Roanoke Counter Report

RVARC has counted 30 locations in the Roanoke Valley with five counters (one infrared, two infrared/pneumatic tubes, one with three permanent inductive loops, and one temporary inductive loop) provided by VDOT and 4 counters provided by Virginia Tech.

Table 1. Sites counted with VDOT or Virginia Tech counters

Dates	Location	Locality	Counter/owner	Ped	Bike
12/9/2015 – current	Memorial Avenue	City of Roanoke	Y2G14015018/VDOT		Greenway, bike lanes
7/18/2019 – current	10th Street – East	City of Roanoke	YPI14027302/Virginia Tech, Metro counter with tubes	Sidewalk	Street
7/18/2019 – 10/13/2020	10th Street – West	City of Roanoke	YPI15027303/Virginia Tech	Sidewalk	
7/18/2019 – 10/30/2020	Campbell Avenue – North	City of Roanoke	YP15027300/Virginia Tech	Sidewalk	
7/18/2019 – current	Campbell Avenue – South	City of Roanoke	YPI15027301/Virginia Tech	Sidewalk	
10/28/2019 – 2/17/2020	Elm Avenue – North	City of Roanoke	YMH19058690/VDOT	Sidewalk	Bike lane
10/29/2019 – 2/17/2020	Elm Avenue – South	City of Roanoke	YMH19058680/VDOT	Sidewalk	Bike lane
11/20/2019	Memorial Avenue	City of Roanoke	YSH19080684/VDOT	Sidewalk/Greenway	
12/7/2019 – 4/12/2020	Roanoke River Greenway – Rivers Edge	City of Roanoke	Y2H19058694/VDOT		Greenway
2/4/2020 – 6/17/2020	Pollard Street	Vinton	YMH19058680/VDOT	Sidewalk	
2/8/2020 – 3/18/2020	Hardy Road	Vinton	YMH19058690/VDOT	Sidewalk	
3/16/2020 – 6/17/2020	Ogden Road	Roanoke County	YMH19058690/VDOT	Social path	

Dates	Location	Locality	Counter/owner	Ped	Bike
6/12/2020 – 7/27/2020	Salem – Main Street – North	Salem	YMH19058680/VDOT	Sidewalk	
6/13/2020 – 7/27/2020	Salem – Main Street – South	Salem	YMH19058690/VDOT	Sidewalk	
7/24/2020 – 8/7/2020	Shaffers Crossing	City of Roanoke	YMH19058690/VDOT	Sidewalk	
7/24/2020 – 8/7/2020	Grandin Road	City of Roanoke	YMH19058680/VDOT	Sidewalk	
8/5/2020 – 9/18/2020	Roanoke – Main Street – East	City of Roanoke	YMH19058680/VDOT	Sidewalk	Bike lane
8/5/2020 – 10/19/2020	Roanoke – Main Street – West	City of Roanoke	YMH19058690/VDOT	Sidewalk	Bike lane
9/16/2020 – 11/01/2020 ; 10/30/2020 – current	Cove Road	City of Roanoke	YMH19058680/VDOT , YP15027300/Virginia Tech	Sidewalk	Bike lane
9/26/2020 – current	Jefferson Street – Downtown	City of Roanoke	YPI15027303/Virginia Tech	Sidewalk	
10/16/2020 – 11/2/2020	Jefferson Street – South	City of Roanoke	YMH19058690/VDOT	Sidewalk	
10/30/2020 – 12/21/2020	Orange Avenue – South/East	City of Roanoke	YMH19058690/VDOT , YMH19058680/VDOT	Sidewalk	
10/30/2020 – 12/21/2020	Orange Avenue – South/West	City of Roanoke	YMH19058690/VDOT , YMH19058680/VDOT	Sidewalk	
11/18/2020 – 12/2/2020	Orange Avenue – North/East	City of Roanoke	YMH19058680/VDOT	Sidewalk	
11/18/2020 – 12/2/2020	Orange Avenue – North/West	City of Roanoke	YMH19058690/VDOT	Sidewalk	
12/22/2020 – 2/23/2021	Melrose Street near	City of Roanoke	YMH19058680/VDOT	Sidewalk	Bike lane

Dates	Location	Locality	Counter/owner	Ped	Bike
	Peters Creek – South				
12/24/2020 – 2/23/2021	Melrose Street near Peters Creek – North	City of Roanoke	YMH19058690/VDOT	Sidewalk	Bike lane
3/1/2021 – current	Melrose Street at New Horizons	City of Roanoke	YMH19058690/VDOT	Sidewalk	
3/4/2021 – 3/15/2021	Norris Drive	City of Roanoke	YMH19058680/VDOT	Sidewalk	

In addition, RVARC has 24 active counters on greenways and trails, some of which have been collecting data since 2010. In 2010, Pathfinders for Greenways purchased $500 TRAFx infrared counters for the growing greenway system. RVARC manages these and other TRAFx counters. TRAFx counters do not distinguish between bicyclists and pedestrians. RVARC staff visit the counters quarterly to retrieve the data. Locality staff use the information to make decisions about maintenance and amenities and to justify needs in grant applications. At the beginning of the pandemic, as people flocked to the Roanoke River Greenway, counts were important for public health decisions to close crowded greenways and open low traffic greenways.

In 2015, VDOT staff installed inductive loops during a road diet project on Memorial Avenue. The road diet included adding a wide sidepath to carry the Roanoke River Greenway as well as bike lanes. The inductive loops were installed in both bike lanes and in the greenway. This counter has data service but until recently, RVARC staff did not have access to the data.

In July 2019, Virginia Tech professor Dr. Steve Hankey provided four infrared EcoCounters and one pneumatic loop Metro counter to RVARC. These do not have data service. RVARC staff visit the EcoCounters monthly to retrieve data and visited the Metro counter weekly.

In October 2019, VDOT TMPD provided two MultiModal EcoCounters with data service to RVARC.

When VDOT Research Council launched a pilot statewide bike/ped count program, the City of Roanoke was approached about receiving permanent counters but unfortunately, negotiations stalled in the legal departments. The Research Council had to shift its focus away from the City but was able to install one infrared counter on Memorial Avenue that counts both bicyclists and pedestrians and using the data from that and the existing inductive loop in the greenway, create a virtual pedestrian counter. This counter has data service.

In December 2019, VDOT TMPD provided a Zelt loop counter with data service to RVARC. This was in place until a flood in April 2020 at which point the Zelt loop counter was returned to VDOT TMPD.

Reference counters

We have used the Virginia Tech counters (that don't have data service) as reference counters since they were installed in July 2019. In November 2019, VDOT installed a counter on the Memorial Avenue greenway/sidewalk. This can also serve as a reference counter (with missing data for January/February 2021 when it vanished).

Two Virginia Tech counters were installed on Campbell Avenue, one on the south side of the street and one on the north. Two were installed on 10th Street, one on the east side and one on the west. The counts on opposite sides of the same street matched each other perfectly. Therefore, we thought it would make sense to split them up and get a broader picture of the region. One counter was moved to Jefferson Street (September 2020) and one to Cove Road (November 2020).

Each location has different characteristics and advantages and disadvantages as a reference counter.

1. Campbell Avenue: Downtown Roanoke near the bus station. This location has the highest pedestrian activity in the Valley, with the possible exception of Rivers Edge on a sunny Saturday. The traffic pattern here is unique to Downtown Roanoke with a pronounced weekday lunch peak. Sunday traffic is considerably lower than weekday and Saturday traffic. We have data at this location from July 2019 – current. The unique weekday lunch peak has been attenuated since the onset of the pandemic.

2. 10th Street: Northwest Roanoke near the Lick Run Greenway. This location has very low pedestrian activity. 10th Street was closed north of this location for three years for construction, including the first year these counters were in place (July 2019 – current). It was important to include a Northwest Roanoke location because this is an environmental justice community that has traditionally been underserved. However, the very low traffic could make this counter unreliable as a reference counter. A possible limitation of this location is that pedestrian traffic may be influenced by the nearby Lick Run Greenway and may be less relevant to an on-street location that is not influenced by a nearby Greenway.

3. Memorial Avenue: Southwest Roanoke on the Roanoke River Greenway. This sidewalk is extra wide to accommodate the greenway traffic and is a high traffic location. It is a virtual pedestrian counter created by an algorithm that counts as a bicycle if the inductive loop nearby also detected a signal a few seconds before or after (depending on the direction) a same-direction signal detected by the infrared counter. As with the 10th Street counter, a possible limitation of this location is that pedestrian traffic is the influence of the Greenway, and since the Greenway actually routes directly onto this sidewalk that influence may be even stronger than the 10th Street location. StreetLight InSight data suggests that most of

the pedestrian traffic is continuing on the street but a substantial share is coming from or going to the Greenway.

4. Jefferson Street: Downtown Roanoke in front of the Social Security office near the library. This location also has high pedestrian activity and traffic patterns match those observed for Campbell Avenue. This counter was placed mid-pandemic, in September 2020, so it is not known if it will also show the pronounced weekday lunch peak.

5. Cove Road: Northwest Roanoke near an intersection with new high visibility crosswalks. This location has higher pedestrian activity than 10th Street. It was placed in November 2020. When it has been in place for a full year, the 10th Street counter will probably be moved to a new location.

