1
Glen Road (Rustic Segment)	1	1		1
Gregg Road	1			
Howard Chapel Road		1		1
Meeting House Road		1		
Oak Hill Road		1		
Old Hundred Road (MD 109)	1			
Peach Tree Road	2			
Query Mill Road	1			
South Glen Road		1		1
Stringtown Road		1		1
White Ground Road	1		1	
Whites Ferry Road	1		1	

There were no crashes that involved a bicycle or a pedestrian along nominated roads.

With very few exceptions, rustic roads do not have sidewalks, sidepaths, or bike lanes. Bicyclists and pedestrians must therefore use the roadway itself. While many rustic roads are very popular with cyclists, due to either the distance from destinations or caution about safety, pedestrian volumes tend to be low along rustic roads. The number of crashes involving a pedestrian is very low most likely because the number of pedestrians using the road is quite low.

Most of the traffic counts available do not include cyclists, but the counts along the 69 road segments analyzed by the firm VHB included these road users.

Table 14. Roads with Cyclists (7-Day Counts) (Top 10)[6] (2015-2020)

Road Name	Cyclists
Glen Road (Exceptional Rustic Segment)	342
South Glen Road	271
Old Bucklodge Lane	195
Glen Mill Road (Rustic Segment)	179
Hughes Road	150
Glen Mill Road (Exceptional Rustic Segment)	140
River Road (Rustic Segment)	102
Turkey Foot Road	99
Howard Chapel Road	93
Berryville Road	90

The traffic counts were conducted from mid-October 2020 through the end of February 2021; the counts would have likely been much higher in the warmer months of the year. But the table above gives a good indication of where cycling is the most popular. Most of the roads above are in the Potomac and Darnestown area. These roads have many more people living along and near them compared to most of the other rustic roads.

Predictive Safety Analysis

Transportation planners in Montgomery Planning's Countywide Planning and Policy Division developed models to estimate the number of predicted crashes at intersections and segments throughout the county for different crash types. They then looked at the results across street types, averaging out the crash risk for all roads with that same classification. The result of their analysis is shown in Table 15.

[6] Only the top 10 of the 69 existing and nominated road segments evaluated by VHB are included in this list.

Table 15. Average Crash Risk by Complete Streets Design Guide (CSDG) Street Type

		Intersection Crash Types					Segment Crash Types	
CSDG Street Type	# Ints.	Ped Dark	Bike	Left Turn	Angle	# Segs.	Ped Seg	Single Vehicle
Major Highway	18	0.05	0.03	0.60	1.08	12	0.02	1.06
Boulevard	1,191	0.02	0.03	0.28	0.81	1,145	0.01	0.13
Downtown Blvd	134	0.16	0.05	0.43	1.09	161	0.04	0.09
Town Center Blvd	225	0.06	0.03	0.31	1.33	272	0.03	0.10
Downtown Street	210	0.06	0.02	0.12	0.33	339	0.01	0.03
Town Center Street	138	0.01	0.01	0.08	0.32	186	0.01	0.05
Neighborhood Conn	2,825	0.00	0.00	0.02	0.15	2,956	0.00	0.03
Country Conn	280	0.00	0.00	0.05	0.22	213	0.00	0.22
Country Road	90	0.00	0.00	0.01	0.12	60	0.00	0.06
Industrial Street	50	0.01	0.01	0.10	0.28	58	0.01	0.04
Neighborhood Street	9,132	0.00	0.00	0.00	0.03	21,656	0.00	0.02
Rustic Road*	183	0.00	0.00	0.01	0.26	317	0.00	0.12

Highlighted cells have the highest value for each column.

* Includes Exceptional Rustic Roads

The most instructive comparison is between country roads, neighborhood streets, and rustic roads (highlighted in yellow). This is because country roads and neighborhood streets are the most similar street types to rustic roads.

For some studied crash types, all three street types have very few predicted crashes: pedestrian crashes after dark at intersections, bicycle intersection crashes, left-turn crashes at intersections (all modes) and pedestrian crashes along segments.

For the other crash types, rustic roads are estimated to have more crashes than their comparable counterparts; estimated crashes are double the estimates on country roads for both angle crashes at four-legged intersections and single-vehicle crashes along road segments. Rustic roads are also far higher than neighborhood streets for these crash types.

These predictions cannot be improved simply by reclassifying a rustic road as a country road or neighborhood street—it will still be the same road. The analysis shows that there are fundamental differences between the functioning of rustic roads compared to other fairly low-volume roads in the county. There appear to be greater safety deficiencies on rustic roads relative to other fairly low-volume roads, such as country roads or neighborhood streets. The specific deficiencies should be identified and addressed.

Summary

Although the formula used to calculate crash rates yields seemingly high numbers for the existing and nominated rustic roads in this study, the rates are useful for comparing the roads against each other and should be used as a starting point to examine where and perhaps why along these roads the crashes may be occurring. After removing intersection crashes, none of the roads has a crash rate high enough to suggest that the road is so unsafe that it should not be classified rustic or exceptional rustic.

A few roads have traffic volumes that may not be consistent with a rustic road. Any road with an average daily traffic count over 3,000 trips per day should receive extra scrutiny when determining whether it should be added to or remain in the program. In one case (Old Hundred Road [MD 109] between Peach Tree Road and Frederick Road [MD 355]), the combination of a high traffic count and a clustering of crashes at a series of interstate ramp intersections led to a recommendation that one segment of one rustic road be removed from the program.

The data tables and crash maps should be used together to evaluate overall road safety and to inform making improvements to the roads to eliminate serious injury and fatal crashes. The Predictive Safety Analysis demonstrates that maintaining roads in their current configuration comes at the cost of additional crashes with fatalities and serious injuries when compared to other low-volume roads in the county.

One alternative—reconstructing the rustic roads in the county to a higher design standard—also has a cost. Not only would it be an extremely costly undertaking to rebuild and maintain these roads, but widening them, installing modern drainage facilities, laying sidewalks, and making other necessary changes would certainly have an environmental impact on the land through which these roads travel, much of which has been left in a more natural state than roads in more urban and suburban areas. More modern road designs could also lead to an increase in vehicle miles traveled when we are trying to encourage fewer cars on the roads in general. Finally, the character these unique roads bring to the county would be lost.

As an alternative, Montgomery Planning's *Vision Zero Community Toolkit* suggests numerous treatments for country roads and country connectors that could be applied to rustic roads to improve their safety. Many of these treatments are relatively low-cost options. For example, shoulder or centerline rumble strips, shoulder markings, or intersection improvements, such as all-way stop controls, can all be used to improve the safety of these roads without severely diminishing their unique character.

When isolating the intersection crashes from the non-intersection crashes, we liked to say that the crashes at the intersections were "not the road's fault." It is an indication that the intersection could use safety improvements, while the road itself may be safe. On the other hand, this implies that non-intersection crashes *are* the road's fault. While this analysis did not indicate that any nominated or existing rustic road was too unsafe to have a rustic designation, it is clear that we are a long way from meeting Vision Zero. If there is a perception—or indeed, a reality—that rustic roads are less safe than other county roads, then efforts must be made to improve them.

Crash and Traffic Analysis - Existing Rustic Roads

Road Name	All Crashes							Non-Intersection Crashes Only							Road Length (Miles)	Crashes per Mile per Year (All Crashes)	Serious and Fatal Crashes per Mile per Year (All Crashes)	Crashes per Mile per Year (Non-Intersection)	Serious and Fatal Crashes per Mile per Year (Non-Intersection)
	Number of Crashes	Bicycle Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury	Total Non-Intersection Crashes	Bicycle Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury					
Avoca Ln	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23	0.0	0.0	0.0	0.0
Barnesville Rd	46	3	-	1	2	16	27	18	-	-	-	1	3	14	5.57	1.4	0.1	0.5	0.0
Batchellors Forest Rd	20	1	-	-	-	7	13	11	-	-	-	-	3	8	2.38	1.4	0.0	0.8	0.0
Batson Rd	10	-	-	-	3	1	6	3	-	-	-	2	-	1	1.27	1.3	0.4	0.4	0.3
Beallsville Rd (MD 109)	34	-	1	-	2	16	16	21	-	-	-	1	7	13	3.61	1.6	0.1	1.0	0.0
Belle Cote Dr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.37	0.0	0.0	0.0	0.0
Bentley Rd	3	-	-	-	-	1	2	1	-	-	-	-	1	-	0.49	1.0	0.0	0.3	0.0
Berryville Rd	9	-	-	-	-	7	2	1	-	-	-	-	-	1	3.49	0.4	0.0	0.0	0.0
Big Woods Rd	6	-	-	-	-	2	4	1	-	-	-	-	-	1	2.54	0.4	0.0	0.1	0.0
Black Rock Rd	17	-	-	-	1	5	11	8	-	-	-	-	4	4	2.46	1.2	0.1	0.5	0.0
Boswell Ln	6	-	-	-	1	-	5	3	-	-	-	1	-	2	0.72	1.4	0.2	0.7	0.2
Brighton Dam Rd	8	-	-	-	1	-	7	5	-	-	-	1	-	4	1.28	1.0	0.1	0.6	0.1
Brookeville Rd	26	2	-	-	-	8	18	11	-	-	-	-	4	7	2.68	1.6	0.0	0.7	0.0
Bryants Nursery Rd	7	-	-	-	-	3	4	3	-	-	-	-	1	2	1.46	0.8	0.0	0.3	0.0
Budd Rd	3	-	-	-	-	1	2	3	-	-	-	-	1	2	1.12	0.4	0.0	0.4	0.0
Burdette Ln	1	-	-	-	-	1	-	-	-	-	-	-	-	-	0.43	0.4	0.0	0.0	0.0
Burnt Hill Rd	15	-	-	1	2	1	11	5	-	-	1	1	-	3	2.77	0.9	0.2	0.3	0.1
Cattail Rd	9	-	-	-	-	3	6	7	-	-	-	-	1	6	0.97	1.5	0.0	1.2	0.0
Clopper Rd	4	1	-	-	1	1	2	1	1	-	-	1	-	-	0.10	7.0	1.8	1.8	1.8
Club Hollow Rd	6	-	-	-	-	2	4	4	-	-	-	-	2	2	2.01	0.5	0.0	0.3	0.0
Comus Rd	31	1	-	1	1	14	15	6	1	-	1	1	2	2	3.32	1.6	0.1	0.3	0.1
Davis Mill Rd	38	1	1	-	2	8	28	10	1	1	-	-	4	6	3.77	1.7	0.1	0.4	0.0
Dustin Rd	1	-	-	-	-	-	1	-	-	-	-	-	-	-	0.59	0.3	0.0	0.0	0.0
Edwards Ferry Rd	20	-	1	-	5	6	9	12	-	1	-	4	3	5	4.34	0.8	0.2	0.5	0.2
Elmer School Rd	5	-	-	-	-	1	4	1	-	-	-	-	-	1	3.19	0.3	0.0	0.1	0.0
Elton Farm Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.88	0.0	0.0	0.0	0.0
Frederick Rd (MD 355)	33	-	-	-	1	9	23	20	-	-	-	1	6	13	0.39	14.0	0.4	8.5	0.4
Game Preserve Rd	71	-	-	-	2	28	41	34	-	-	-	1	15	18	1.66	7.1	0.2	3.4	0.1
Glen Mill Rd	17	-	-	-	-	4	13	3	-	-	-	-	-	3	1.87	1.5	0.0	0.3	0.0
Glen Rd (Exceptional Rustic)	54	-	-	-	-	16	38	28	-	-	-	-	9	19	1.34	6.7	0.0	3.5	0.0
Glen Rd (Rustic)	25	1	1	-	3	8	14	9	-	1	-	2	3	4	2.98	1.4	0.2	0.5	0.1
Gregg Rd	7	1	-	-	-	2	5	-	-	-	-	-	-	-	1.88	0.6	0.0	0.0	0.0
Haines Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.83	0.0	0.0	0.0	0.0
Haviland Mill Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.05	0.0	0.0	0.0	0.0
Hawkes Rd	20	-	-	1	1	10	8	1	-	-	1	-	-	-	1.04	3.2	0.3	0.2	0.2
Hipsley Mill Rd	12	-	-	-	-	8	4	1	-	-	-	-	-	1	1.97	1.0	0.0	0.1	0.0
Howard Chapel Rd	8	-	1	-	-	5	3	2	-	1	-	-	1	1	1.69	0.8	0.0	0.2	0.0
Hoyles Mill Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.35	0.0	0.0	0.0	0.0
Hughes Rd	3	-	-	-	-	-	3	2	-	-	-	-	-	2	2.77	0.2	0.0	0.1	0.0
Hunting Quarter Rd	2	-	-	-	-	1	1	1	-	-	-	-	1	-	1.61	0.2	0.0	0.1	0.0
Hyattstown Mill Rd	3	-	-	-	-	-	3	-	-	-	-	-	-	-	0.77	0.6	0.0	0.0	0.0
Jerusalem Rd	10	-	-	-	1	4	5	4	-	-	-	1	3	-	1.67	1.0	0.1	0.4	0.1
Johnson Rd	1	-	-	-	-	-	1	1	-	-	-	-	-	1	0.42	0.4	0.0	0.4	0.0
Jonesville Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.47	0.0	0.0	0.0	0.0
Kingsley Rd	2	-	-	-	-	-	2	1	-	-	-	-	-	1	0.64	0.5	0.0	0.3	0.0
Kingstead Rd	7	-	-	-	-	1	6	3	-	-	-	-	1	2	0.90	1.3	0.0	0.6	0.0
Link Rd	2	-	-	-	-	1	1	-	-	-	-	-	-	-	0.59	0.6	0.0	0.0	0.0
Martinsburg Rd	6	-	-	-	2	-	4	2	-	-	-	-	-	2	4.17	0.2	0.1	0.1	0.0
Meeting House Rd	16	-	1	-	-	6	10	1	-	-	-	-	-	1	0.41	6.4	0.0	0.4	0.0
Montevideo Rd	4	-	-	-	-	2	2	3	-	-	-	-	2	1	2.24	0.3	0.0	0.2	0.0
Moore Rd	4	-	-	-	-	1	3	-	-	-	-	-	-	-	1.68	0.4	0.0	0.0	0.0
Mount Ephraim Rd	5	-	-	-	-	2	3	1	-	-	-	-	-	1	2.41	0.3	0.0	0.1	0.0
Mount Nebo Rd	3	-	-	-	1	1	1	3	-	-	-	1	1	1	1.60	0.3	0.1	0.3	0.1
Mountain View Rd	3	-	-	-	-	1	2	-	-	-	-	-	-	-	0.73	0.7	0.0	0.0	0.0

Crash and Traffic Analysis - Existing Rustic Roads

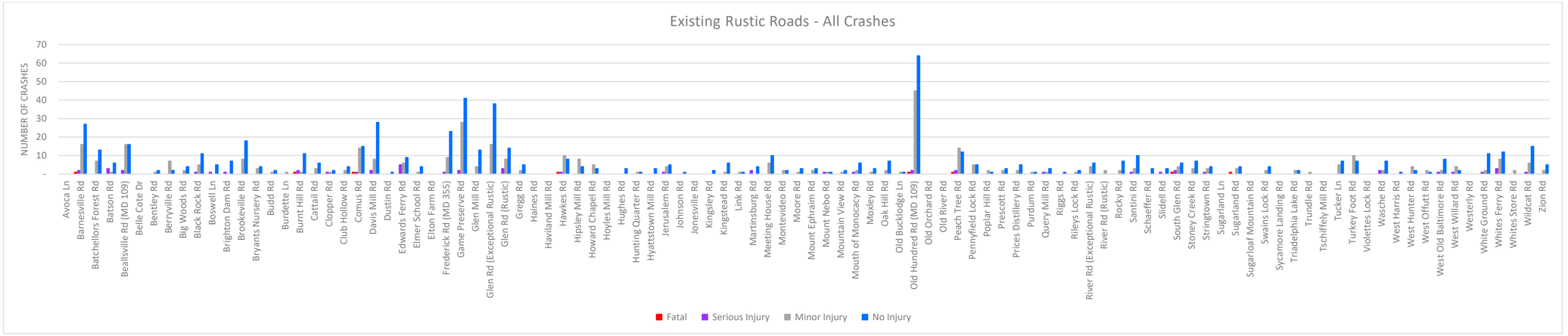
Road Name	All Crashes							Non-Intersection Crashes Only							Road Length (Miles)	Crashes per Mile per Year (All Crashes)	Serious and Fatal Crashes per Mile per Year (All Crashes)	Crashes per Mile per Year (Non-Intersection)	Serious and Fatal Crashes per Mile per Year (Non-Intersection)
	Number of Crashes	Bicycle Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury	Total Non-Intersection Crashes	Bicycle Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury					
Mouth of Monocacy Rd	9	-	-	-	1	2	6	-	-	-	-	-	-	-	2.48	0.6	0.1	0.0	0.0
Moxley Rd	4	-	-	-	-	1	3	-	-	-	-	-	-	-	2.22	0.3	0.0	0.0	0.0
Oak Hill Rd	9	-	1	-	-	2	7	4	-	-	-	-	1	3	1.44	1.0	0.0	0.5	0.0
Old Bucklodge Ln	2	-	-	-	-	1	1	-	-	-	-	-	-	-	1.99	0.2	0.0	0.0	0.0
Old Hundred Rd (MD 109)	112	1	-	1	2	45	64	26	-	-	-	1	9	16	5.71	3.3	0.1	0.8	0.0
Old Orchard Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.46	0.0	0.0	0.0	0.0
Old River Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.26	0.0	0.0	0.0	0.0
Peach Tree Rd	29	2	-	1	2	14	12	10	-	-	-	-	3	7	9.76	0.5	0.1	0.2	0.0
Pennyfield Lock Rd	10	-	-	-	-	5	5	-	-	-	-	-	-	-	0.92	1.8	0.0	0.0	0.0
Poplar Hill Rd	3	-	-	-	-	2	1	-	-	-	-	-	-	-	0.71	0.7	0.0	0.0	0.0
Prescott Rd	5	-	-	-	-	2	3	-	-	-	-	-	-	-	0.41	2.0	0.0	0.0	0.0
Prices Distillery Rd	7	-	-	-	-	2	5	4	-	-	-	-	2	2	3.01	0.4	0.0	0.2	0.0
Purdum Rd	2	-	-	-	-	1	1	-	-	-	-	-	-	-	1.46	0.2	0.0	0.0	0.0
Query Mill Rd	5	1	-	-	1	1	3	1	-	-	-	-	-	1	1.56	0.5	0.1	0.1	0.0
Riggs Rd	1	-	-	-	-	-	1	-	-	-	-	-	-	-	0.69	0.2	0.0	0.0	0.0
Rileys Lock Rd	3	-	-	-	-	1	2	1	-	-	-	-	-	1	0.68	0.7	0.0	0.2	0.0
River Rd (Exceptional Rustic)	10	-	-	-	-	4	6	4	-	-	-	-	1	3	5.06	0.3	0.0	0.1	0.0
River Rd (Rustic)	2	-	-	-	-	2	-	-	-	-	-	-	-	-	1.51	0.2	0.0	0.0	0.0
Rocky Rd	9	-	-	-	-	2	7	5	-	-	-	-	1	4	2.31	0.7	0.0	0.4	0.0
Santini Rd	14	-	-	-	1	3	10	-	-	-	-	-	-	-	0.58	4.0	0.3	0.0	0.0
Schaeffer Rd	3	-	-	-	-	-	3	3	-	-	-	-	-	3	2.23	0.2	0.0	0.2	0.0
Slidell Rd	4	-	-	-	1	-	3	1	-	-	-	1	-	-	3.65	0.2	0.0	0.0	0.0
South Glen Rd	13	-	1	1	2	4	6	7	-	1	1	1	3	2	0.82	2.7	0.6	1.4	0.4
Stoney Creek Rd	10	-	-	-	-	3	7	-	-	-	-	-	-	-	1.46	1.1	0.0	0.0	0.0
Stringtown Rd	8	-	1	-	1	3	4	5	-	1	-	1	1	3	2.13	0.6	0.1	0.4	0.1
Sugarland Ln	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.43	0.0	0.0	0.0	0.0
Sugarland Rd	8	-	-	1	-	3	4	1	-	-	-	-	1	-	4.75	0.3	0.0	0.0	0.0
Sugarloaf Mountain Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13	0.0	0.0	0.0	0.0
Swains Lock Rd	6	-	-	-	-	2	4	1	-	-	-	-	-	1	0.30	3.4	0.0	0.6	0.0
Sycamore Landing Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.82	0.0	0.0	0.0	0.0
Triadelphia Lake Rd	4	-	-	-	-	2	2	-	-	-	-	-	-	-	0.85	0.8	0.0	0.0	0.0
Trundle Rd	1	-	-	-	-	1	-	-	-	-	-	-	-	-	0.86	0.2	0.0	0.0	0.0
Tschiffely Mill Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.68	0.0	0.0	0.0	0.0
Tucker Ln	12	-	-	-	-	5	7	2	-	-	-	-	1	1	1.00	2.0	0.0	0.3	0.0
Turkey Foot Rd	17	-	-	-	-	10	7	3	-	-	-	-	3	-	2.67	1.1	0.0	0.2	0.0
Violettes Lock Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58	0.0	0.0	0.0	0.0
Wasche Rd	11	-	-	-	2	2	7	3	-	-	-	-	1	2	2.73	0.7	0.1	0.2	0.0
West Harris Rd	1	-	-	-	-	-	1	-	-	-	-	-	-	-	2.08	0.1	0.0	0.0	0.0
West Hunter Rd	6	-	-	-	-	4	2	4	-	-	-	-	3	1	1.66	0.6	0.0	0.4	0.0
West Offutt Rd	3	-	-	-	-	2	1	3	-	-	-	-	2	1	2.23	0.2	0.0	0.2	0.0
West Old Baltimore Rd	11	-	-	-	1	2	8	3	-	-	-	-	-	3	3.99	0.5	0.0	0.1	0.0
West Willard Rd	7	-	-	-	1	4	2	5	-	-	-	1	2	2	3.55	0.3	0.0	0.2	0.0
Westerly Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.31	0.0	0.0	0.0	0.0
White Ground Rd	14	1			1	2	11	9	1			1		8	4.49	0.5	0.0	0.3	0.0
Whites Ferry Rd	23	1	-	-	3	8	12	14	1	-	-	1	6	7	3.93	1.0	0.1	0.6	0.0
Whites Store Rd	2	-	-	-	-	2	-	1	-	-	-	-	1	-	1.80	0.2	0.0	0.1	0.0
Wildcat Rd	22	-	-	-	1	6	15	12	-	-	-	1	4	7	2.32	1.6	0.1	0.9	0.1
Zion Rd	7	-	-	-	-	2	5	4	-	-	-	-	1	3	1.53	0.8	0.0	0.4	0.0

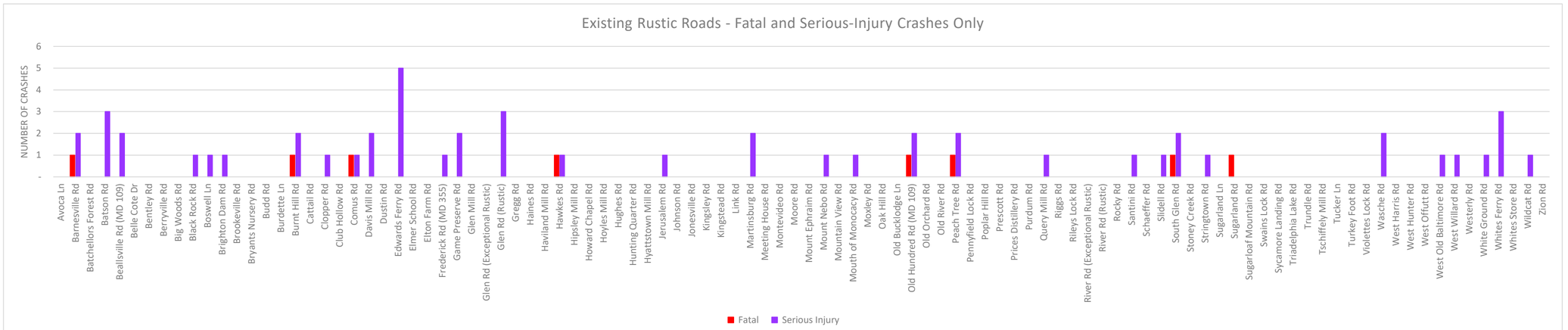
Crash and Traffic Analysis - Existing Rustic Roads

Road Name	AADT	Crashes per 100,000,000 VMT	Serious and Fatal Crashes per 100,000,000 VMT	Non-Intersection Crashes per 100,000,000 VMT	Non-Intersection Serious and Fatal Crashes per 100,000,000 VMT	AADT Source	AADT Comments
Avoca Ln	65	-	-	-	-	VHB	
Barnesville Rd	3,481	108.38	7.07	42.41	2.36	SHA	SHA says 3,931 near eastern end and 3,031 on western end. Used average of SHA numbers.
Batchellors Forest Rd	1,216	315.32	-	173.42	-	MPT	MC DTE turning movement counts 10/8/2015. SHA has 1,100 in 13-hour count on 3/7/2012.
Batson Rd	1,024	350.02	105.01	105.01	70.00	VHB	
Beallsville Rd (MD 109)	1,590	270.35	15.90	166.98	7.95	SHA	
Belle Cote Dr	75	-	-	-	-	VHB	
Bentley Rd	940	298.96	-	99.65	-	MPT	2002 ADT count from 2015 Sandy Spring RVP
Berryville Rd	154	764.09	-	84.90	-	VHB	
Big Woods Rd	226	477.22	-	79.54	-	VHB	
Black Rock Rd	245	1,286.27	75.66	605.30	-	VHB	
Boswell Ln	1,891	200.05	33.34	100.03	33.34	SHA	
Brighton Dam Rd	682	417.68	52.21	261.05	52.21	SHA	
Brookeville Rd	3,715	119.41	-	50.52	-	SHA	
Bryants Nursery Rd	135	1,624.14	-	696.06	-	VHB	
Budd Rd	155	790.67	-	790.67	-	VHB	
Burdette Ln	185	578.12	-	-	-	VHB	
Burnt Hill Rd	389	636.33	127.27	212.11	84.84	VHB	
Cattail Rd	2,375	178.03	-	138.47	-	MCDOT	From bridge inventory just to the west of the rustic road designation in Poolesville
Clopper Rd	912	2,103.07	525.77	525.77	525.77	SHA	SHA says 912 on 9/20/2018. MARC RCSP says SHA says "fewer than 700 in 2014"
Club Hollow Rd	416	327.49	-	218.33	-	MCDOT	
Comus Rd	745	572.20	36.92	110.75	36.92	SHA	
Davis Mill Rd	640	719.26	37.86	189.28	-	VHB	
Dustin Rd	202	381.14	-	-	-	VHB	
Edwards Ferry Rd	250	842.66	210.67	505.60	168.53	VHB	
Elmer School Rd	211	339.66	-	67.93	-	VHB	
Elton Farm Rd	120	-	-	-	-	MPT	Assume 120 based on 6 houses, trailhead, and horse operation
Frederick Rd (MD 355)	15,996	239.33	7.25	145.05	7.25	SHA	SHA says 16,325 at Fire Tower Road on 8/21/2019; 15,667 at MD-109 on 8/30/2016
Game Preserve Rd	888	2,198.39	61.93	1,052.75	30.96	VHB	
Glen Mill Rd	1,927	215.82	-	38.09	-	VHB	
Glen Rd (Exceptional Rustic)	2,393	767.79	-	398.12	-	VHB	SHA says 3,841 (west) and 3,551 (east)
Glen Rd (Rustic)	5,031	76.25	9.15	27.45	6.10	SHA	
Gregg Rd	390	435.72	-	-	-	MCDOT	
Haines Rd	63	-	-	-	-	VHB	
Haviland Mill Rd	309	-	-	-	-	VHB	
Hawkes Rd	705	1,241.60	124.16	62.08	62.08	VHB	
Hipsley Mill Rd	398	700.33	-	58.36	-	VHB	
Howard Chapel Rd	452	477.48	-	119.37	-	VHB	
Hoyles Mill Rd	30	-	-	-	-	MPT	10 trips each per 3 houses
Hughes Rd	389	127.13	-	84.76	-	VHB	
Hunting Quarter Rd	105	539.49	-	269.75	-	MPT	Approx. 35 parking spaces (assume 3 trips per day); park access only (no residences)
Hyattstown Mill Rd	50	3,553.51	-	-	-	MCDOT	
Jerusalem Rd	1,020	267.90	26.79	107.16	26.79	MCDOT	
Johnson Rd	71	1,537.20	-	1,537.20	-	VHB	
Jonesville Rd	80	-	-	-	-	VHB	
Kingsley Rd	54	2,640.20	-	1,320.10	-	VHB	
Kingstead Rd	530	671.39	-	287.74	-	SHA	AADT from more heavily traveled part of Kingstead Rd to the east of the rustic road
Link Rd	119	1,310.91	-	-	-	VHB	
Martinsburg Rd	264	249.11	83.04	83.04	-	VHB	
Meeting House Rd	800	2,206.56	-	137.91	-	MPT	SHA says 532 on 6/12/2014 from 6AM - 7PM; 2014 ADT count from 2015 Sandy Spring RVP is 800 trips
Montevideo Rd	175	465.67	-	349.25	-	MCDOT	
Moore Rd	250	433.67	-	-	-	MPT	~250 trips disappear on Bucklodge between SHA measuring points
Mount Ephraim Rd	751	125.98	-	25.20	-	SHA	
Mount Nebo Rd	201	425.64	141.88	425.64	141.88	VHB	
Mountain View Rd	1,126	167.53	-	-	-	VHB	