Nowhere else in the Valley has the same traffic pattern as Downtown Roanoke. Downtown Salem, Downtown Vinton, and Grandin Village might reasonably be expected to have a similar pattern but none of them have the pronounced midweek lunch peak. Therefore, it might make sense to keep only one reference counter in downtown Roanoke and move the other to another location, probably one of the other downtowns. (Grandin Village is close to Memorial Avenue where there is another reference counter and we want to distribute the counters widely.) The 10th Street counter should also be moved to another location because the traffic there is too low to be reliable.

It is important for local staff to have access to the counter data.

Because RVARC staff now have access to the data for the inductive loops, the infrared counter, and the virtual pedestrian counter, RVARC was aware that something had happened to the infrared counter on or about January 4, 2020. Staff visited the counter to assess the situation and discovered that the counter had vanished and the sign post it was installed on had changed. Staff worked with the City and Eco-Visio to track it down. On January 4, a driver swerved to avoid a vehicle that pulled out in front of him and hit the sign post, breaking it into two pieces and knocking the counter off. The driver called the police and cleaned up the scene, throwing the broken pieces and the counter into his car. When RVARC staff contacted him, he realized what he had and promptly returned the counter to RVARC.

Hours required

The weekly visits required by the Metro counter to retrieve data make it time consuming and impractical. Monthly and quarterly data retrieval is more manageable, depending on how many counters and how accessible they are. Four counters require monthly visits. A dozen or so require quarterly visits, and some of those require hiking up a mountain to access.

Counters that have data service and transmit to the cloud require very little time to access the data. The counters should be monitored frequently for the first few days. After that once a week is reasonable and staff can follow up if something looks strange.

It doesn't do any good to collect data if no one sees it. The inductive loops embedded in the pavement on Memorial Avenue bike lanes and greenway were not seen by anyone for several years. Now that RVARC staff have access to this data, it's a gold mine of historical patterns. It's important to allow for staff time to review, analyze, and report data.

Some other steps that take staff time:

- Solicit requests for count locations from locality staff, local advocates, and other agencies (i.e. Downtown Roanoke Inc., Roanoke Regional Partnership).
- Research why the counts have been requested, what type of counts (bike or ped), etc.
- Research the area to identify candidate locations. This may require more back-and-forth if an ideal location isn't available in order to identify a feasible location that is close enough to the place of interest. For example, many people want to know about crosswalk activity, which isn't possible, and they usually settle for knowing the activity on one or two approaches near the intersection.
- Determine a day with appropriate weather to retrieve and deploy the counter. This may require coordinating with locality staff.
- Alert locality staff of the final location and the date the counter is deployed.

Flooding, snow, streetsweeping

The Zelt loop was placed at a location that had flooded only once in ten years. While it was in place, that location nearly flooded twice. The third time the counter was at risk of flooding, it was removed and the location did flood. It flooded two more times after that – after flooding just once in ten years, it flooded three times in a single year. While the counter was in place, staff had to monitor flood levels.

Another issue with the Zelt loop was the possibility of snow. The greenway gets plowed after snowfall, which would destroy the wires and could damage the counter. While the counter was in place, December through April, staff had to monitor the weather and be prepared to go out in adverse conditions to pull up the counter potentially under a blanket of snow.

The same issue was true for pneumatic tubes. Staff placed pneumatic tubes in the bike lane on Melrose Avenue on December 23. Staff had to monitor the weather and be prepared to go out in adverse conditions to pull up the tubes before the snowplow got there.

Although there was no snow accumulation on Melrose Avenue when the tubes were in place, one of the bike lanes dropped to zero counts suddenly. Staff discovered that the tubes on that side had come loose and half of one tube was missing entirely. The most likely explanation is a streetsweeper. In the future, staff will contact maintenance before installing tubes in the bike lane and work around the streetsweeping schedule.

Locality partners

RVARC staff can install infrared counters with no assistance but have relied on locality staff to install pneumatic tubes. It will be more efficient for RVARC to purchase supplies such as asphalt nails, a heavy hammer, etc. RVARC doesn't have a company vehicle but will purchase a flashing light that employees can mount on their private vehicles to provide work zone protection.

Vinton and Roanoke County installed a 3-foot tall sign post to mount the counter to in locations that didn't have a post in the right place.

Bike lanes or not

So far staff have only counted bikes where there are bike lanes or on bike paths. Localities have repeatedly requested counts at locations that do not yet have bike lanes. They want counts before and after bike lanes are installed. They want counts on roads that they think bicyclists are using, but they aren't sure. Eco-Visio has advised RVARC that larger diameter tubes that can stand up to motor vehicles can be used and that these should be purchased from Eco-Visio – other manufacturers' tubes do not work with Eco-Visio equipment, in their experience. RVARC has purchased this tubing and other equipment to start counts on roads without bike lanes.

Finding the right place to count

The infrared counters are easy to install but there are limitations on where they can be placed. Some of the issues we have experienced:

- Elm Avenue, one of the counters didn't transmit data. After some trouble shooting with Eco-Visio, it was determined that the signal strength was insufficient at that location. This didn't affect the data but did generate several trips to the counter to investigate what was wrong.
- Pollard Street, ghost counts probably from reflections of traffic off a glass window. The counter was moved to a location facing a brick wall. Options were limited because of parking lots and glass windows.
- Ogden Road, after several weeks of normal counts, started having ghost counts sometimes. These increased in frequency. When the counter was moved, it was discovered that a bush had grown over the counter.
- Orange Avenue South/East, extreme ghost counts (tens of thousands). This was probably electromagnetic interference. Staff installed a Faraday cage (e.g. wrapped the sensor in aluminum foil) which reduced but did not abolish the ghost counts.
- Melrose Street at New Horizons, insufficient signal strength. This didn't affect the data but generated several trips to the counter to investigate what was wrong.

An issue in placement of the pneumatic tubes came up on Cove Road. The initial site was too close to a curve and traffic encroached in the bike lane causing extra counts. Another site was found further from the curve.

Correct wire banding

Staff attempted to order wire banding to attach the counters but got the wrong type, 0.030" thickness instead of 0.015" thickness. That makes the band extremely difficult to cut and difficult to fit through the slots. On the other hand, this makes the counter more securely attached (the one that got hit by a car and broke off the signpost was attached with 0.015" banding).

Vinton Pedestrian Counts

July 27, 2020

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and has provided Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. Vinton identified two priority locations for pedestrian counts near signalized intersections that are receiving pedestrian improvements through the Pedestrian Safety Action Plan program: 1) Gus Nicks Boulevard/Washington Avenue and Pollard Street and 2) Hardy Road and Vinyard Road.

Several planners and citizens walked along Gus Nicks Boulevard, Washington Avenue, and Pollard Street through downtown Vinton in 2019 to review pedestrian accommodations. Gus Nicks Boulevard has average annual daily vehicle traffic (AADT) of 21,000, Washington Avenue 20,000, and Pollard Street 6,000. The #35/#36 bus serves Pollard Street and Washington Avenue. Downtown locations that generate pedestrian traffic include the library, the post office, City Hall, the Farmers Market, restaurants, bars, retail, and offices. New developments including the recently finished Billy Byrd Apartments, construction underway at Vinton Motors, and desired development of Gish Mill are expected to generate more pedestrian activity. The counter was initially mounted on a signpost on Pollard Street near Washington Avenue but it had to be moved because a glass window was reflecting automobile traffic toward the infrared sensor. It was placed on Pollard Avenue near Lee Street (Figure 1). Pedestrian counts were collected February 13 – June 11, 2020. This counter was intended to collect data for one month, but it was still in place when the COVID-19 state of emergency began, and leaving it in place allowed analysis of the effect of the pandemic on pedestrian traffic.

Figure 1. Location of counter. *Left:* Standing on the west side of Pollard Street facing northbound. *Right:* Facing south.

Hardy Road has 12,000 AADT and is also served by the #35/#36 bus. Destinations in and near Lake Drive Plaza generate pedestrian activity, including fast food restaurants, a grocery store, and Rosie's Gaming Emporium. Vinton staff installed a signpost on Hardy Road that the counter could be mounted to (Figure 2). Pedestrian counts were collected February 8 – March 15, 2020.

Figure 2. Location of counter. *Left:* Standing on the north side of Hardy Road facing east. *Right:* Facing west.