Crash and Traffic Analysis - Existing Rustic Roads

Road Name	AADT	Crashes per 100,000,000 VMT	Serious and Fatal Crashes per 100,000,000 VMT	Non-Intersection Crashes per 100,000,000 VMT	Non-Intersection Serious and Fatal Crashes per 100,000,000 VMT	AADT Source	AADT Comments
Mouth of Monocacy Rd	155	1,067.83	118.65	-	-	MCDOT	
Moxley Rd	138	596.00	-	-	-	VHB	
Oak Hill Rd	901	316.94	-	140.86	-	VHB	
Old Bucklodge Ln	139	330.67	-	-	-	VHB	
Old Hundred Rd (MD 109)	8,200	109.15	2.92	25.34	0.97	SHA	SHA shows a 2019 AADT of 2,850 between Thurston Road and I-270; the 8,200 AADT is between I-270 and MD 355
Old Orchard Rd	157	-	-	-	-	VHB	
Old River Rd	210	-	-	-	-	MPT	1 house at 10 trips per day + 100 per day for each of 2 businesses
Peach Tree Rd	556	243.97	25.24	84.13	-	VHB	
Pennyfield Lock Rd	544	911.13	-	-	-	MCDOT	
Poplar Hill Rd	100	1,938.88	-	-	-	VHB	
Prescott Rd	-	-	-	-	-	MPT	Gated road now a trail.
Prices Distillery Rd	475	223.42	-	127.67	-	VHB	
Purdum Rd	700	89.24	-	-	-	MCDOT	
Query Mill Rd	475	308.40	61.68	61.68	-	VHB	
Riggs Rd	20	3,308.15	-	-	-	MPT	1 tree farm/commercial driveway access @ 20 trips per day
Rileys Lock Rd	220	921.81	-	307.27	-	MPT	2 houses @ 10 trips/day + Calleva @ 50/day + boat ramp/parking lot for C&O @ 100/day + M-NCPPC @ 50/day
River Rd (Exceptional Rustic)	60	1,503.60	-	601.44	-	VHB	
River Rd (Rustic)	253	239.64	-	-	-	VHB	
Rocky Rd	151	1,180.46	-	655.81	-	VHB	
Santini Rd	174	6,344.21	453.16	-	-	VHB	
Schaeffer Rd	2,964	20.74	-	20.74	-	MCDOT	
Slidell Rd	247	202.43	50.61	50.61	50.61	VHB	
South Glen Rd	2,095	346.87	80.05	186.78	53.36	VHB	
Stoney Creek Rd	1,061	293.78	-	-	-	VHB	
Stringtown Rd	1,556	110.01	13.75	68.75	13.75	VHB	
Sugarland Ln	400	-	-	-	-	MCDOT	
Sugarland Rd	186	413.60	51.70	51.70	-	VHB	
Sugarloaf Mountain Rd	751	-	-	-	-	SHA	Used traffic count from Mount Ephraim Road per SHA data
Swains Lock Rd	80	11,569.73	-	1,928.29	-	MPT	3 houses @ 10 trips per day + C&O Canal parking lot @ 50 trips per day
Sycamore Landing Rd	115	-	-	-	-	MCDOT	
Triadelphia Lake Rd	149	1,435.24	-	-	-	VHB	
Trundle Rd	140	377.14	-	-	-	MPT	7 houses @ 10 trips per day
Tschiffely Mill Rd	40	-	-	-	-	MPT	2 houses used by Calleva @ 10 trips per day apiece; small parking lot at end of road @ 20 trips per day
Tucker Ln	338	1,614.35	-	269.06	-	VHB	SHA says 441
Turkey Foot Rd	797	364.74	-	64.37	-	VHB	SHA says 2,101
Violettes Lock Rd	102	-	-	-	-	MPT	5 houses @ 10 trips per day + 2 extra for architect; parking lot for C&O @ 50 trips per day
Wasche Rd	265	693.24	126.04	189.07	-	MPT	MCDOT difference from Whites Ferry Rd on either side of Wasche plus half of Edwards Ferry traffic (270)
West Harris Rd	135	162.70	-	-	-	MCDOT	
West Hunter Rd	250	661.57	-	441.05	-	MPT	18 houses @ 10 trips/day + 10/day for equestrian facility + 10/day for cemetery + 50 cut-thru/day
West Offutt Rd	250	245.85	-	245.85	-	MPT	Estimate based on West Willard counts and other, similar cut-through opportunities
West Old Baltimore Rd	100	1,257.46	114.31	342.94	-	VHB	
West Willard Rd	400	225.34	32.19	160.95	32.19	MPT	MCDOT shows 115 at the south end near River Road; add in golf course and Isaac Walton League
Westerly Rd	300	-	-	-	-	MPT	Estimate based on West Willard counts and other cut-through opportunities
White Ground Rd	625	227.80	16.27	146.44	16.27	SHA	The fatal crash in a parking lot next to the road has been removed from the crash counts
Whites Ferry Rd	1,930	138.32	18.04	84.20	6.01	MCDOT	
Whites Store Rd	250	202.95	-	101.47	-	MPT	~250 trips disappear on Bucklodge between SHA measuring points
Wildcat Rd	389	1,115.13	50.69	608.25	50.69	MCDOT	
Zion Rd	2,230	93.90	-	53.66	-	MCDOT	


Existing Rustic Roads - All Crashes
NUMBER OF CRASHES
70
60
50
40
30
20
10
-
Avoca Ln
Barnesville Rd
Batchellors Forest Rd
Batson Rd
Beallsville Rd (MD 109)
Belle Cote Dr
Bentley Rd
Berryville Rd
Big Woods Rd
Black Rock Rd
Boswell Ln
Brighton Dam Rd
Brookeville Rd
Bryants Nursery Rd
Budd Rd
Burdette Ln
Burnt Hill Rd
Cattail Rd
Clopper Rd
Club Hollow Rd
Comus Rd
Davis Mill Rd
Dustin Rd
Edwards Ferry Rd
Elmer School Rd
Elton Farm Rd
Frederick Rd (MD 355)
Game Preserve Rd
Glen Mill Rd
Glen Rd (Exceptional Rustic)
Glen Rd (Rustic)
Gregg Rd
Haines Rd
Haviland Mill Rd
Hawkes Rd
Hipsley Mill Rd
Howard Chapel Rd
Hoyles Mill Rd
Hughes Rd
Hunting Quarter Rd
Hyattstown Mill Rd
Jerusalem Rd
Johnson Rd
Jonesville Rd
Kingsley Rd
Kingstead Rd
Link Rd
Martinsburg Rd
Meeting House Rd
Montevideo Rd
Moore Rd
Mount Ephraim Rd
Mount Nebo Rd
Mountain View Rd
Mouth of Monocacy Rd
Moxley Rd
Oak Hill Rd
Old Bucklodge Ln
Old Hundred Rd (MD 109)
Old Orchard Rd
Old River Rd
Peach Tree Rd
Pennyfield Lock Rd
Poplar Hill Rd
Prescott Rd
Prices Distillery Rd
Purdum Rd
Query Mill Rd
Riggs Rd
Rileys Lock Rd
River Rd (Exceptional Rustic)
River Rd (Rustic)
Rocky Rd
Santini Rd
Schaeffer Rd
Slidell Rd
South Glen Rd
Stoney Creek Rd
Stringtown Rd
Sugarland Ln
Sugarland Rd
Sugarloaf Mountain Rd
Swains Lock Rd
Sycamore Landing Rd
Triadelphia Lake Rd
Trundle Rd
Tschiffely Mill Rd
Tucker Ln
Turkey Foot Rd
Violettes Lock Rd
Wasche Rd
West Harris Rd
West Hunter Rd
West Offutt Rd
West Old Baltimore Rd
West Willard Rd
Westerly Rd
White Ground Rd
Whites Ferry Rd
Whites Store Rd
Wildcat Rd
Zion Rd
Fatal
Serious Injury
Minor Injury
No Injury


Existing Rustic Roads - Fatal and Serious-Injury Crashes Only
NUMBER OF CRASHES
6
5
4
3
2
1
-
Avoca Ln
Barnesville Rd
Batchellors Forest Rd
Batson Rd
Beallsville Rd (MD 109)
Belle Cote Dr
Bentley Rd
Berryville Rd
Big Woods Rd
Black Rock Rd
Boswell Ln
Brighton Dam Rd
Brookeville Rd
Bryants Nursery Rd
Budd Rd
Burdette Ln
Burnt Hill Rd
Cattail Rd
Clopper Rd
Club Hollow Rd
Comus Rd
Davis Mill Rd
Dustin Rd
Edwards Ferry Rd
Elmer School Rd
Elton Farm Rd
Frederick Rd (MD 355)
Game Preserve Rd
Glen Mill Rd
Glen Rd (Exceptional Rustic)
Glen Rd (Rustic)
Gregg Rd
Haines Rd
Haviland Mill Rd
Hawkes Rd
Hipsley Mill Rd
Howard Chapel Rd
Hoyles Mill Rd
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Tschiffely Mill Rd
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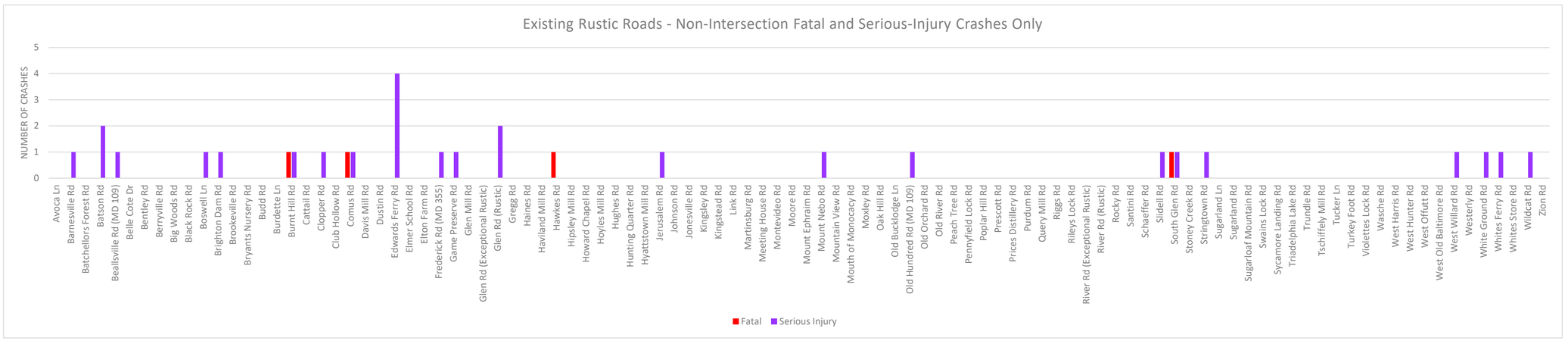
Turkey Foot Rd
Violettes Lock Rd
Wasche Rd
West Harris Rd
West Hunter Rd
West Offutt Rd
West Old Baltimore Rd
West Willard Rd
Westerly Rd
White Ground Rd
Whites Ferry Rd
Whites Store Rd
Wildcat Rd
Zion Rd
Fatal
Serious Injury


Existing Rustic Roads - Non-Intersection Fatal and Serious-Injury Crashes Only
NUMBER OF CRASHES
5
4
3
2
1
0
Avoca Ln
Barnesville Rd
Batchellors Forest Rd
Batson Rd
Beallsville Rd (MD 109)
Belle Cote Dr
Bentley Rd
Berryville Rd
Big Woods Rd
Black Rock Rd
Boswell Ln
Brighton Dam Rd
Brookeville Rd
Bryants Nursery Rd
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Sugarloaf Mountain Rd
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Triadelphia Lake Rd
Trundle Rd
Tschiffely Mill Rd
Tucker Ln
Turkey Foot Rd
Violettes Lock Rd
Wasche Rd
West Harris Rd
West Hunter Rd
West Offutt Rd
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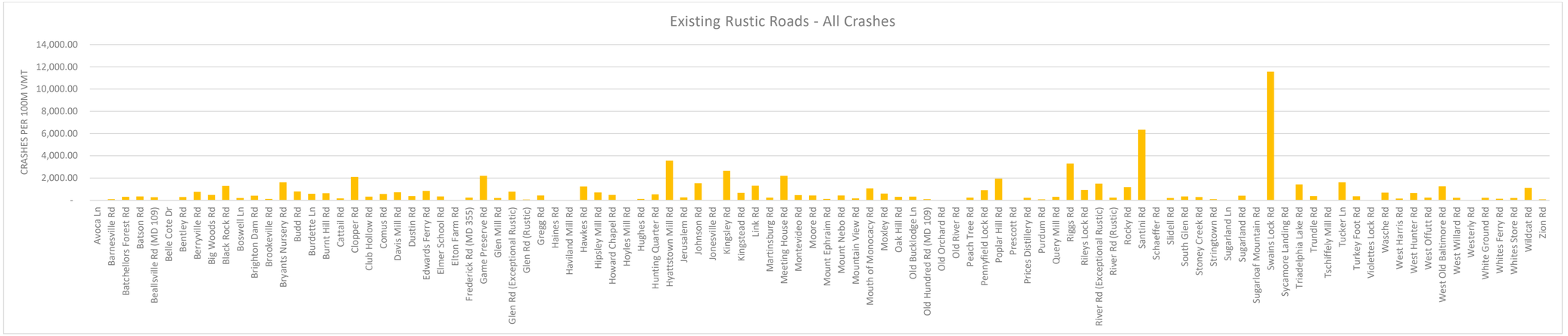
West Willard Rd
Westerly Rd
White Ground Rd
Whites Ferry Rd
Whites Store Rd
Wildcat Rd
Zion Rd
Fatal
Serious Injury


Existing Rustic Roads - All Crashes
CRASHES PER 100M VMT
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12,000.00
10,000.00
8,000.00
6,000.00
4,000.00
2,000.00
-
Avoca Ln
Barnesville Rd
Batchellors Forest Rd
Batson Rd
Beallsville Rd (MD 109)
Belle Cote Dr
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Berryville Rd
Big Woods Rd
Black Rock Rd
Boswell Ln
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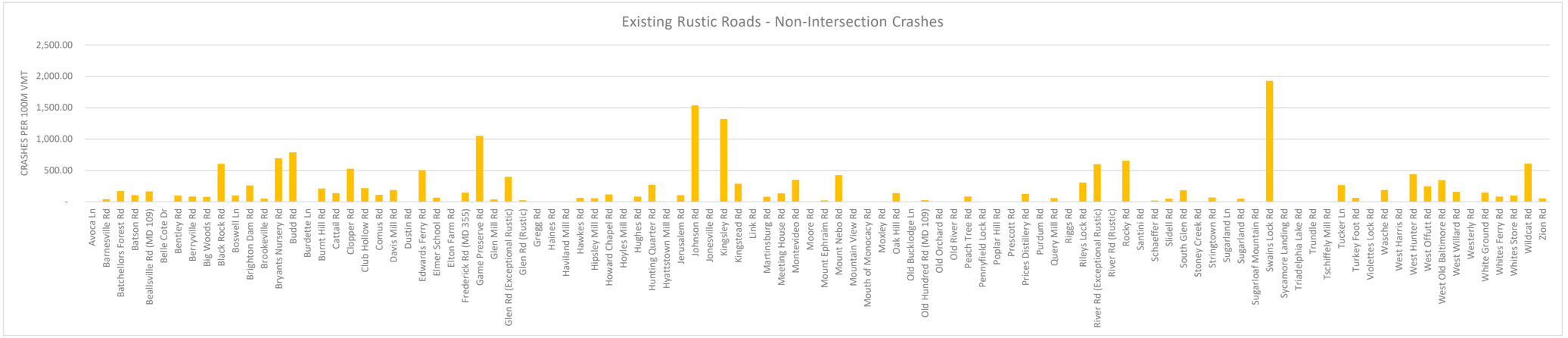
Wildcat Rd
Zion Rd


Existing Rustic Roads - Non-Intersection Crashes
CRASHES PER 100M VMT
2,500.00
2,000.00
1,500.00
1,000.00
500.00
Avoca Ln
Barnesville Rd
Batchellors Forest Rd
Batson Rd
Beallsville Rd (MD 109)
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South Glen Rd
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Stringtown Rd
Sugarland Ln
Sugarland Rd
Sugarloaf Mountain Rd
Swains Lock Rd
Sycamore Landing Rd
Triadelphia Lake Rd
Trundle Rd
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Turkey Foot Rd
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West Harris Rd
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West Willard Rd
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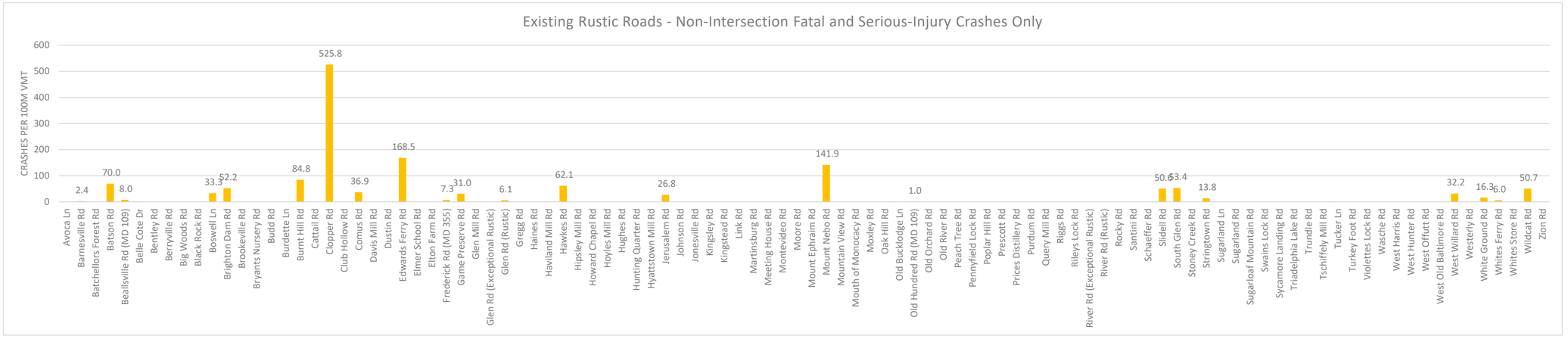
White Ground Rd
Whites Ferry Rd
Whites Store Rd
Wildcat Rd
Zion Rd


Existing Rustic Roads - Non-Intersection Fatal and Serious-Injury Crashes Only
CRASHES PER 100M VMT
600
500
400
300
200
100
0
2.4
70.0
8.0
33.3
52.2
84.8
525.8
36.9
168.5
7.3
31.0
6.1
62.1
26.8
141.9
1.0
50.6
53.4
13.8
32.2
16.3
6.0
50.7
Avoca Ln
Barnesville Rd
Batchellors Forest Rd
Batson Rd
Beallsville Rd (MD 109)
Belle Cote Dr
Bentley Rd
Berryville Rd
Big Woods Rd
Black Rock Rd
Boswell Ln
Brighton Dam Rd
Brookeville Rd
Bryants Nursery Rd
Budd Rd
Burdette Ln
Burnt Hill Rd
Cattail Rd
Clopper Rd
Club Hollow Rd
Comus Rd
Davis Mill Rd
Dustin Rd
Edwards Ferry Rd
Elmer School Rd
Elton Farm Rd
Frederick Rd (MD 355)
Game Preserve Rd
Glen Mill Rd
Glen Rd (Exceptional Rustic)
Glen Rd (Rustic)
Gregg Rd
Haines Rd
Haviland Mill Rd
Hawkes Rd
Hipsley Mill Rd
Howard Chapel Rd
Hoyles Mill Rd
Hughes Rd
Hunting Quarter Rd
Hyattstown Mill Rd
Jerusalem Rd
Johnson Rd
Jonesville Rd
Kingsley Rd
Kingstead Rd
Link Rd
Martinsburg Rd
Meeting House Rd
Montevideo Rd
Moore Rd
Mount Ephraim Rd
Mount Nebo Rd
Mountain View Rd
Mouth of Monocacy Rd
Moxley Rd
Oak Hill Rd
Old Bucklodge Ln
Old Hundred Rd (MD 109)
Old Orchard Rd
Old River Rd
Peach Tree Rd
Pennyfield Lock Rd
Poplar Hill Rd
Prescott Rd
Prices Distillery Rd
Purdum Rd
Query Mill Rd
Riggs Rd
Rileys Lock Rd
River Rd (Exceptional Rustic)
River Rd (Rustic)
Rocky Rd
Santini Rd
Schaeffer Rd
Slidell Rd
South Glen Rd
Stoney Creek Rd
Stringtown Rd
Sugarland Ln
Sugarland Rd
Sugarloaf Mountain Rd
Swains Lock Rd
Sycamore Landing Rd
Triadelphia Lake Rd
Trundle Rd
Tschiffely Mill Rd
Tucker Ln
Turkey Foot Rd
Violettes Lock Rd
Wasche Rd
West Harris Rd
West Hunter Rd
West Offutt Rd
West Old Baltimore Rd
West Willard Rd
Westerly Rd
White Ground Rd
Whites Ferry Rd
Whites Store Rd
Wildcat Rd
Zion Rd

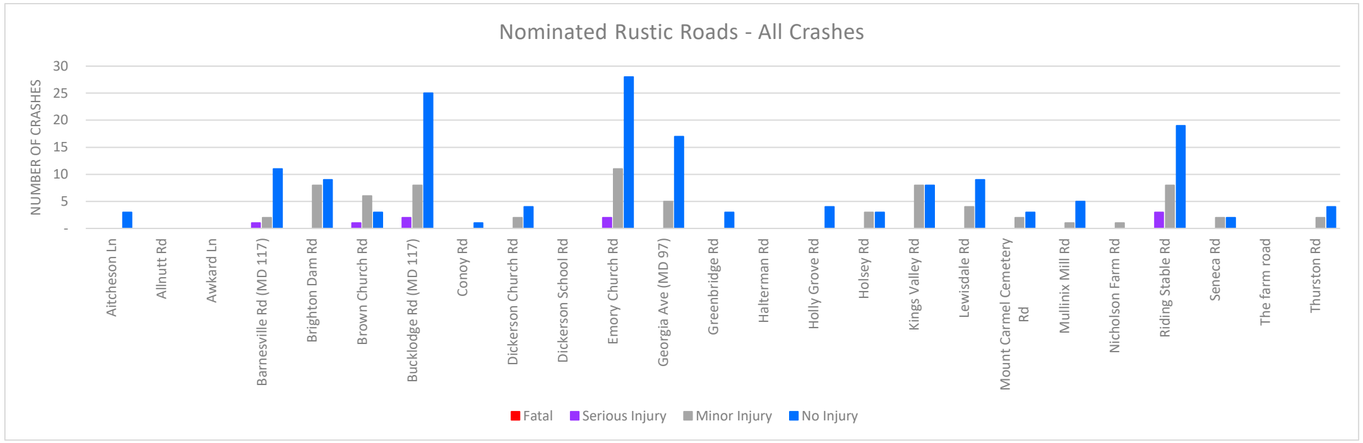
Crash and Traffic Analysis - Nominated Rustic Roads

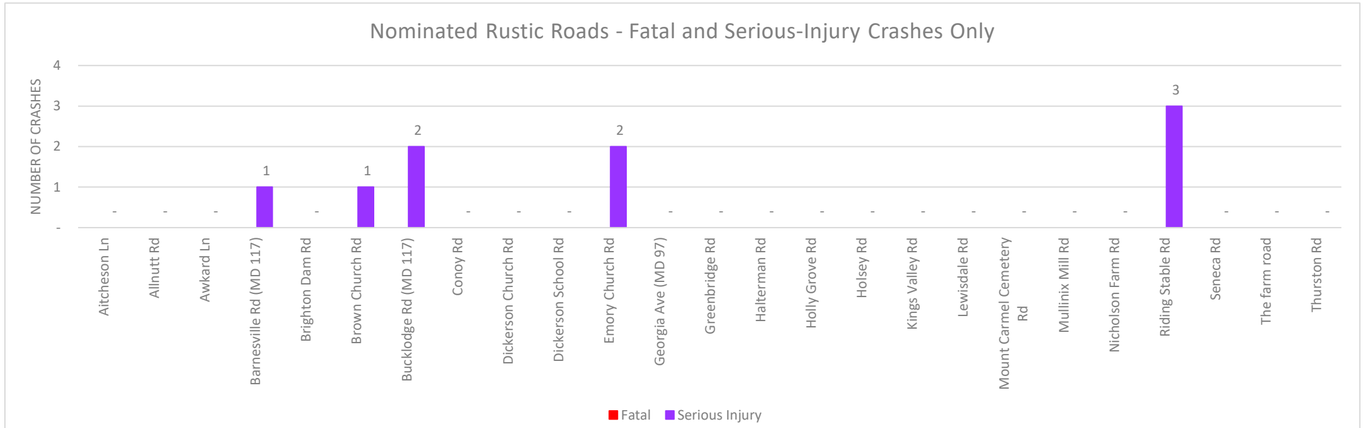
Road Name	All Crashes							Non-Intersection Crashes Only							Road Length (Miles)	Crashes per Mile per Year (All Crashes)	Serious and Fatal Crashes per Mile per Year (All Crashes)	Crashes per Mile per Year (Non-Intersection)	Serious and Fatal Crashes per Mile per Year (Non-Intersection)
	Number of Crashes	Bicycle Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury	Total Non-Intersection Crashes	Bicycle Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury					
Aitcheson Ln	3	-	-	-	-	-	3	1	-	-	-	-	-	1	0.22	2.3	0.0	0.8	0.0
Allnutt Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.64	0.0	0.0	0.0	0.0
Awkard Ln	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.23	0.0	0.0	0.0	0.0
Barnesville Rd (MD 117)	14	-	-	-	1	2	11	7	-	-	-	1	1	5	1.07	2.2	0.2	1.1	0.2
Brighton Dam Rd	17	-	-	-	-	8	9	5	-	-	-	-	1	4	0.97	2.9	0.0	0.9	0.0
Brown Church Rd	10	-	-	-	1	6	3	2	-	-	-	1	-	1	1.21	1.4	0.1	0.3	0.1
Bucklodge Rd (MD 117)	35	-	-	-	2	8	25	20	-	-	-	1	5	14	4.11	1.4	0.1	0.8	0.0
Conoy Rd	1	-	-	-	-	-	1	-	-	-	-	-	-	-	1.26	0.1	0.0	0.0	0.0
Dickerson Church Rd	6	-	-	-	-	2	4	-	-	-	-	-	-	-	0.21	4.7	0.0	0.0	0.0
Dickerson School Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.20	0.0	0.0	0.0	0.0
Emory Church Rd	41	-	-	-	2	11	28	1	-	-	-	-	-	1	0.72	9.5	0.5	0.2	0.0
Georgia Ave (MD 97)	22	-	-	-	-	5	17	4	-	-	-	-	2	2	0.62	5.9	0.0	1.1	0.0
Greenbridge Rd	3	-	-	-	-	-	3	-	-	-	-	-	-	-	0.54	0.9	0.0	0.0	0.0
Halterman Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.36	0.0	0.0	0.0	0.0
Holly Grove Rd	4	-	-	-	-	-	4	-	-	-	-	-	-	-	0.33	2.0	0.0	0.0	0.0
Holsey Rd	6	-	-	-	-	3	3	1	-	-	-	-	-	1	0.68	1.5	0.0	0.2	0.0
Kings Valley Rd	16	-	-	-	-	8	8	1	-	-	-	-	-	1	2.79	1.0	0.0	0.1	0.0
Lewisdale Rd	13	-	-	-	-	4	9	7	-	-	-	-	-	7	2.24	1.0	0.0	0.5	0.0
Mount Carmel Cemetery Rd	5	-	-	-	-	2	3	1	-	-	-	-	-	1	0.28	3.0	0.0	0.6	0.0
Mullinix Mill Rd	6	-	-	-	-	1	5	2	-	-	-	-	-	2	1.99	0.5	0.0	0.2	0.0
Nicholson Farm Rd	1	-	-	-	-	1	-	-	-	-	-	-	-	-	0.21	0.8	0.0	0.0	0.0
Riding Stable Rd	30	-	-	-	3	8	19	1	-	-	-	-	-	1	0.83	6.0	0.6	0.2	0.0
Seneca Rd	4	1	-	-	-	2	2	-	-	-	-	-	-	-	0.45	1.5	0.0	0.0	0.0
The farm road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.45	0.0	0.0	0.0	0.0
Thurston Rd	6	-	-	-	-	2	4	-	-	-	-	-	-	-	0.58	1.7	0.0	0.0	0.0

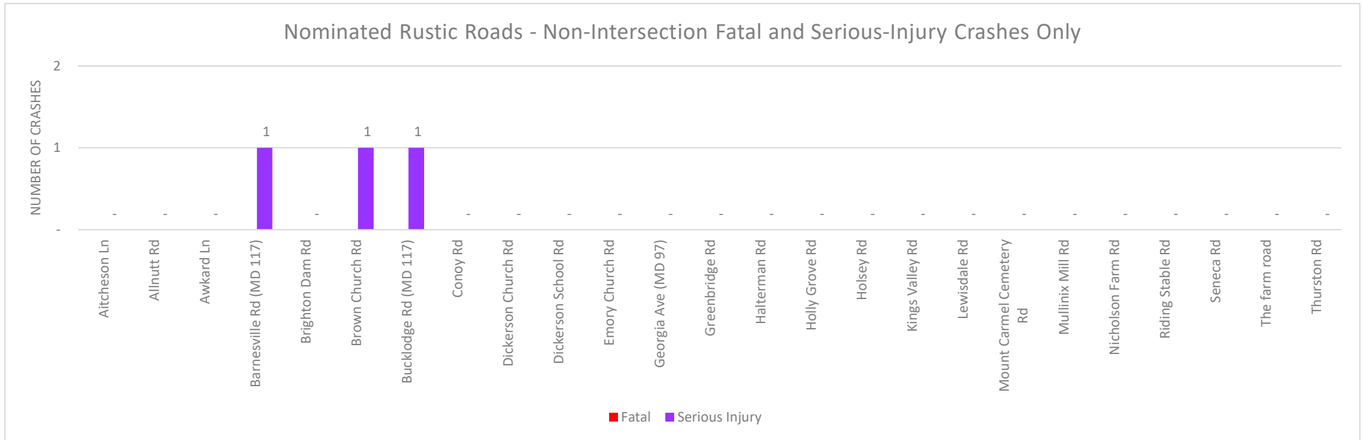
Crash data from January 2015 to December 2020
Top 5 values in each column shaded orange