Ideally, permanent counters collect data for a full year so that day-of-year factors can be applied to the raw data from temporary counters such as these to calculate Average Annual Daily Traffic for that location. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters at two locations. After examining travel patterns, the two counters at 10th Street NW near the Lick Run Greenway were selected to provide day-of-year factors to the Vinton pedestrian counts because the travel characteristics of that location are more similar than the other location (Campbell Ave SW) to the Vinton locations. Day-of-year factors were determined for each of the two 10th Street NW counters by dividing the day's count for each counter by the average of 365 days of counts for that counter. The day-of-year factor was the average of the two counters' day-of-year factors. Each day's counts on each of the Vinton locations were divided by the day-of-year factor for the corresponding date. The adjusted counts were averaged to calculate the annual average daily pedestrian traffic at each location.
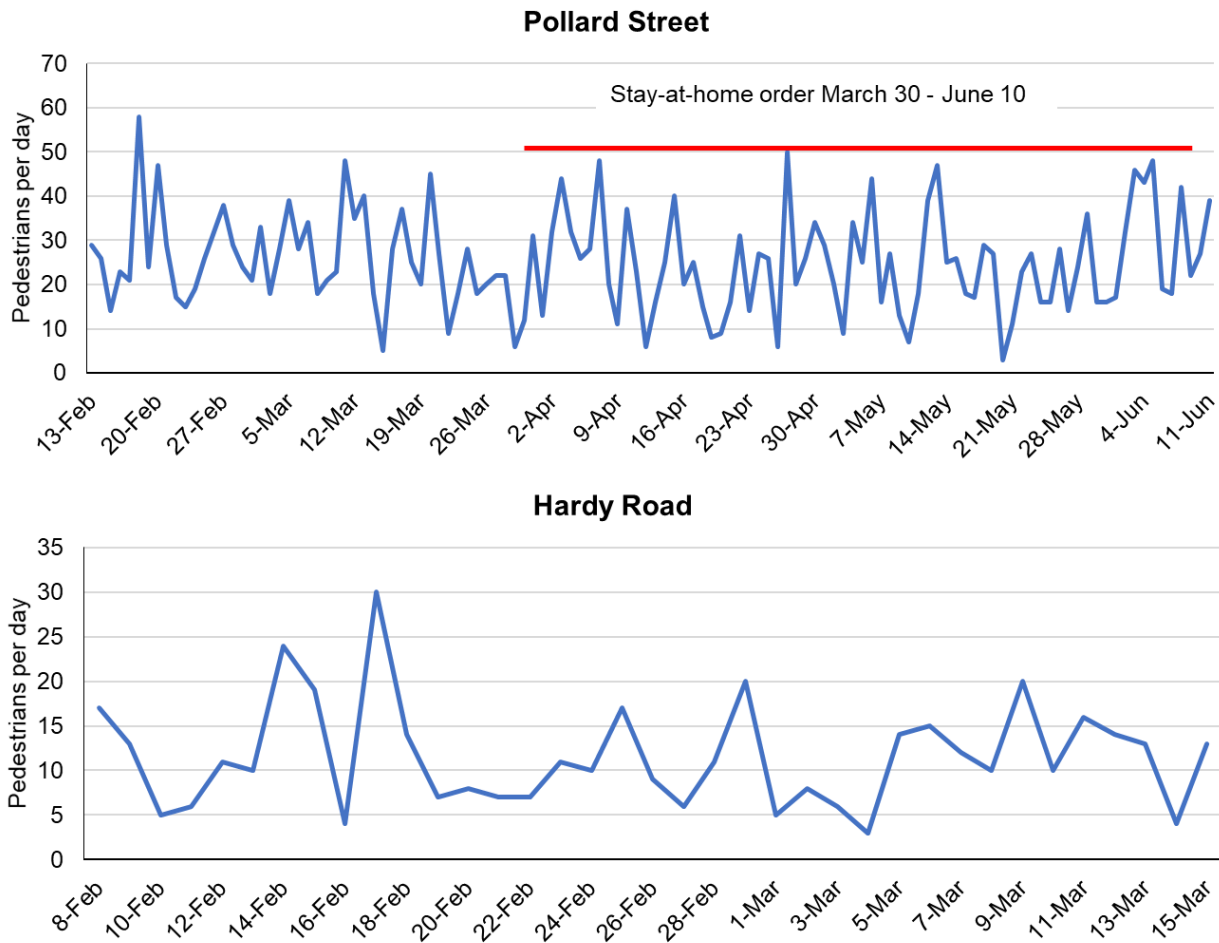
Pollard Street

Hardy Road

Figure 3. Daily counts not adjusted by day-of-year factor.

After adjusting each day's count with the day-of-year factor, the Average Annual Daily Pedestrian Traffic for Pollard Street was 27.0 and for Hardy Road 11.3. The raw counts ranged from 3 to 58 for Pollard Street and 3 to 30 for Hardy Road (Figure 3). Pedestrian traffic on Pollard Street was unaffected by the COVID-19 state of emergency: Average Annual Daily Pedestrian Traffic of 26.4 from February 13 – March 22 vs. 27.4 from March 30 – June 10. The governor closed schools on March 23 and issued the stay-at-home order on March 30 and reopening began June 10.

Daily traffic patterns were analyzed. On Pollard Street, pedestrian traffic was lowest on Sundays (47% below average) and almost higher Tuesday – Friday, reaching a peak 26% higher than average on Friday (Figure 4). On Hardy Road, Mondays and Fridays were 26% and 21% higher than average while Wednesdays and Sundays were about 20% below average (Figure 4).

Hourly pedestrian traffic on Pollard Street showed a morning peak at 9:00 am and a lower lunch peak from 12:00 pm – 2:00 pm (Figure 5). On Hardy Road, pedestrian traffic rose steadily from 5:00 am with peaks at 12:00 pm and 4:00 pm.
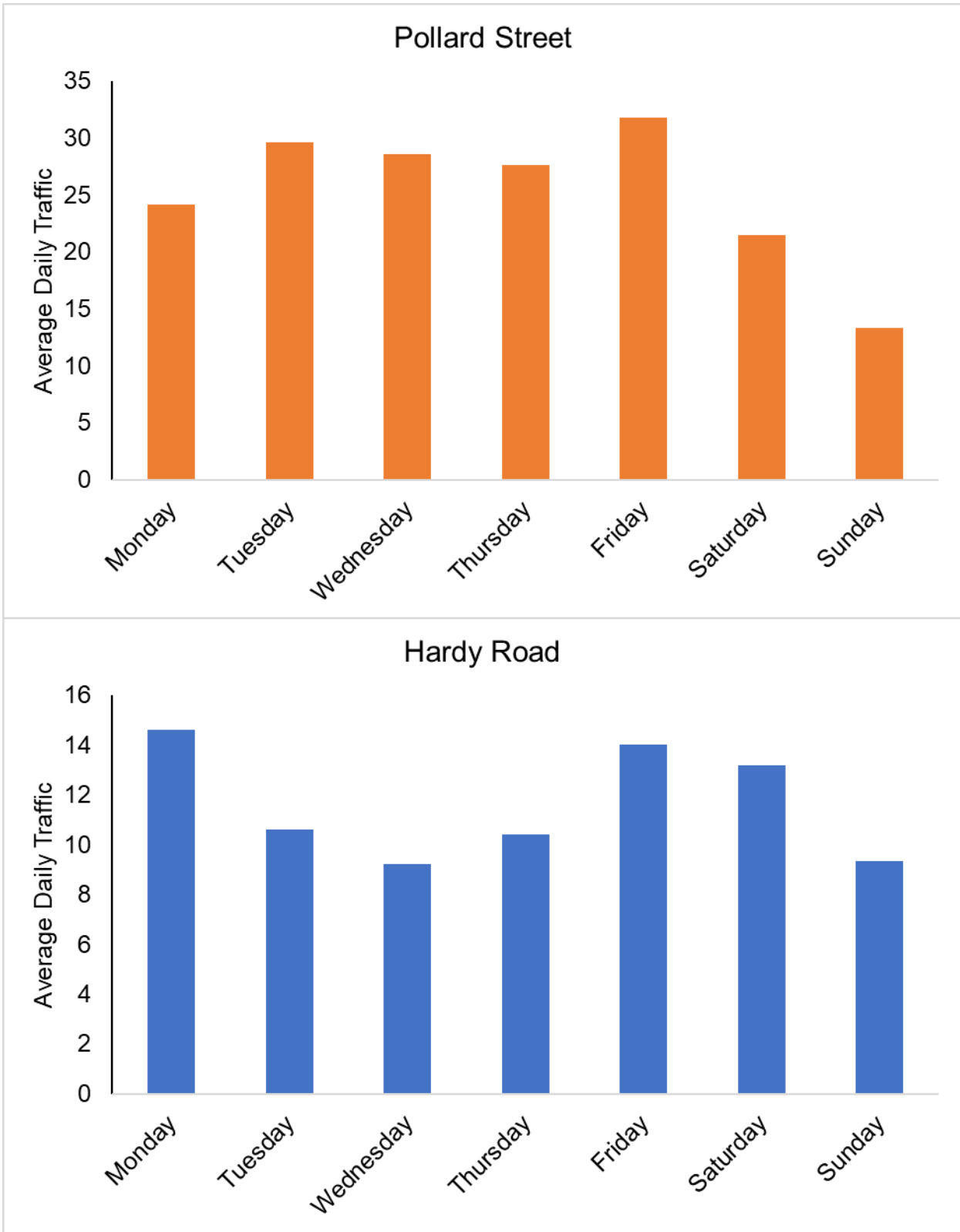
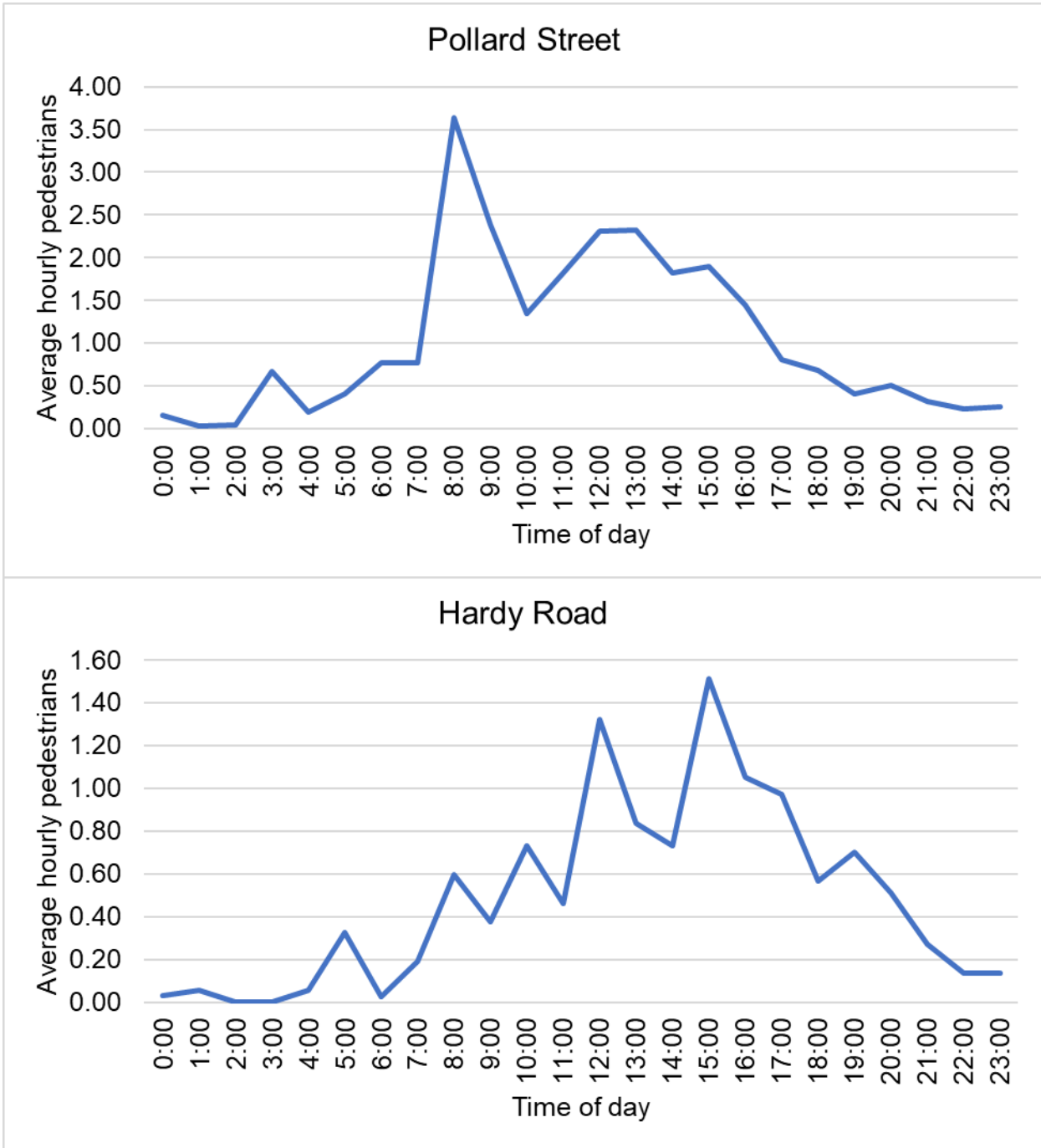*Figure 4.* Day of week average daily pedestrian traffic.

Figure 5. Average hourly pedestrian traffic (not adjusted for day-of-year factor which is only relevant to daily counts).

Shaffers Crossing and Grandin Village

August 6, 2020

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and provided Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. Shaffers Crossing and Grandin Village are locations of interest.

Shaffers Crossing: Average Annual Daily Pedestrian Traffic 47.5

Shaffers Crossing is the 875-foot segment that connects Boulevard St to 24th Street. It passes under four railroad bridges. A new boardwalk was constructed after the collapse of the previous boardwalk. The new ADA-compliant boardwalk is five feet wide and connects to the sidewalks on both ends with ramps (previously there were steps). 24th Street has an average annual daily vehicle traffic of 9,700. 10th Street crosses the railroads 1.2 miles to the east and Peters Creek 2.4 miles to the west; there are no closer places to cross the railroads. Hurt Park Elementary School is on the south side. Goodwill is on the north side. Both sides have affordable housing complexes, industrial uses, and bus lines.

RVARC staff installed a counter on the railing of the boardwalk (Figure 1). Pedestrian counts were collected July 25 – August 3, 2020.

Ideally, permanent counters collect data for a full year so that day-of-year factors can be applied to the raw data from temporary counters such as the one at Shaffers Crossing to calculate Average

Figure 1. Facing south at the location of the counter

Annual Daily Traffic for that location. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters at two locations. After examining travel patterns, the two counters at 10th Street NW near the Lick Run Greenway were selected to provide day-of-year factors to the Shaffers Crossing pedestrian counts because the travel characteristics of that location are more similar than the other location (Campbell Ave SW) to Shaffers Crossing. Day-of-year factors were determined for each of the two 10th Street NW counters by dividing the day's count for each counter by the average of 365 consecutive days of counts for that counter. The day-of-year factor was the average of the two counters' day-of-year factors. Each day's counts on Shaffers Crossing were divided by the day-of-year factor for the corresponding date. The adjusted counts were averaged to calculate the annual average daily pedestrian traffic at that location.
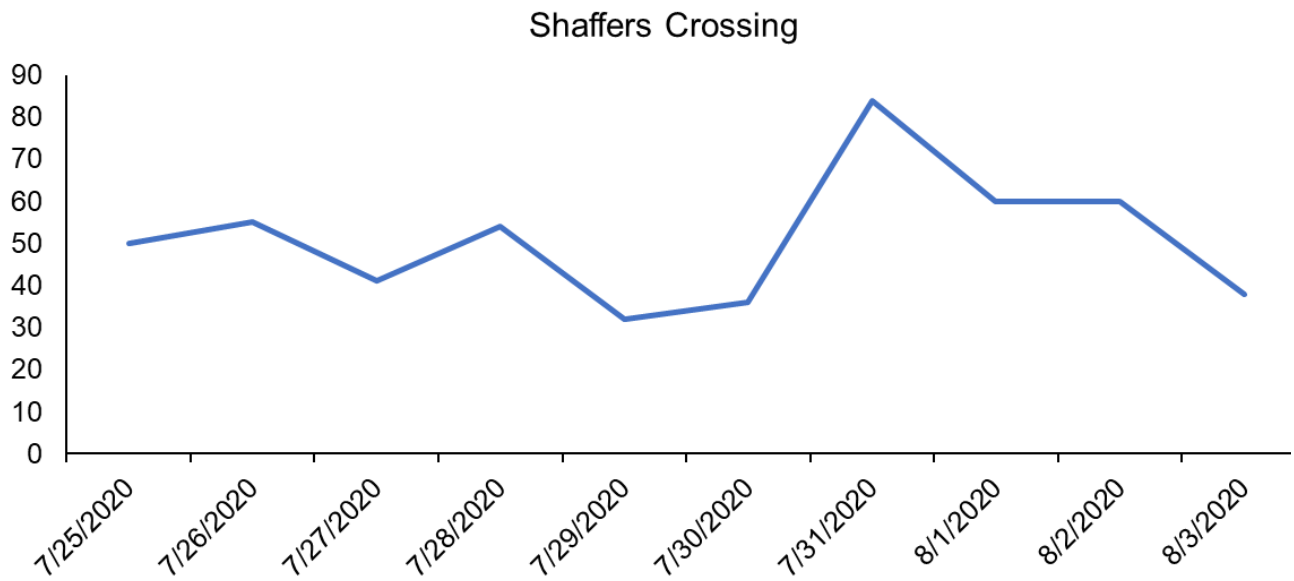
Figure 2. Pedestrian counts at Shaffers Crossing

After adjusting each day's count with the day-of-year factor, the Average Annual Daily Pedestrian Traffic for Shaffers Crossing was 47.5. The raw counts ranged from 32 to 84 (Figure 2).