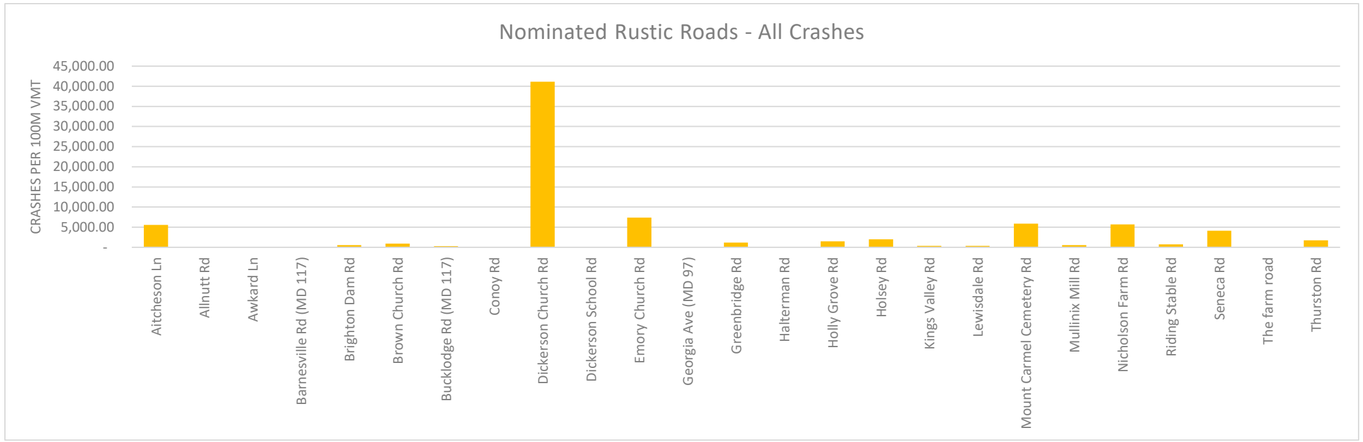
Crash and Traffic Analysis - Nominated Rustic Roads

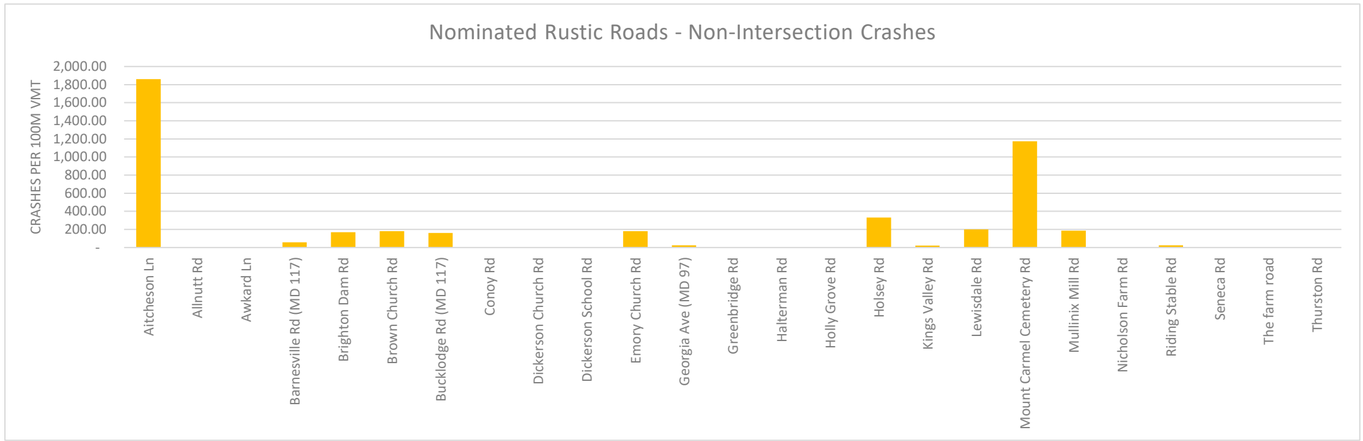
Road Name	AADT	Crashes per 100,000,000 VMT	Serious and Fatal Crashes per 100,000,000 VMT	Non-Intersection Crashes per 100,000,000 VMT	Non-Intersection Serious and Fatal Crashes per 100,000,000 VMT	AADT Source	AADT Comments
Aitcheson Ln	112	5,578.56	-	1,859.52	-	VHB	
Allnutt Rd	28	-	-	-	-	VHB	
Awkard Ln	170	-	-	-	-	MPT	Late addition to program: 15 houses @ 10 trips per day + 1 small religious use @ 20 trips per day
Barnesville Rd (MD 117)	5,250	113.74	8.12	56.87	8.12	SHA	SHA says 5,250 from MD 28 to MD 121 .10 mile west of MD-121
Brighton Dam Rd	1,384	576.99	-	169.70	-	VHB	
Brown Church Rd	419	899.91	89.99	179.98	89.99	VHB	
Bucklodge Rd (MD 117)	1,371	283.96	16.23	162.26	8.11	SHA	SHA says 1,134 0.5 miles E (north) of MD 28; 1,371 0.15 miles W (south) of Buck Ridge Court (near CSX tracks)
Conoy Rd		-	-	-	-	NA	Not eligible for program - not a public road
Dickerson Church Rd	31	41,134.34	-	-	-	VHB	
Dickerson School Rd	41	-	-	-	-	VHB	
Emory Church Rd	351	7,402.35	361.09	180.55	-	VHB	
Georgia Ave (MD 97)	12,251	132.70	-	24.13	-	NA	Not eligible for program until bypass has been completed
Greenbridge Rd	211	1,203.12	-	-	-	VHB	
Halterman Rd	109	-	-	-	-	VHB	
Holly Grove Rd	370	1,514.97	-	-	-	MPT	Late addition to program: 20 houses @ 10 trips per day + Awkard traffic
Holsey Rd	203	1,988.43	-	331.40	-	VHB	
Kings Valley Rd	729	359.19	-	22.45	-	VHB	
Lewisdale Rd	711	372.81	-	200.74	-	VHB	
Mount Carmel Cemetery Rd	141	5,873.76	-	1,174.75	-	VHB	
Mullinix Mill Rd	246	558.85	-	186.28	-	VHB	
Nicholson Farm Rd	38	5,702.83	-	-	-	VHB	
Riding Stable Rd	2,166	762.96	76.30	25.43	-	VHB	
Seneca Rd	100	4,093.57	-	-	-	MPT	Est. based on 2 houses + trailhead
The farm road		-	-	-	-	NA	Not eligible for program - not a public road
Thurston Rd	269	1,756.45	-	-	-	VHB	

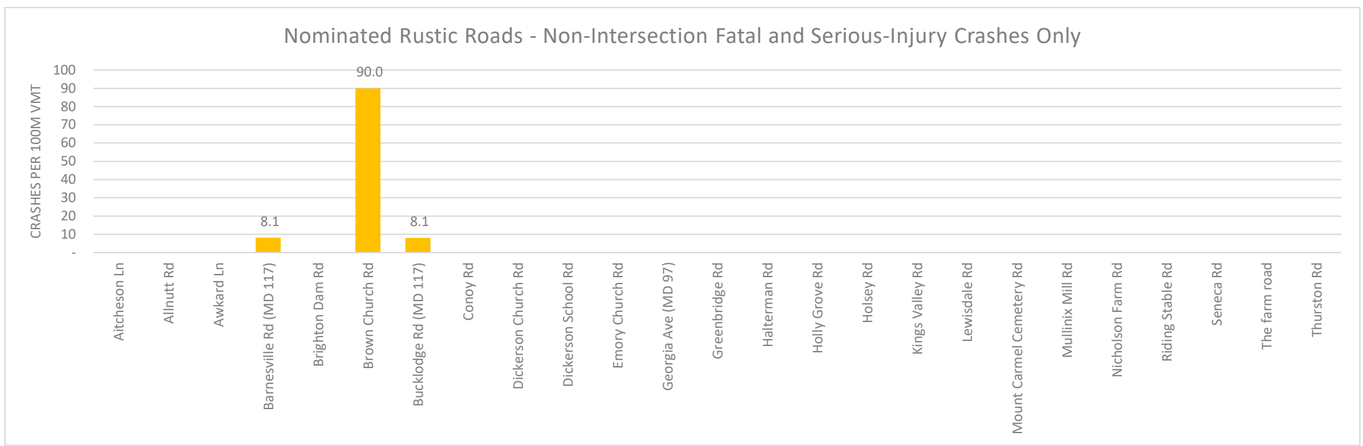

Nominated Rustic Roads - All Crashes
NUMBER OF CRASHES
30
25
20
15
10
5
-
Aitcheson Ln
Allnutt Rd
Awkard Ln
Barnesville Rd (MD 117)
Brighton Dam Rd
Brown Church Rd
Bucklodge Rd (MD 117)
Conoy Rd
Dickerson Church Rd
Dickerson School Rd
Emory Church Rd
Georgia Ave (MD 97)
Greenbridge Rd
Halterman Rd
Holly Grove Rd
Holsey Rd
Kings Valley Rd
Lewisdale Rd
Mount Carmel Cemetery Rd
Mullinix Mill Rd
Nicholson Farm Rd
Riding Stable Rd
Seneca Rd
The farm road
Thurston Rd
Fatal
Serious Injury
Minor Injury
No Injury


Nominated Rustic Roads - Fatal and Serious-Injury Crashes Only
NUMBER OF CRASHES
4
3
2
1
-
1
1
2
2
3
Aitcheson Ln
Allnutt Rd
Awkard Ln
Barnesville Rd (MD 117)
Brighton Dam Rd
Brown Church Rd
Bucklodge Rd (MD 117)
Conoy Rd
Dickerson Church Rd
Dickerson School Rd
Emory Church Rd
Georgia Ave (MD 97)
Greenbridge Rd
Halterman Rd
Holly Grove Rd
Holsey Rd
Kings Valley Rd
Lewisdale Rd
Mount Carmel Cemetery Rd
Mullinix Mill Rd
Nicholson Farm Rd
Riding Stable Rd
Seneca Rd
The farm road
Thurston Rd
Fatal
Serious Injury

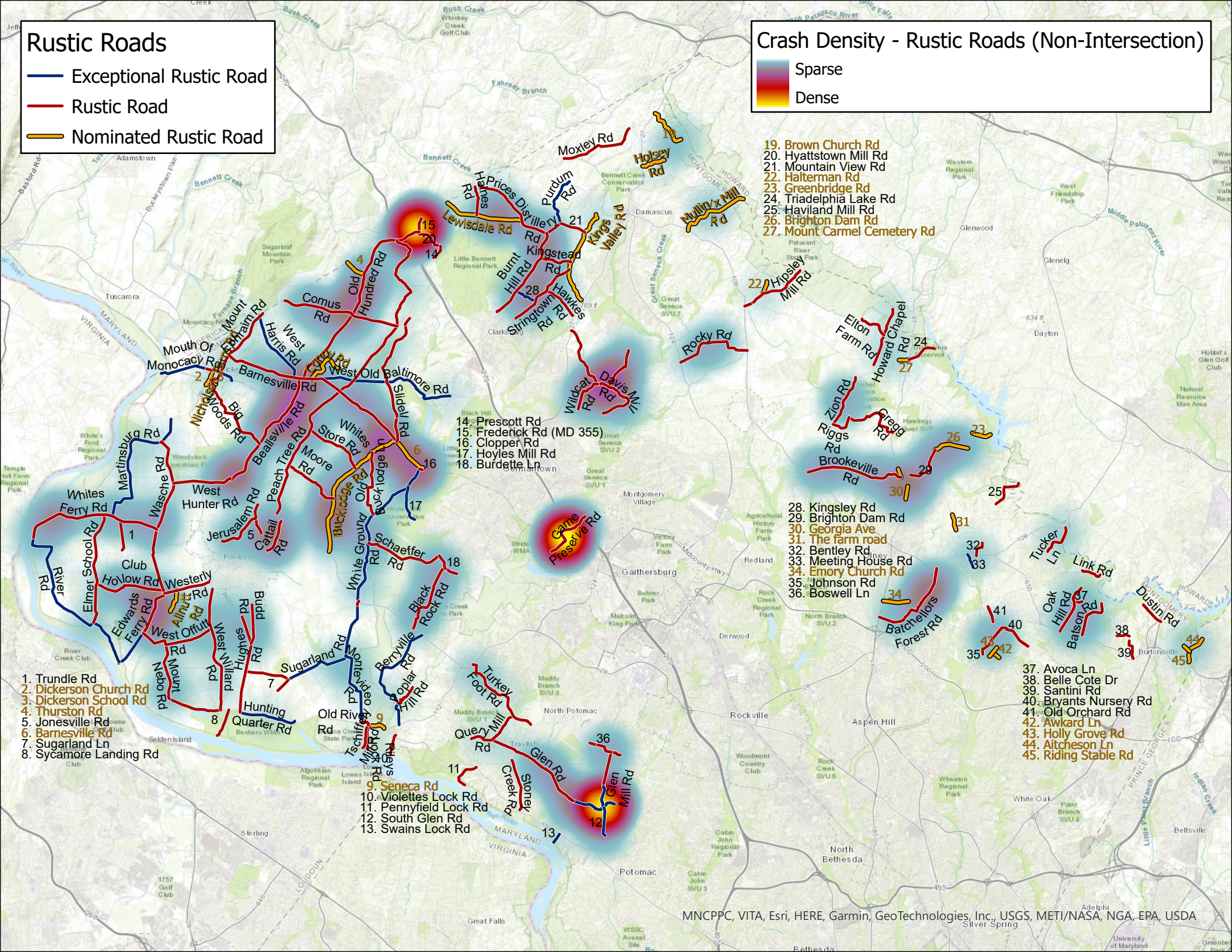

Nominated Rustic Roads - Non-Intersection Fatal and Serious-Injury Crashes Only
NUMBER OF CRASHES
2
1
-
1
1
1
Aitcheson Ln
Allnutt Rd
Awkard Ln
Barnesville Rd (MD 117)
Brighton Dam Rd
Brown Church Rd
Bucklodge Rd (MD 117)
Conoy Rd
Dickerson Church Rd
Dickerson School Rd
Emory Church Rd
Georgia Ave (MD 97)
Greenbridge Rd
Halterman Rd
Holly Grove Rd
Holsey Rd
Kings Valley Rd
Lewisdale Rd
Mount Carmel Cemetery Rd
Mullinix Mill Rd
Nicholson Farm Rd
Riding Stable Rd
Seneca Rd
The farm road
Thurston Rd
Fatal
Serious Injury