The duration of counts was too short to analyze weekly patterns. Hourly pedestrian traffic rises to a morning peak at 7:00 am and remains high until 10:00 pm (Figure 3).
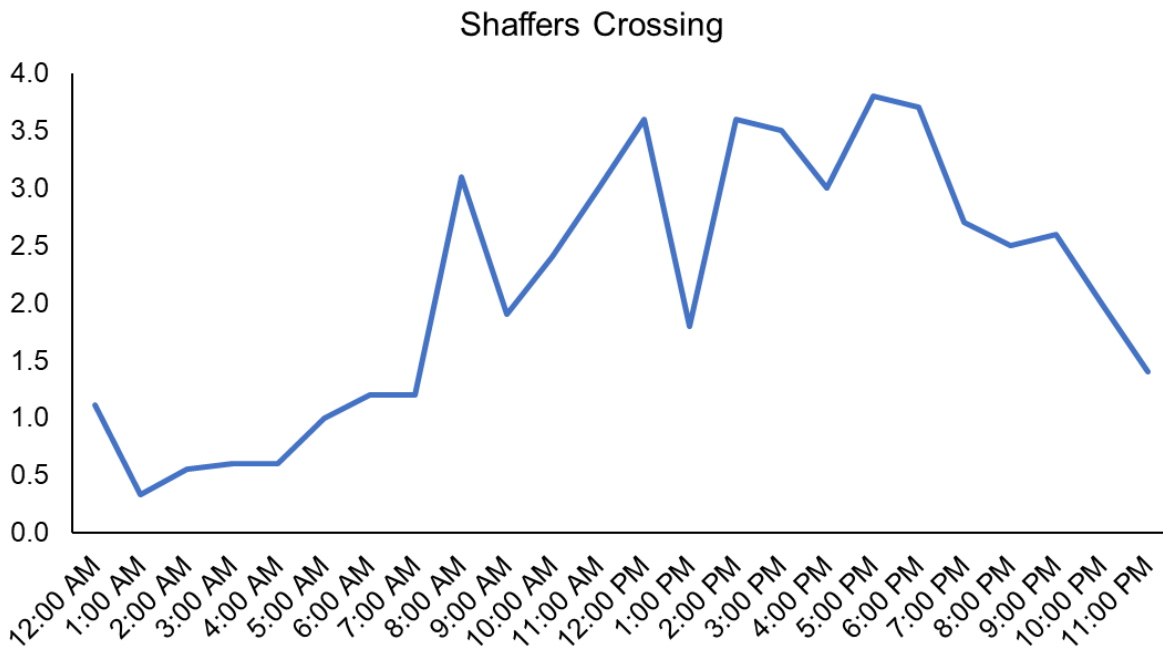

Figure 3. Average hourly pedestrian traffic

Grandin Village: Average Annual Daily Pedestrian Traffic 296

Grandin Village is a village center at the intersection of Memorial Avenue and Grandin Road, both of which are part of Route 11. A streetscape project in 2004 on Grandin Road and bike lanes striped on Memorial Avenue in 2015 slowed traffic and improved the walkability. The Grandin Theater, the Roanoke Natural Foods Co-op, and the Co-Lab serve as anchor uses and the village has several restaurants and some retail. There is a church and an elementary school. The #65/#66 bus route serves Grandin Village.

RVARC staff installed a counter on the west side of Grandin Road facing Heights Community Church (Figure 4). Pedestrian counts were collected July 25 – August 3, 2020.

Ideally, permanent counters collect data for a full year so that day-of-year factors can be applied to the raw data from temporary counters such as the one at Grandin Village to calculate Average Annual Daily Traffic for that location. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters at two locations. After examining travel patterns, the two counters on Campbell Avenue were selected to provide day-of-year factors to the Grandin Village pedestrian counts because the travel characteristics of that location are more similar than the other location (10th Street NW) to Grandin Village. Day-of-year factors were determined for each of the two Campbell Avenue counters by dividing the day's count for each counter by the average of 365 consecutive days of counts for that counter. The day-of-year factor was the average of the two counters' day-of-year factors. Each day's counts at Grandin Village were divided by the day-of-year factor for the corresponding date. The adjusted counts were averaged to calculate the annual average daily pedestrian traffic at that location.

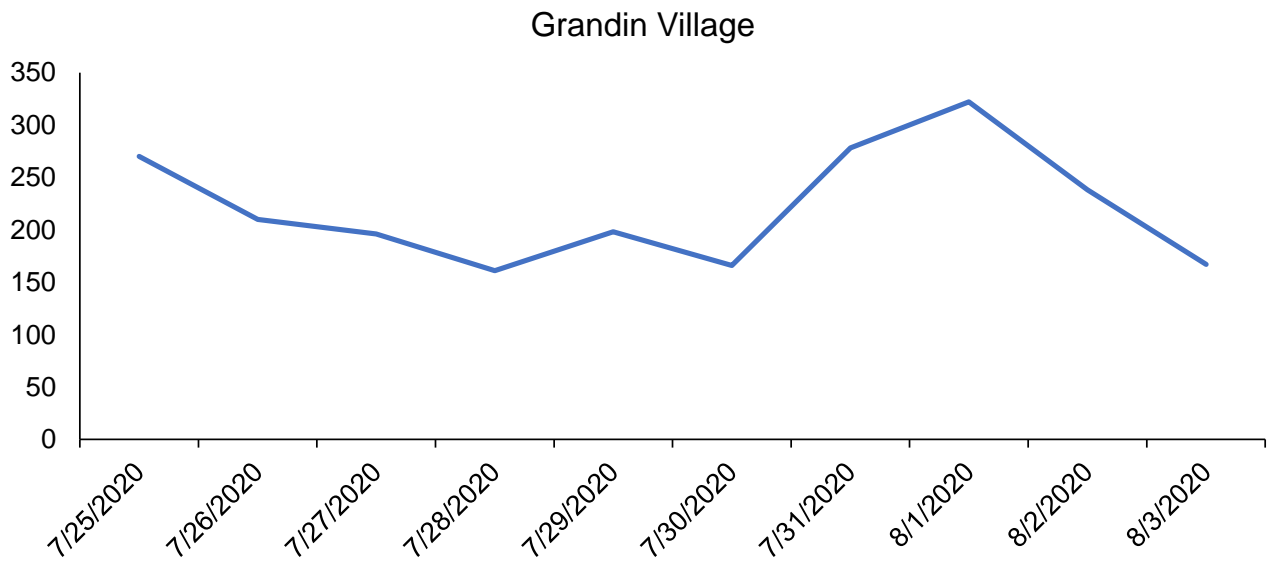*Figure 4.* Facing south at the location of the counter.

Grandin Village

Figure 5. Pedestrian counts at Grandin Village

After adjusting each day's count with the day-of-year factor, the Average Annual Daily Pedestrian Traffic for Grandin Village was 296. The raw counts ranged from 161 to 322 (Figure 5).

The duration of counts was too short to analyze weekly patterns. Hourly pedestrian traffic rises to a morning peak at 7:00 am and remains high until 9:00 pm (Figure 6).
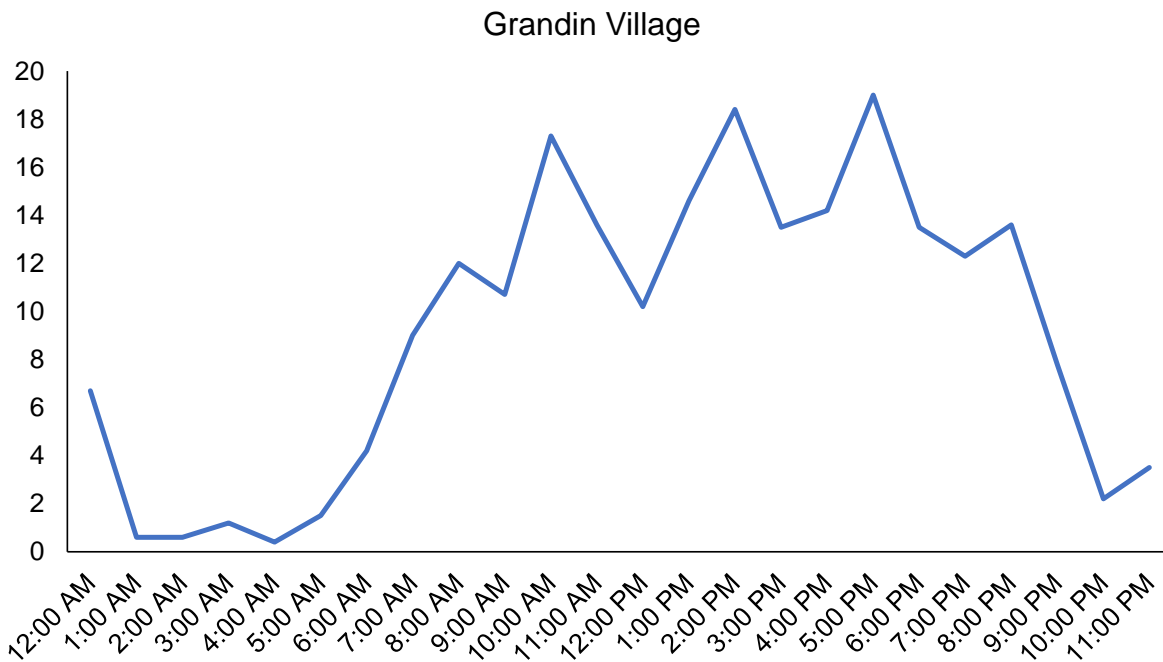
Grandin Village


Figure 6. Average hourly pedestrian traffic

Salem Pedestrian Counts

July 27, 2020

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and has provided Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. Salem staff identified downtown Main Street for collecting data on pedestrian activity.
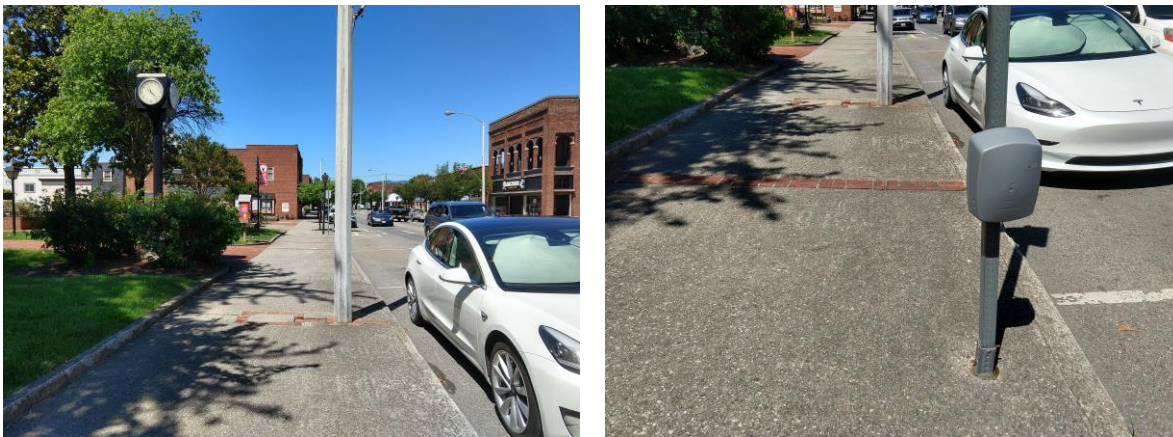
Figure 2. Location of counter. *Left:* Standing on the south side of Main Street facing west. *Right:* Also facing west, with the counter visible.
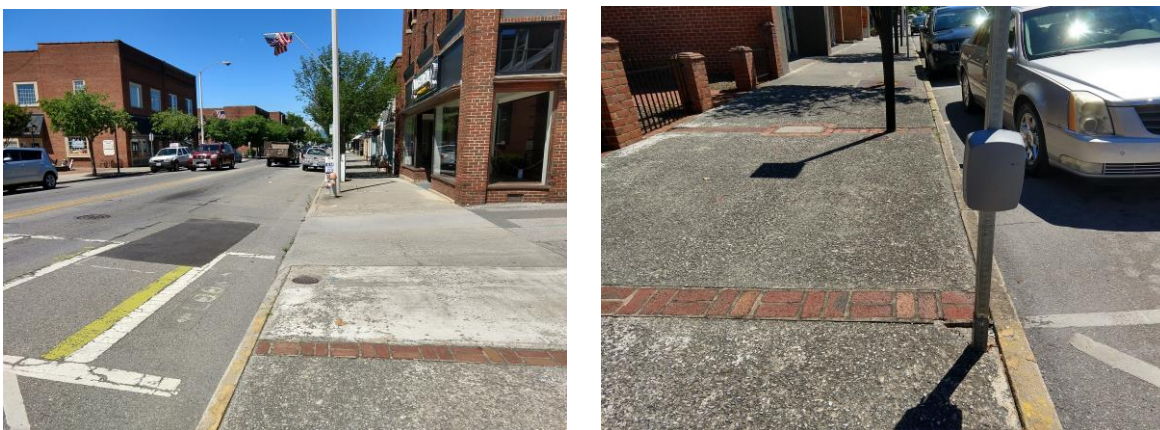
Figure 1. Location of counter. *Left:* Standing on the north side of Main Street facing west. *Right:* Facing east, with the counter visible.

Several planners and citizens walked along Main Street through downtown Salem in 2019 to review pedestrian accommodations. Main Street has average annual daily vehicle traffic (AADT) of 13,000. The #91/#92 bus serves Main Street. Downtown locations that generate pedestrian traffic include the library, City Hall, the Farmers Market, restaurants, bars, retail, and offices, as well as events. The Salem Downtown Plan anticipates more pedestrian activity and funded streetscape projects will

improve walkability. Two counters were placed on Main Street in front of the library (Figure 1) and across the street (Figure 2). Pedestrian counts were collected June 13 – July 23, 2020.

Ideally, permanent counters collect data for a full year so that day-of-year factors can be applied to the raw data from temporary counters such as these to calculate Average Annual Daily Traffic for that location. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters at two locations. After examining travel patterns, the two counters on Campbell Ave SW near Jefferson St were selected to provide day-of-year factors to the Salem Main St pedestrian counts because the characteristics of pedestrian activity in downtown Roanoke location are likely to be similar to downtown Salem. Day-of-year factors were determined for each of the two Campbell Ave counters by dividing the day's count for each counter by the average of 365 days of counts for that counter. The day-of-year factor was the average of the two counters' day-of-year factors. Each day's counts on each of the Main St locations were divided by the day-of-year factor for the corresponding date. The adjusted counts were averaged to calculate the annual average daily pedestrian traffic at each location.
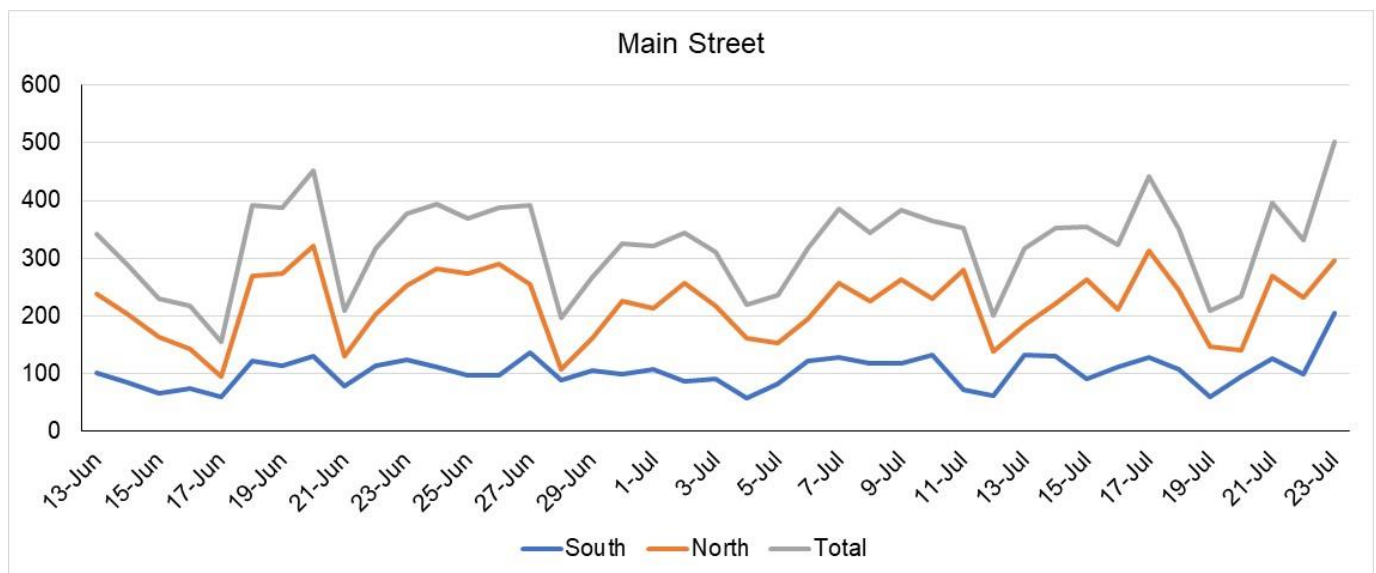

Figure 3. Daily counts not adjusted by day-of-year factor.

After adjusting each day's count with the day-of-year factor, the Average Annual Daily Pedestrian Traffic for Main Street was 491, 164 on the south side and 328 on the north side. The raw counts ranged from 282 to 2,529 (68 to 1,033 on the south side and 173 to 1,496 on the north side) (Figure 3).

Daily traffic patterns were analyzed. Pedestrian traffic was lowest on Sundays (about 2/3 of average) and steady the rest of the week, almost 20% higher than average on Thursday (Figure 4). Data was not adjusted by day-of-year factors so that weekly patterns could be observed.

Hourly pedestrian traffic on Main Street climbed early and showed a peak from 9:00 am to 2:00 pm with a lower evening peak from 6:00 pm – 9:00 pm (Figure 5). The hourly pattern was the same on both sides but with different volumes.
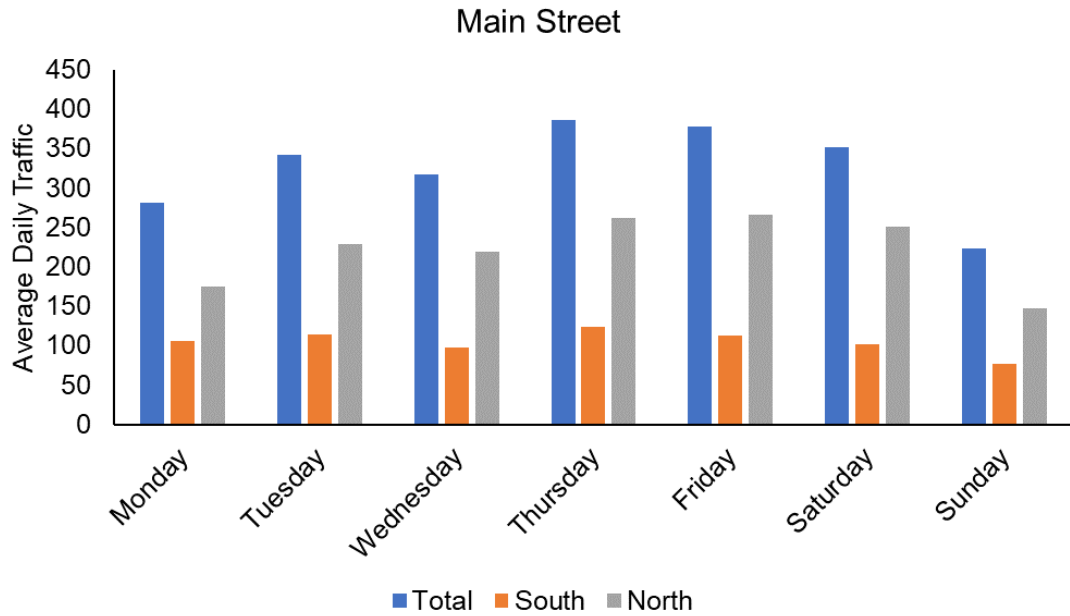