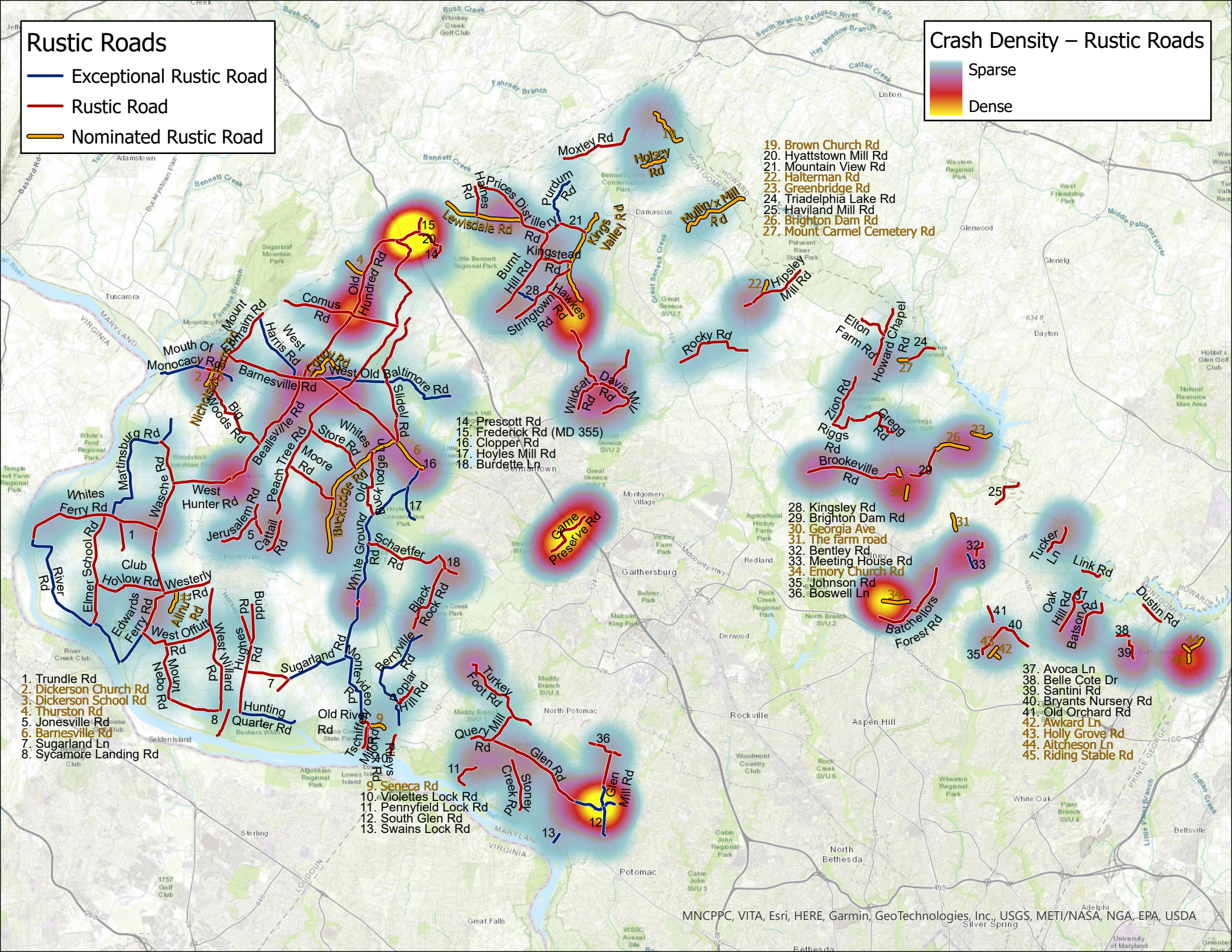

Nominated Rustic Roads - All Crashes
CRASHES PER 100M VMT
45,000.00
40,000.00
35,000.00
30,000.00
25,000.00
20,000.00
15,000.00
10,000.00
5,000.00
-
Aitcheson Ln
Allnutt Rd
Awkard Ln
Barnesville Rd (MD 117)
Brighton Dam Rd
Brown Church Rd
Bucklodge Rd (MD 117)
Conoy Rd
Dickerson Church Rd
Dickerson School Rd
Emory Church Rd
Georgia Ave (MD 97)
Greenbridge Rd
Halterman Rd
Holly Grove Rd
Holsey Rd
Kings Valley Rd
Lewisdale Rd
Mount Carmel Cemetery Rd
Mullinix Mill Rd
Nicholson Farm Rd
Riding Stable Rd
Seneca Rd
The farm road
Thurston Rd

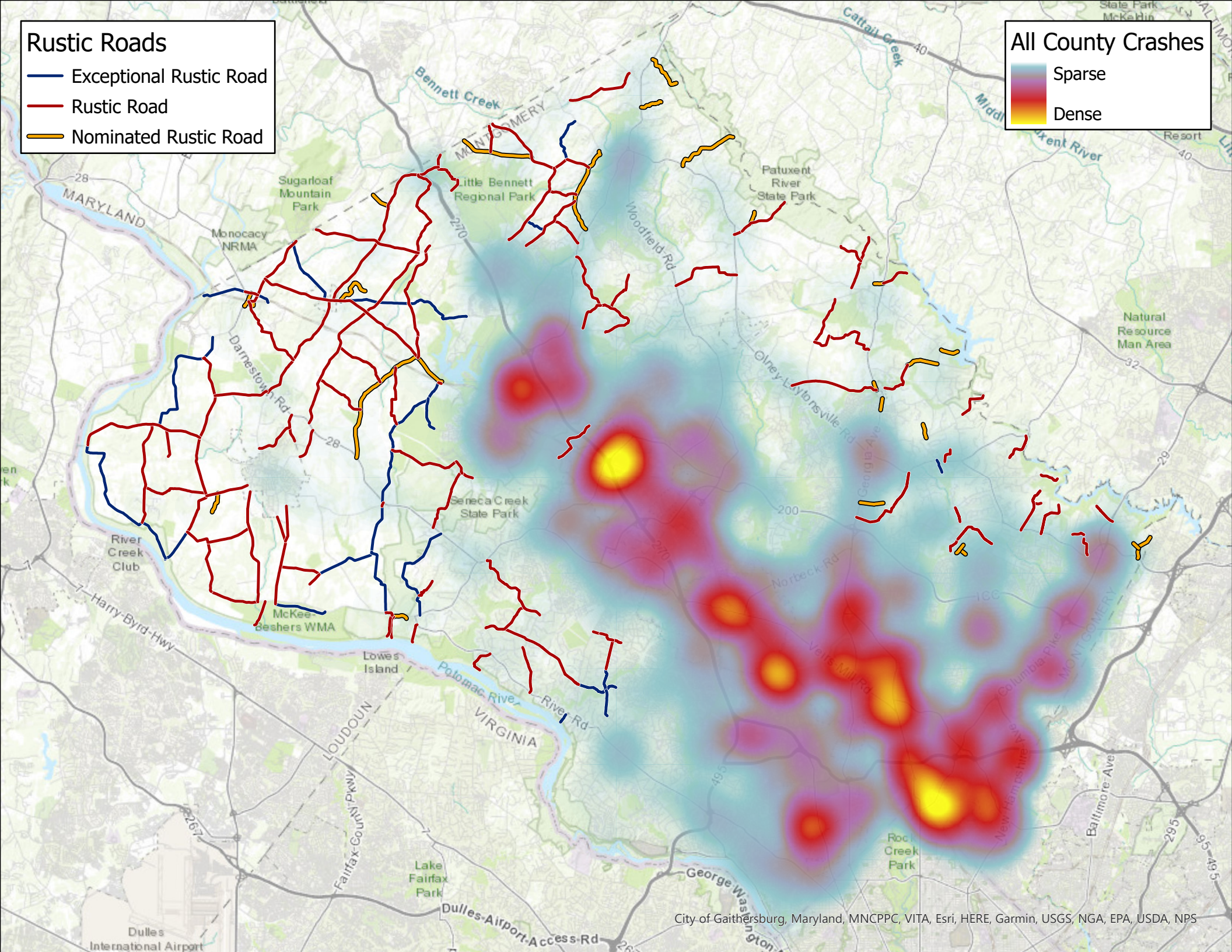

Nominated Rustic Roads - Non-Intersection Crashes
CRASHES PER 100M VMT
2,000.00
1,800.00
1,600.00
1,400.00
1,200.00
1,000.00
800.00
600.00
400.00
200.00
-
Aitcheson Ln
Allnutt Rd
Awkard Ln
Barnesville Rd (MD 117)
Brighton Dam Rd
Brown Church Rd
Bucklodge Rd (MD 117)
Conoy Rd
Dickerson Church Rd
Dickerson School Rd
Emory Church Rd
Georgia Ave (MD 97)
Greenbridge Rd
Halterman Rd
Holly Grove Rd
Holsey Rd
Kings Valley Rd
Lewisdale Rd
Mount Carmel Cemetery Rd
Mullinix Mill Rd
Nicholson Farm Rd
Riding Stable Rd
Seneca Rd
The farm road
Thurston Rd


Nominated Rustic Roads - Non-Intersection Fatal and Serious-Injury Crashes Only
CRASHES PER 100M VMT
100
90
80
70
60
50
40
30
20
10
-
8.1
90.0
8.1
Aitcheson Ln
Allnutt Rd
Awkard Ln
Barnesville Rd (MD 117)
Brighton Dam Rd
Brown Church Rd
Bucklodge Rd (MD 117)
Conoy Rd
Dickerson Church Rd
Dickerson School Rd
Emory Church Rd
Georgia Ave (MD 97)
Greenbridge Rd
Halterman Rd
Holly Grove Rd
Holsey Rd
Kings Valley Rd
Lewisdale Rd
Mount Carmel Cemetery Rd
Mullinix Mill Rd
Nicholson Farm Rd
Riding Stable Rd
Seneca Rd
The farm road
Thurston Rd

Road Name	Classification	Number of Crashes	Bike Involved	Pedestrian Involved	Fatal	Serious Injury	Minor Injury	No Injury	Road Length (Miles)	Crashes per Mile per Year (All Crashes)	2019 AADT	2020 AADT	Crashes per 100,000,000 VMT (All Crashes) (2019)	Serious and Fatal Crashes per 100,000,000 VMT (2019)	Comments
Annapolis Rock Rd	Country Road	21	0	0	0	0	6	15	1.40	2.5	2860	4661	240	0	
Barnesville Rd	Country Road	15	0	0	0	1	3	11	1.08	2.3	5250	4351	121	8	
Beallsville Rd	Country Arterial	28	0	0	0	2	13	13	2.00	2.3	2953	2454	216	15	
Bethesda Church Rd	Country Arterial	11	0	0	0	0	1	10	1.87	1.0	1911	1602	141	0	
Bethesda Church Rd	Country Road	5	0	0	0	1	0	4	1.87	0.4	1911	1602	64	13	
Bordly Dr	Country Road	16	0	0	0	0	6	10	1.36	2.0	1841	1522	291	0	
Brighton Dam Rd	Country Road	17	0	0	0	0	8	9	0.97	2.9	682	630	1169	0	
Brink Rd	Country Arterial	87	0	0	0	3	38	46	3.13	4.6	13721	11462	92	3	measuring point quite distant from country arterial section
Bucklodge Rd	Country Road	34	0	0	0	2	8	24	4.09	1.4	5250	4351	72	4	measuring point is on Barnesville Road near Clarksburg Road
Clarksburg Rd	Country Arterial	114	0	1	1	7	24	82	6.94	2.7	4280	3571	175	12	
Clopper Rd	Country Arterial	15	0	0	0	0	7	8	1.00	2.5	8100	6711	85	0	
Damascus Rd	Country Arterial	86	3	2	1	10	40	35	5.22	2.7	2844	2365	265	34	
Darnestown Rd	Country Arterial	110	0	0	5	7	47	51	7.65	2.4	7341	6082	89	10	5924/4915 south of MD 109
Dickerson Rd	Country Arterial	25	0	0	0	1	8	16	2.10	2.0	9553	7914	57	2	7341/6082 south of Mount Ephraim Road
Dorsey Rd	Country Arterial	16	0	1	0	0	7	9	0.80	3.3	NA	NA	NA	NA	No suitable nearby traffic counts
Ednor Rd	Country Arterial	46	1	1	0	1	22	23	1.98	3.9	4891	4082	217	5	
Goshen Rd	Country Arterial	37	0	1	0	2	14	21	0.71	8.7	12841	10722	185	10	measuring point is between Wightman and Warfield Roads, country arterial is north of Warfield
Grand Elm St	Country Road	10	0	0	0	1	2	7	0.09	17.9	861	722	5696	570	assume Piedmont Road traffic counts.
Griffith Rd	Country Road	17	0	0	0	0	8	9	2.88	1.0	NA	NA	NA	NA	No suitable nearby traffic counts
Gue Rd	Country Road	1	0	0	0	0	0	1	1.05	0.2	562	473	78	0	
Hawkins Creamery Rd	Country Road	15	0	0	0	0	5	10	2.85	0.9	2951	2462	81	0	
Howard Chapel Dr	Country Road	6	0	0	0	1	2	3	1.74	0.6	651	542	242	40	
Johnson Dr	Country Road	4	0	0	0	1	0	3	0.73	0.9	NA	NA	NA	NA	No suitable nearby traffic counts
Kemptown Rd	Country Arterial	18	0	0	0	3	3	12	1.41	2.1	4813	3994	121	20	
Kings Valley Rd	Country Road	3	0	0	0	0	1	2	0.67	0.7	831	692	247	0	
Long Corner Rd	Country Road	29	0	0	0	3	13	13	2.76	1.8	1252	1053	383	40	only section north of Gue Road included in AADT
Martinsburg Rd	Country Arterial	4	0	0	0	1	2	1	0.54	1.2	1244	NA	273	68	From 13-hour turning movement study in 2016
Partnership Rd	Country Arterial	17	0	0	0	0	5	12	3.84	0.7	931	NA	217	0	From 13-hour turning movement study in 2006
Piedmont Rd	Country Road	7	0	0	0	1	1	5	1.49	0.8	861	722	248	35	
Ridge Rd	Country Arterial	69	0	0	1	7	27	34	2.41	4.8	20673	17124	63	7	17430/14431 north of Kemptown Road
River Rd	Country Arterial	17	1	0	0	2	7	8	4.33	0.7	3241	2832	55	7	measuring point is just west of the Seneca Road/River Road instersection, a little to the east of the segment
Shiloh Church Rd	Country Road	5	0	0	0	0	2	3	2.02	0.4	1200	NA	94	0	Perhaps half of the ~2,400 trips on Comus go south here
South Glen Rd	Country Road	21	1	0	1	1	6	13	0.87	4.0	8431	7042	131	12	
Sundown Rd	Country Arterial	30	1	0	0	2	14	14	3.65	1.4	4541	3762	83	6	
Warfield Rd (CA)	Country Arterial	40	0	0	0	0	20	20	0.95	7.0	6261	5232	308	0	
Warfield Rd (CR)	Country Road	52	0	0	0	0	28	24	0.95	9.2	6261	5232	401	0	measuring point is on country arterial portion east of MD 124
Watkins Rd	Country Road	19	0	0	0	2	5	12	3.17	1.0	NA	NA	NA	NA	No suitable nearby traffic counts
Whites Ferry Rd	Country Arterial	79	0	0	2	7	27	43	5.10	2.6	6442	5333	110	13	should probably have split this one; AADT west of Poolesville is 2375/1975
Zion Rd	Country Road	22	2	0	1	0	8	13	1.83	2.0	2285	NA	241	11	From 13-hour turning movement study in 2018


Rustic Roads
Exceptional Rustic Road
Rustic Road
Nominated Rustic Road
Crash Density - Rustic Roads (Non-Intersection)
Sparse
Dense
1. Trundle Rd
2. Dickerson Church Rd
3. Dickerson School Rd
4. Thurston Rd
5. Jonesville Rd
6. Barnesville Rd
7. Sugarland Ln
8. Sycamore Landing Rd
9. Seneca Rd
10. Violettes Lock Rd
11. Pennyfield Lock Rd
12. South Glen Rd
13. Swains Lock Rd
14. Prescott Rd
15. Frederick Rd (MD 355)
16. Clopper Rd
17. Hoyles Mill Rd
18. Burdette Ln
19. Brown Church Rd
20. Hyattstown Mill Rd
21. Mountain View Rd
22. Halterman Rd
23. Greenbridge Rd
24. Triadelphia Lake Rd
25. Haviland Mill Rd
26. Brighton Dam Rd
27. Mount Carmel Cemetery Rd
28. Kingsley Rd
29. Brighton Dam Rd
30. Georgia Ave
31. The farm road
32. Bentley Rd
33. Meeting House Rd
34. Emory Church Rd
35. Johnson Rd
36. Boswell Ln
37. Avoca Ln
38. Belle Cote Dr
39. Santini Rd
40. Bryants Nursery Rd
41. Old Orchard Rd
42. Awkard Ln
43. Holly Grove Rd
44. Aitcheson Ln
45. Riding Stable Rd
MNCPPC, VITA, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, METI/NASA, NGA, EPA, USDA