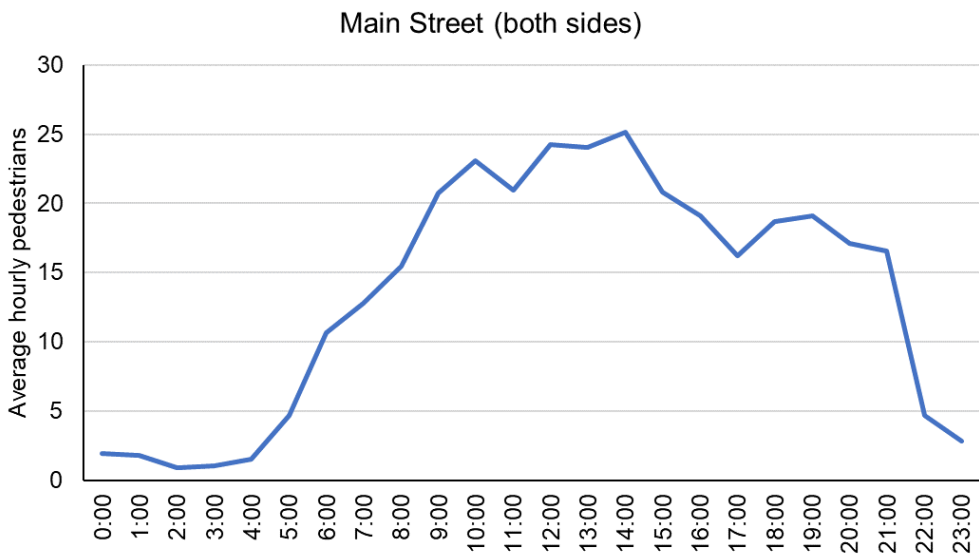Figure 4. Day of week average daily pedestrian traffic (not adjusted).

Figure 5. Average hourly pedestrian traffic on Main Street (south and north sides).

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Roanoke City Downtown Pedestrian Activity

May 4, 2020

In 2018, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters on 10th Street and on Campbell Avenue[1]. One counter is on the south side of Campbell Avenue and the other on the north side between Campbell Court and Jefferson Street. These have collected data continuously since July 19, 2019. As of April 7, 2020, an average 1,674 (± 609 standard deviation) people walk past the two counters each day.

Events

Pedestrian traffic may reflect economic activity during special events. Nine single-day events (Table 1) and five multi-day events (Table 2) were held during from July 19 to April 7. All single-day events except the Halloween Costume Contest generated more traffic pedestrian than average for the entire time period and more than average for the month of the event (Table 1). Even though the St. Patrick's Day Parade was canceled, March 14 had almost five times as many pedestrians as the average per day for the month of March.

All multi-day events except Elmwood on Ice generated more traffic pedestrian than average for the entire time period and more than average for the duration of the event (Table 2). Two of the Dickens of a Christmas dates had the highest pedestrian traffic of any day except March 14 (the St. Patrick's Day events). Elmwood on Ice and Party in Elmwood may not influence pedestrian traffic on Campbell Avenue as strongly as other events because Elmwood Park is several blocks away from Campbell Avenue.

Table 1. Pedestrian traffic during downtown single-day events

Event	Date	Count	% Average[a]	% Average Monthly Daily[b]
Movies in the Market	8/9/2019	2366	141%	116%
Scotty McCreery	8/16/2019	2664	159%	131%
Microfestivus	8/10/2019	2679	160%	131%
Festival on India	8/17/2019	2427	145%	119%
Symphony Under the Stars	8/24/2019	2288	137%	112%
Henry Street Heritage Festival	9/21/2019	2583	154%	134%
Foreigner	9/26/2019	2265	135%	118%
Downtown Roanoke Halloween Costume Contest	10/31/2019	1490	89%	80%
St. Patrick's Day (Martins, Corned Beef, Sidewinders)	3/14/2020	6730	402%	472%

[a] Count divided by the average of all days from July 19 – April 7.

[1] Although a full year of data is not yet available, day-of-year factors were calculated using six months of data. When a full year is available, day-of-year factors will be recalculated.

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[b] Count divided by the average of all days of the month of the event.

Table 2 Pedestrian traffic during downtown multi-day events[a]

Event	Dates	Average Daily Count	% Average[b]	% average duration daily[c]	Total Count[d]
Elmwood on Ice	11/27/2019 - 2/2/2020	1553	93%	N/A	105617
City Market Saturdays	7/20/2019 - 9/28/2019	2381	142%	122%	26194
Party in Elmwood	7/18/2019 - 9/26/2019	2079	124%	107%	20794
First Friday	7/19/2019 - 10/4/2019	2495	149%	127%	14969
Dickens of a Christmas	12/6/2019 - 12/20/2019	2715	162%	154%	8144

[a] Entire daily count data for events provided at the end.
[b] Count divided by the average of all days from July 19 – April 7.
[c] Count divided by the average of all days of the duration of the event. (Elmwood on Ice occurred every day for its duration, so this is not applicable.)
[d] Sum of all days that this event was held.

Trends

Pedestrian traffic counts were available for the entire months of August 2019 through March 2020 (Figure 1). The daily average number of pedestrians declined from over 2,000 in August to 1,427 in March.

The day-of-week pattern shows highest pedestrian activity on Fridays and Saturdays and lowest activity on Sundays (Figure 2). The low Sunday activity relative to weekdays indicates high commuter activity. The high Friday/Saturday activity indicates high retail activity.

The hourly pattern indicates a dominant lunch peak of 160 pedestrians during the noon hour (Figure 3). A typical commuter traffic pattern has a morning and evening peak. The effect of retail shut-downs in response to the pandemic on pedestrian traffic reveal that downtown pedestrian activity is heavily driven by retail. Hourly pedestrian activity at other locations in the Valley with less intense retail density was not affected by shut-downs (data not shown). The hourly activity during the pandemic shut-downs is lower throughout the day. The lunch peak is most suppressed and shows that there is a morning and evening peak. Before the shut-down, pedestrian activity declined gradually through the evening with significant activity persisting at 1:00 am (40 pedestrians, almost as many as 7:00 am with 45 pedestrians). During the shut-down, pedestrian activity virtually ends by 8:00 pm (19 pedestrians).
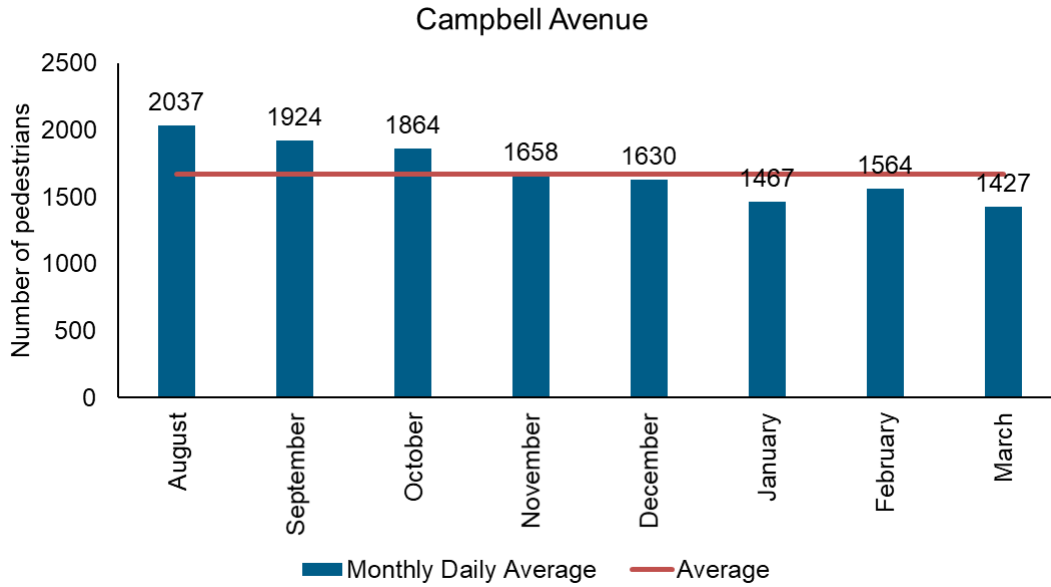
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Campbell Avenue