Rustic Roads
Exceptional Rustic Road
Rustic Road
Nominated Rustic Road
Crash Density – Rustic Roads
Sparse
Dense
1. Trundle Rd
2. Dickerson Church Rd
3. Dickerson School Rd
4. Thurston Rd
5. Jonesville Rd
6. Barnesville Rd
7. Sugarland Ln
8. Sycamore Landing Rd
9. Seneca Rd
10. Violettes Lock Rd
11. Pennyfield Lock Rd
12. South Glen Rd
13. Swains Lock Rd
14. Prescott Rd
15. Frederick Rd (MD 355)
16. Clopper Rd
17. Hoyles Mill Rd
18. Burdette Ln
19. Brown Church Rd
20. Hyattstown Mill Rd
21. Mountain View Rd
22. Halterman Rd
23. Greenbridge Rd
24. Triadelphia Lake Rd
25. Haviland Mill Rd
26. Brighton Dam Rd
27. Mount Carmel Cemetery Rd
28. Kingsley Rd
29. Brighton Dam Rd
30. Georgia Ave
31. The farm road
32. Bentley Rd
33. Meeting House Rd
34. Emory Church Rd
35. Johnson Rd
36. Boswell Ln
37. Avoca Ln
38. Belle Cote Dr
39. Santini Rd
40. Bryants Nursery Rd
41. Old Orchard Rd
42. Awkard Ln
43. Holly Grove Rd
44. Aitcheson Ln
45. Riding Stable Rd
MNCPPC, VITA, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, METI/NASA, NGA, EPA, USDA


Rustic Roads
Exceptional Rustic Road
Rustic Road
Nominated Rustic Road
All County Crashes
Sparse
Dense
Bennett Creek
Cattail Creek
Sugarloaf Mountain Park
Little Bennett Regional Park
Patuxent River State Park
Monocacy NRMA
Woodfield Rd
Olney-Laytonsville Rd
Natural Resource Man Area
Darnestown Rd
Seneca Creek State Park
River Creek Club
Harry-Byrd-Hwy
McKee-Beshers WMA
Lowes Island
Potomac River
River Rd
VIRGINIA
LOUDOUN
Fairfax County Pkwy
Lake Fairfax Park
Dulles-Airport-Access-Rd
Dulles International Airport
Norbeck Rd
Georgia Ave
Columbia Pike
New Hampshire Ave
Baltimore Ave
Rock Creek Park
City of Gaithersburg, Maryland, MNCPPC, VITA, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

Evaluating Crash Data for Rustic Roads: Methodology

Below is a rough summary of the procedure used to create the crash maps and crash data tables. Several iterations of this procedure were performed with slight tweaks made each time, and then more tweaks made to the maps when preparing them for publication. Some of these tweaks, such as to feature colors, may not be shown.

A. Create county-wide crash map.

1. Create a new ArcGIS Pro project and add the following layers or layer groups:
    a. Basemap – County Boundary with Mask (you'll need this for analysis, but turn off the layers so that they don't display)
    b. Basemap - City, County & Adjacent Counties
        i. Zoom to County Boundary (note that this is just a line feature, not a polygon feature, so use the Montgomery County polygon from the above basemap group for analysis)
        ii. Change color of municipalities to "topaz sand" and set to 50% transparency
    c. Transportation – Existing Transit Stations (turn on MARC Stations). Do not show out beyond 1:50,000.
    d. Transportation – Existing Transitways (tun on MARC line only and symbolize as railroad)
    e. Transportation – Rustic Roads
        i. Use definition query to limit to Rustic and Exceptional Rustic Roads only. Remove Country Roads and Country Arterials from the symbology.
        ii. Change the symbology for existing rustic roads to "Minor Road (Scheme 3)" from the gallery. Then change the inner color to "spruce green" (or "Tuscan red" to match other maps) and the outer color to white. Reduce the outer color's width to 2.4. Do the same for existing exceptional rustic roads, but change the inner color to "dark umber" (or "dark navy" to match other maps).
    f. Nominated Rustic Roads
        i. This layer isn't in Q:\Layer Files. You'll have to ask around to find the most recent version of the nominated roads. There should be 29 features in the table representing 26 roads.
        ii. Change the symbology for the nominated roads to "Minor Road (Scheme 3)" from the gallery. Then change the inner color to "peony pink" (or "electron gold" to match other maps) and the outer color to black. Reduce the outer color's width to 2.4.
    g. Transportation – Street Centerlines
    h. Hydrologic – All Features. Use a definition query to only include "Single Line Streams" and "Stream Poly Centerlines" (remove water canals and hidden water features).
    i. Buildings – Footprints. Do not show out beyond 1:50,000. (turn layer off for now)
    j. Properties – !prop_POLY_with_data. Do not show out beyond 1:100,000. (turn layer off for now)
    k. Forests – Forest (2006, 2008 & 2015). Turn on most recent and set to 70% transparency. (turn layer off for now)

l. Parks – All (set to 50% transparency). Filter to existing parks only (Status = "Existing"). (turn layer off for now)

2. Obtain raw crash data and add to project. [Note: started with 68,308 crashes, going from January 1, 2015 through March 3, 2021.]
3. Turn off display of all fields except those shown below (the bottom ones are near the end of the field list). Update the Alias field to be more readable. Add the Bike and Ped fields (Short data type) if they aren't there (see note below similar table below):

Field Name	Alias
id	Crash ID
reportnumber	Report Number
acrsreporttype	Report Type
crashdatetime	Date & Time
roadname	Road Name
offroaddescription	**o**ffroaddescription
total_serious	Serious
total_fatal	Fatal
Bike	Bicycle Involved
Ped	Pedestrian Involved

[After comparing the results of the analysis after one run through the data, it was discovered that the algorithm that had been used to locate the crashes had a bug that was not correctly locating crashes that were specified as being X miles from an intersection versus X feet. The bug was corrected and the crash points relocated, but the process that populates the various fatal, serious, bike, and ped fields was not performed against the relocated points, nor were the manual edits to these fields. I added the Bike and Ped fields to a copy of the updated crash data table and joined the previous data to the relocated data by Report Number and populated these fields from the previous data. I did this for the in-county crashes only. For no apparent reason, there were 3 more points in the new data than in the previous data. The report numbers for the new rows are MCP29360008, MCP30780020, and DM83880030; all three are parking lot crashes that aren't near a rustic road.]

4. The total_serious, total_fatal, Bike, and Ped columns should be populated by CWP staff as part of their crash location script and post-script manual edits. However, the last time I ran the data, the Serious and Fatal fields were all Null and the Bike and Ped fields were missing. I had to add them and then populate from a previous copy of the data that had been manually scrubbed, but this is not optimal.
5. Add the following fields:

Field Name	Alias	Data Type
Crash_Type	Crash Type	Text, 255 characters
Crash_Mode	Crash Mode	Text, 255 characters

6. Before doing the next step on my 4th or 5th time through the data, I obtained a spreadsheet from Countywide Planning that shows the maximum severity level for anybody involved in a crash. It turns out the crash data only has severity level for the drivers of vehicles (and other non-motorists involved), but not for passengers, so we were missing some serious and fatal injuries when a passenger was the one experiencing such. So I got the spreadsheet and joined it to the county crash data by report number. I only had through November 2020 in the spreadsheet, but

didn't likely miss that many from the last two months of that year, especially given the small subset of crashes along rustic roads.

7. Use Field Calculator to set the value of Crash Type as follows (the count column is for the current analysis). In past iterations of this process, I did this after separating out the non-county crashes, but the last time I did it I forgot to do that first, so here are the numbers:

Criteria	Crash Type	[Count]
Fatal = 1	Fatal	175
Crash Type Does Not Include the Value "Fatal" and Overall Highest Injury = 5	Fatal	16
Serious = 1 and Crash Type Does Not Include the Value "Fatal"	Serious Injury	1,359
(Crash Type Does Not Include the Values "Fatal" or "Serious Injury") and Overall Highest Injury = 4	Serious Injury	115
Report Type = "Injury Crash" and (Crash Type Does Not Include the Values "Fatal" or "Serious Injury")	Minor Injury	22,609
(Crash Type Does Not Include the Values "Fatal", "Serious Injury", or "Minor Injury") and Overall Highest Injury = 2 or 3	Minor Injury	0
Crash Type Is Null	No Injury	44,034
See note below about manual updates[1]	Fatal No Injury	-2 2

[1]There are currently several crashes flagged as Fatal that the CWP scrub shows as non-fatal. There is another spreadsheet (in addition to the one used above) that shows the manual adjustments, so you'll have to get the spreadsheet from CWP and see which accidents weren't really fatal (these were ruled as being caused by a medical condition or suicide). Set Crash Type to "No Injury" for the ones the spreadsheet shows this way. There are 8 rows in to check (by Report Number). DD55200006, MCP2848009G are the report numbers of the two I updated from Fatal to No Injury.

8. Remove the join on the spreadsheet.
9. Filter out any crashes where the "crashdatetime" field contains the string "2021" (see note above). [Note that the date field is a text field, so you can't meaningfully sort by this column. Note also that I was advised to ignore data from early 2021 because the county's Vision Zero coordinator needs time to manually confirm many of the crash details, some of which change after the initial report. Removes 1,051 crashes, leaving 67,257 crashes.]
10. "Clip" raw crash data to county using Select By Location to select all crashes within the county. Use a search distance of 100 feet. Export selected features [67,167 of them] to your local project geodatabase as County_Crashes_Only. Then reverse the selection to get all the crashes outside

the county boundary [90 crashes] and export that as Crashes_Outside_County. (Most of these [I think] are actually inside the county but weren't easily located by CWP using automated tools. It would take far too long to manually locate these crashes, but you are welcome to give it a try.) Remove the original crash data layer (or perhaps hold onto it for a while for QC purposes).

11. Create 100.5-foot buffers around the existing and nominated rustic roads. (I was originally using a 100-foot buffer, but the automated crash location tool encountered thousands of crashes that occurred "100 feet" from a given intersection, so the crashes were located exactly 100 feet away. It wasn't clear if these would be included within a 100-foot buffer, so I used 100.5 feet to be sure.)
    a. Use Pairwise Dissolve to dissolve existing and nominated rustic roads by road name within those layers. Include a count of OJBECTIDs per road name (just for the record and to be satisfied it was dissolved correctly). There are currently 99 existing rustic roads, so there should be 99 rows in the dissolved layer. The total of the count of the OBJECTIDs field should equal the number of existing or nominated rustic road segments in the current rustic roads layer [a subset of the Master Plan of Highways layer].) There are currently 25 nominated rustic roads, so there should be 25 rows in the dissolved layer. Name these layers "Existing_RR_Dissolved" and "Nominated_RR_Dissolved". The lines in these layers will be used as the basis for all the analysis that follows.
    b. Split Glen Road and River Road into two segments each, with "(Rustic)" and "(Exceptional Rustic)" added to the split parts. (Split Glen Road at the Piney Meetinghouse Road intersection, with the rustic segment to the west and exceptional rustic to the east.) Update the count of segments for each of these new segments—there should now be 1 segment in each. There are a few other roads where part is Rustic and part is Exceptional Rustic that will not be considered separately, so you should not split the other roads. This is just the way it is.
    c. Before proceeding, take a little time to make some minor edits to the dissolved roads, especially where the master plan recommends changes to the extents. There are a few places where there are gaps between road segments and others where there are slight overlaps. There are also a few roads that are poorly aligned, extend too far, or don't extend far enough. Be especially careful about checking for multipart features. Check out these roads in particular:
        i. Barnesville Road (very small east end correction)
        ii. Batchellors Forest Road (west end)
        iii. Boswell Road (east end, general alignment on west end)
        iv. Brookeville Road (cut off at new roundabout)
        v. Comus Road (at Peach Tree Road)
        vi. Dustin Road (cut off at roundabout)
        vii. Hoyles Mill Road (park gate at eastern end)
        viii. Mount Ephraim Road (cut off Sugarloaf Mountain Road part and add western West Harris part to Mount Ephraim; fix multipart)
        ix. Mouth of Monocacy Road (east end alignment)
        x. Old Hundred Road (at Peach Tree Road)
        xi. Peach Tree Road (north end, gaps, and a few other minor corrections)
        xii. Query Mill (at Turkey Foot Road)

xiii. Slidell Road (remove north end, corrections to south end, small gap, at W. Old Baltimore)
xiv. Stoney Creek Road (gaps)
xv. Stringtown Road (south end)
xvi. Turkey Foot Road (near Dodie Drive, Straw Bale Lane, south of Falling Leaf Drive, gap at High Meadow Road, south end, extra segments/gaps)
xvii. West Harris Road (cut off Mt. Ephraim Part)

d. Add a "Road Name" (50 characters long should be plenty), a "Miles" field (Double data type, format to two decimal places) to both dissolved tables. Populate Road Name from the LOCALROADNAME or LABEL_NAME or whatever else it might be called in the old table. Calculate Miles by dividing Shape_Length by 5280. Then delete the old road name fields from the tables, along with the count field (probably COUNT_OBJECTID) you added when you dissolved the layers above. Replace "Rd" with "Road", "Ln" with "Lane", "Dr" with "Drive", and "Ave" with "Avenue". Add highway numbers where missing: Barnesville (MD 117 for eastern, nominated part), Beallsville (MD 109), Bucklodge (MD 117), Frederick Road (MD 355), Georgia (MD 97), Old Hundred (MD 109).
e. Use the Buffer tool to create 100.5-foot buffers for each of these dissolved layers. At the time of this writing, you should have 102 segments in the existing rustic roads layer and 25 in the nominated roads layer. (Existing_RR_Buffer_100_5_FT and Nominated_RR_Buffer_100_5_FT seem like good names.)

12. Clean up crash points. There are a few that took place in parking lots but have been located through an algorithm beyond our control along a road when the "offroaddescription" field shows that they actually occurred in a parking lot. There are too many parking lot crashes to go through all of them, so we only want to look at the ones that are currently located within 100.5 feet of an existing or nominated rustic road.
    f. Select By Location from County_Crashes_Only the crashes that intersect the existing rustic roads 100.5-foot buffers. Add to this selection those that intersect the nominated rustic roads 100.5-foot buffers. [Total of 1,149 crashes.] Select By Attributes ("Select subset from the current selection") using the SQL query "lower(offroaddescription) LIKE '%parking lot%'". [When I did this, there were 13 crashes to look at.] Make a (temporary) layer from the selected features.
    g. Pan or zoom to each of the found parking lot crashes to see if they are located correctly. It may be helpful to add aerial imagery and address points to cross-reference the "offroaddescription" with where the points should be relocated. Move the points to somewhere in the appropriate parking lot. I had to move 7 points, but this still left 8 of them within 100 feet of an existing or nominated rustic road (not all the moved points were moved outside an RR buffer). Save edits and remove the temporary crash selection layer.
13. I tried to use the combination of Crash Type, Bicycle Involved, and Pedestrian Involved to symbolize the Crash Points, but for some reason it wouldn't show all possible combinations of the three fields. (The Bicycle Involved field would not display in combination with the Pedestrian Involved filed.) This is why I added the Crash_Mode field above. If you can manage to get the symbology to work correctly using the combination of these three fields, you won't need to do the following two steps.

14. Use Field Calculator to populate the Crash Mode field based on the combination of Crash Type, Bicycle Involved, and Pedestrian Involved. See chart below.
15. Symbolize the Crash Points to match the Pedestrian Master Plan's scheme (the count column is for my current analysis) (Use Is or Is Not Equal to 1 for Yes and No below):

Crash Type	Bicycle Involved	Pedestrian Involved	Crash Mode	[Count]
Fatal	Yes	Yes	Pedestrian & Bike Involved, Fatality	0
Fatal	Yes	No	Bicycle Involved, Fatality	10
Fatal	No	Yes	Pedestrian Involved, Fatality	75
Fatal	No	No	Vehicle(s) Only, Fatality	103
Serious Injury	Yes	Yes	Pedestrian & Bike Involved, Serious Injury	0
Serious Injury	Yes	No	Bicycle Involved, Serious Injury	75
Serious Injury	No	Yes	Pedestrian Involved, Serious Injury	333
Serious Injury	No	No	Vehicle(s) Only, Serious Injury	1,044
Minor Injury	Yes	Yes	Pedestrian & Bike Involved, Minor Injury	6
Minor Injury	Yes	No	Bicycle Involved, Minor Injury	648
Minor Injury	No	Yes	Pedestrian Involved, Minor Injury	2,252
Minor Injury	No	No	Vehicle(s) Only, Minor Injury	19,421
No Injury	Yes	Yes	Pedestrian & Bike Involved, No Injury	2
No Injury	Yes	No	Bicycle Involved, No Injury	89
No Injury	No	Yes	Pedestrian Involved, No Injury	113
No Injury	No	No	Vehicle(s) Only, No Injury	42,996

The Vision Zero map's symbology is shown below. Create symbology to match this, but use gray for "Minor Injury" and blue for "No Injury" combinations. (Note that I also used a pentagon instead of an octagon for the Pedestrian/Bike combo, but it turns out both are hard to distinguish from a circle.

16. Order the symbology first by Fatal, Serious, Non-Serious, and No Injury; then order by Bicycle, Pedestrian, Pedestrian & Bike, and Vehicle(s) Only within the levels of seriousness.
17. Enable symbol layer drawing for the crash point layer. Set the drawing order as above.
18. Create bar charts by Crash Type and by Crash Mode. The ones in ArcMap Pro give you an idea, but you may want to export to Excel to better stack the data.

B. Create a Countywide Crash Heat Map

1. Create a new map and add the County_Crashes_Only, rustic roads, and nominated rustic roads layers. Make sure the two roads layers are above the crashes layer.
2. Symbolize the crashes layer using the Heat Map symbology. A radius of 25 seems to work pretty well. Rename the crash layer "Crash Density" and set the transparency to 15%. Use the World Topographic Map as the background.

C. Create a Rustic Roads Crash Heat Map and Statistics

1. Select all county crash points within the two 100.5-foot buffer layers (existing and nominated rustic roads). [Note: 941 points selected near rustic roads; 238 points selected near nominated roads; 1,144 total points selected (meaning 35 points overlap between rustic and nominated roads)]
2. Remove crashes that took place on I-270 where it crosses over a rustic road. Select By Attributes with "Remove from the current selection" selected and search for Road Name is EISENHOWER MEMORIAL HWY. (This removes three crashes that are on Old Hundred and Game Preserve Road, so we're now down to 1,141 crashes.)
3. Export the selected features as new layer "All_RR_Crashes".
4. Reverse the selection [Note: 66,126 points selected] and create the layer "Non_RR_Crashes".
5. Import the symbology from the County Crashes layer.
6. Create a new map and add the All_RR_Crashes, rustic roads, and nominated rustic roads layers. Make sure the two road layers are above the crashes layer.
7. Symbolize the crashes layer using the Heat Map symbology. A radius of 25 still seems to work pretty well. Rename the crash layer "Crash Density – Rustic Roads" and set layer transparency to 15%. Use the World Topographic Map as the background.

D. Create crash statistics for rustic roads.

1. Use the Summarize Within tool to summarize the crashes within the Nominated and Existing Rustic Roads by crash type. ("Existing_RR_Crash_Type" and "Nominated_RR_Crash_Type".) Use Summary Fields "Serious", "Fatal", "Bicycle Involved", and "Pedestrian Involved" ("Sum" statistic) and select Crash Type for Group Field. Give the Output Grouped Table a unique name so that it doesn't get overwritten when you run the tool a second time. ("Existing_RR_Crash_Type_Summary" and "Nominated_RR_Crash_Type_Summary")
2. Use the Pivot Table tool to convert the summary tables to something that can be joined back to the road summary tables. Input Field = Join ID; Pivot Field = Crash Type; Value Field = Count of Points. Set the output table name to Existing_RR_Crash_Type_Pivot_Table and Nominated_RR_Crash_Type_Pivot_Table.
3. Join the crash type pivot tables to the crash type summarize-within buffers. (You may notice that in some cases the sum of total or serious or fatal crashes does not equal the computed total for these fields; this is because the underlying crash data did not update these fields based on other passengers (other than the drive) in vehicular crashes that were determined based on the external spreadsheet discussed above.) Create the following fields (data type = Long) in each crash type summary table: Fatal_Injury, Serious_Injury, Minor_Injury, No_Injury, Bike_Non_Int, Ped_Non_Int, Fatal_Non_Int, Serious_Non_Int, Minor_Non_Int, None_Non_Int. Use aliases: Fatal Injury, Serious Injury, Minor Injury, No Injury, Bicyclists Involved (Non-Intersection), Pedestrians Involved (Non-Intersection), Fatal (Non-Intersection), Serious (Non-Intersection), Minor (Non-Intersection), None (Non-Intersection). Set the first four of these equal to the joined pivot table's fields from above. (You'll calculate the non-intersection crashes in a minute.) Also update the other aliases in the table at this time: "Crashes" (for Count of Points), "Bicyclists Involved" (for Sum bike), and "Pedestrians Involved" (for Sum Ped). Turn off the sum_total_serious and sum_total_fatal (see note above). Remove the join.
4. Create crash type charts for the Summarize_Within layers.
    a. Create a Total Crashes By Road Name chart (Crashes field) for each of the crash type summary layers. Category = Road Name; Numeric field = Crashes; Label Bars; X-axis 31-character limit; Chart title = Total Crashes by Road; Y axis title = Crashes
    b. Create a chart for Serious Injury and Fatal Crashes only for each of the crash type summary layers. I found it helpful to make a stacked chart to save a little space. Note that there are too many roads in the program to display all the road names, so it may help to export to Excel to make charts. Chart title = Fatal and Serious Crashes by Road; Y axis title = Crashes

E. Create Road-by-Road Crash Maps

1. Create layers showing all the intersections along existing and nominated rustic roads. Use the dissolved road layers. (Create two layers, even though there will be some redundancy where nominated and existing rustic roads meet.) Use Feature Vertices to Points and select "Both start and end vertex" as the Point Type. I named them "Existing_RR_Intersections" and "Nominated_RR_Intersections". Create a new field (50-character text) in both intersection layers to track the vertex type. Initially set each Vertex Type to "Intersection". You will need to manually zoom to each road to find the other intersections, so be prepared to spend a little time, although it's not too hard. Another thing to be on the lookout for are starting and ending vertices that are in the middle of a given road. When you find these, the road has either been

broken into sections at major intersections or there is an error in the road where it is broken at some arbitrary point in the middle. Sort the intersection points by Road Name and take this opportunity to fix the road lines if it is one of these arbitrary mid-points. If you find a vertex that is at the end of a road, change the Vertex Type to "End of Road". If it is in the middle of a road, such as when a road crosses the county line or only part of a road has been nominated or is in the program, change the Vertex Type to "Non-Intersection". A good hint for end-of-road points is if the "To Location" of the road says "End".

2. Identify crashes near intersections. Use the "Near" tool in GIS to calculate the distance to the nearest intersection. First, you'll have to merge the two intersection layers, but when I used the "Merge" tool in ArcGIS Pro it gave me an unusable result, so I created a new point layer called "All_RR_Intersections" by selecting Vertex Type = "Intersection" from the Existing_RR_Intersections layer and creating a new layer from the selected features, and then exporting the features to the new layer. Select the intersections from the Nominated_RR_Intersections layer and add them to the new layer. When you run the Near tool on the All_RR_Crashes layer, it appends two new fields to the table: NEAR_FID and NEAR_DIST. (Make sure to set the search distance to 100.5 feet when you run the Near tool.) NEAR_FID is a pointer back to the closest intersection point, and NEAR_DIST is the distance from an intersection point. If NEAR_DIST is -1, then there were no intersections within 100.5 feet of the crash.
3. Create a new crash point layer for only those crashes that are not within 100.5 feet of an intersection. (In other words, select the All_RR_Crashes where NEAR_DIST = -1.) I named the new layer "All_RR_Crashes_No_Int". [Note: 441 crashes.]
4. Use the summarize within command to create summaries by Crash Type using the non-intersection crash point layer ("Existing_RR_No_Int" and "Nominated_RR_No_Int") (sum the bicycle- and pedestrian-involved crashes), create pivot tables from the summary tables ("Existing_RR_No_Int_Summary" and "Nominated_RR_No_Int_Summary"; "Existing_RR_No_Int_Pivot_Table" and "Nominated_RR_No_Int_Pivot_Table"), join the pivot tables to the original summarize within tables (by crash type) and set the non-intersection values to the crash values from the new pivot table. You will need to join the Existing_RR_No_Int layer to the Existing_RR_Crash_Type layer on Road Name to get the non-intersection Bike and Pedestrian totals. Remove the join(s).

F. Crashes per unit of length.

1. Add another Double field, Crashes_per_Mile, rounded to two decimal places to both Crash Type summary layers.
2. Use Calculate Field to populate Crashes_per_Mile by dividing the number of crashes by the miles. This isn't rocket science, people.
3. Do something similar for the nominated Rustic Roads.

G. Disperse Markers

1. A lot of crash points overlap, so it is impossible to tell how many accidents happened in a spot just by looking. Use the geoprocessing tool "Disperse Markers" to spread the points out where they overlap. This tool requires that a reference scale be set, so before you can run it, right-click on the map name in the table of contents and open the properties window. On the General Tab,

set the reference scale to 1:5,000. Also set the current view window to 1:5,000. Because this tool actually moves the location of the points, not just how they appear on the map, it is critical that you **make a copy** of the layer and work on that copy so that you don't move the original crash points. I called the table All_RR_Crashes_Dispersed in anticipation of its final state.

2. In the Disperse Markers dialog, set the Input Point Features to the copy of the crash data. [Originally, I did not disperse every crash point in the county, but instead only dispersed the markers along the existing and nominated rustic roads. This is because after a couple of hours the process only seemed to be 20% of the way through. Later I was able to disperse the non-RR markers and it completed in about 70 minutes.] Set Minimum Spacing to 0 to get touching points. Leave the Dispersal Pattern set to "Expanded".
3. When you have finished running the tool, go back into the map properties and set the Reference Scale back to "None" or you'll be sad.

H. Create crash type charts for the Summarize_Within layers.

1. All Crashes
   a. Category = Road Name
   b. Aggregation = None
   c. Numeric Fields:
      i. Fatal Injury
      ii. Serious Injury
      iii. Minor Injury
      iv. No Injury
   d. Label bars = checked
   e. Recolor series symbols to match crash colors (Fatal = poinsettia red; Serious = anemone violet; Minor = gray 50%; None = lapis lazuli)
   f. X-axis label character limit = 31
   g. Y-axis bounds maximum = 65 (whatever multiple of 5 is equal to or greater than the default value here)
   h. Chart title = "Crash Type (All Crashes)"
   i. X axis title off
   j. Y axis title = "Crashes"
   k. Turn the legend off by clicking on the  button when you have the chart open. (Do this only for the non-intersection crashes.)
2. Non-Intersection Crashes
   a. Same as above except:
      i. Numeric Fields will be the non-intersection equivalents
      ii. The Y-axis bounds limit should be the same multiple of 5 chosen for all crashes above
      iii. The Chart title should be "Crash Type (Non-Intersection)"

I. Create Map Series

1. Add a layout to the project (11 x 8.5 landscape).
2. Name it "Road-By-Road Layout – Existing".
3. Add guides 3/16ths top, bottom, left, and right.
4. Add vertical guides at 8 and 1/8th and 8 and 1/4th.

5. Add horizontal guides at 2 and 1/8th and 2 and 1/4th.
6. Insert a map frame within the largest frame using the Crash Analysis map.
7. Set a Map Series based on the existing rustic roads summary by crash type layer.
8. Open the Properties of the Map Series and set the Best Fit Extent to a 10 percent margin rounded to the nearest 200.
9. Insert the Page Name: Road Name Dynamic Text at the top of the space on the right. Center it and remove the "Page Name" label.
10. Go back to the Crash Analysis map and make a copy of the County_Crashes_Only layer and name it "Crash Mode". Group the layer symbology by mode (Bicycle Involved, Pedestrian Involved, Pedestrian & Bike Involved, Vehicle(s) Only) and then change the fill to No Color. Fix the label names appropriately.
11. Insert a Legend below the Road Name label. Include the following layers:
    a. Rustic Roads
    b. Nominated Rustic Roads
    c. 100.5-foot buffers
    d. Municipality Boundaries
    e. Properties
    f. Building Footprints
    g. Forest
    h. Parks
    i. Crash Mode
12. The legend should start around 8.0 in and extend 4.5 in.
13. Create another map and name it "County". This will be the index map. Add the following layers:
    a. Roads 1:175K (Need the Freeways and Major Roads)
    b. County Boundary
    c. Agricultural Reserve
14. Insert a map frame using this new County map in the box in the lower right of the layout. Set the zoom to 1:1,000,000.
15. Add an extent indicator to the index map. Collapse to point smaller than 1,000 points and make some really obvious point symbol.
16. Insert the Page with Count Dynamic Text underneath the index map, right-justified.
17. Insert three more Dynamic Text fields (all Attributes) below the legend:
    a. Road Length (in miles)
    b. Bicycles Involved (count)
    c. Pedestrians Involved (count)
18. Below the three attribute and just above the index map, add a scale bar.
19. Add the All Crashes and Non-Intersection Crash bar charts to the area under the Road Map on the left. Turn on the legend for the All Crashes map.
20. Put some text fields for "No Crashes" and "No Non-Intersection Crashes" behind the two charts in case there is no data.
21. There are a few road names that don't show up no matter what you do. Create a Graphics Layer for less than 10K viewing and another for 40K-50K and create labels for the following roads:
    a. [Note that in the latest iteration I didn't create labels for any of the roads. You may need to look through the final map series and see if any labels are necessary.]

22. To make the roads stand out, go back to the Crash Analysis Map one more time and
    a. Turn on the 100.5-foot buffer layer.
    b. Change the color to a semi-transparent yellow fill and a solid 1-point yellow outline.
    c. Go to Properties for the layer and select the Page Query option at the bottom of the list.
    d. Set the filter to match on road name.