Figure 1. Average daily pedestrian traffic per month
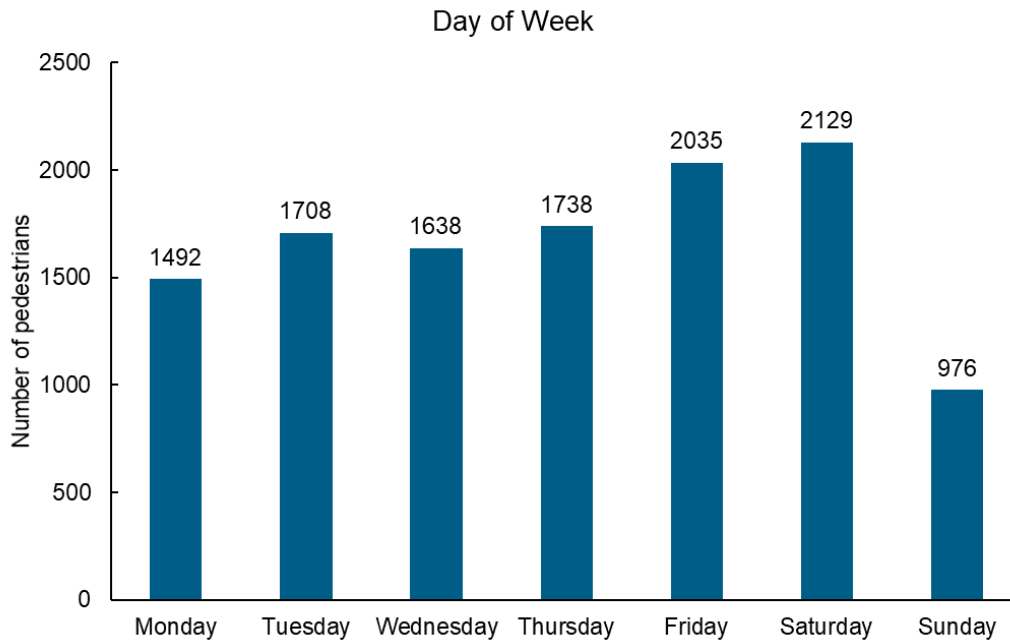
Day of Week

Figure 2. Average day-of-week pedestrian traffic on Campbell Avenue

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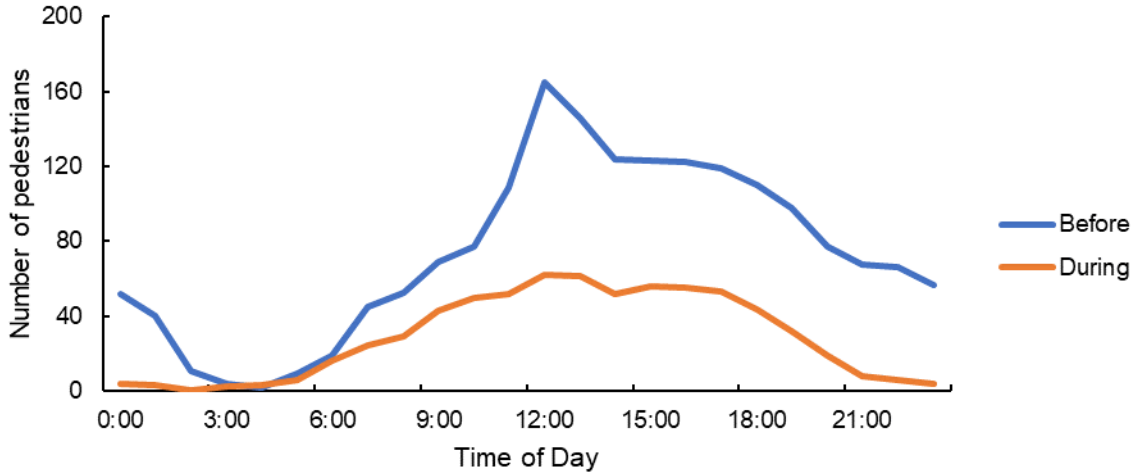P: 540.343.4417 / F: 540.343.4416
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Figure 3. Average hourly pedestrian traffic before (February 15 – March 15) and during (April 1 – April 7) the pandemic shutdown.

In addition to generating data about Campbell Avenue, day-of-year factors are derived from data from these semi-permanent counters and applied to raw data collected from temporary counters elsewhere in the valley to calculate Average Annual Daily Traffic.

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Elmwood on Ice	
Date	Count
11/27/2019	1871
11/28/2019	1496
11/29/2019	1847
11/30/2019	1505
12/1/2019	673
12/2/2019	1355
12/3/2019	1741
12/4/2019	1589
12/5/2019	1613
12/6/2019	3244
12/7/2019	1931
12/8/2019	793
12/9/2019	1146
12/10/2019	1499
12/11/2019	1450
12/12/2019	1741
12/13/2019	1712
12/14/2019	2229
12/15/2019	1152
12/16/2019	1537
12/17/2019	1639
12/18/2019	1633
12/19/2019	1602
12/20/2019	3188
12/21/2019	1981
12/22/2019	980
12/23/2019	1710
12/24/2019	1334
12/25/2019	363
12/26/2019	1690
12/27/2019	2055
12/28/2019	2180
12/29/2019	829
12/30/2019	1642
12/31/2019	2313
1/1/2020	1279
1/2/2020	1570
1/3/2020	1710
1/4/2020	1481
1/5/2020	664
1/6/2020	1537
1/7/2020	1378
1/8/2020	1502

City Market Saturdays	
Date	Count
7/20/2019	1786
7/27/2019	1959
8/3/2019	2310
8/10/2019	2679
8/17/2019	2427
8/24/2019	2288
8/31/2019	2588
9/7/2019	2412
9/14/2019	2281
9/21/2019	2583
9/28/2019	2881

Party in Elmwood	
Date	Count
7/25/2019	2028
8/1/2019	2357
8/8/2019	2045
8/15/2019	1922
8/22/2019	2174
8/29/2019	2181
9/5/2019	1906
9/12/2019	1929
9/19/2019	1987
9/26/2019	2265

First Friday	
Date	Count
7/19/2019	2012
8/2/2019	2752
8/16/2019	2664
9/6/2019	2376
9/20/2019	2459
10/4/2019	2706

Dickens of a Christmas	
Date	Count
12/6/2019	3244
12/13/2019	1712
12/20/2019	3188

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1/9/2020	1670
1/10/2020	1747
1/11/2020	1578
1/12/2020	1093
1/13/2020	1472
1/14/2020	1762
1/15/2020	1944
1/16/2020	1597
1/17/2020	1754
1/18/2020	1499
1/19/2020	732
1/20/2020	1156
1/21/2020	1435
1/22/2020	1592
1/23/2020	1612
1/24/2020	1342
1/25/2020	1898
1/26/2020	755
1/27/2020	1402
1/28/2020	1493
1/29/2020	1491
1/30/2020	1526
1/31/2020	1792
2/1/2020	1879
2/2/2020	1012

Orange Avenue, Gainsboro Road, Burrell Street, and Lick Run Greenway Intersection

February 15, 2021

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and provided two Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. The EcoCounters are infrared counters. RVARC has operated a greenway count program since 2010 using TRAFx infrared counters. These are permanently installed but can be moved when necessary. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four EcoCounters. These generate provide reference counts to calculate average annual daily traffic from temporary count sites.

In conjunction with the RVARC greenway count program that has been operating since 2010 and uses TRAFx infrared counters, pedestrian activity was assessed at the intersection of Orange Avenue, Gainsboro Road, Burrell Street, and the Lick Run Greenway.

Intersection of Orange Avenue, Gainsboro Road, Burrell Street, and the Lick Run Greenway. Counters were placed at the red stars.

This intersection is a significant intersection for all modes of transportation, carrying 22,000 Average Annual Daily Traffic. It is very close to the I-581 interchange with Orange Avenue. Orange Avenue is part of the U.S. 460 corridor which stretches east-west across the entire urbanized area. Gainsboro Road and Burrell Street, along with Liberty Road, form a corridor that crosses three barriers to north-south travel: the railroad tracks, Orange Avenue, and I-581. The Lick Run Greenway connects downtown Roanoke to Valley View Mall, crossing this intersection from the southeast corner to the northwest corner.

There are many destinations nearby that may draw pedestrians, such as Washington Park, Comfort Inn, the Gainsboro YMCA, three schools (Lucy Addison Middle School, Lincoln Terrace Elementary School, and Roanoke Catholic School), the Burrell Center, and several churches. There are bus stops near the intersection on both sides of three legs (Orange Avenue to the west, north and south; Burrell Street, east and west; and Gainsboro Road, east and west). Washington Park has a swimming pool that operates in the summer. There are several multi-family complexes nearby. Other destinations that could draw pedestrian traffic from the north and west through this intersection include the Berglund Center, Sheetz, McDonalds, the Hotel Roanoke, the post office, and downtown Roanoke.

Counter locations on the south side of Orange Avenue: west side of Gainsboro Road (left), east side of Gainsboro Road (right), and east side of Gainsboro Road on the Lick Run Greenway (center)

Counter locations on the north side of Orange Avenue: west side of Burrell Street (left), east side of Burrell Street (right)

The intersection has pedestrian push buttons but does not have pedestrian heads on the traffic signals. The distance for pedestrians to cross is long and pedestrians are faced with conflicting movements of left-turns on permissive green or flashing yellow and right-turns on red or green. Two legs (south and west) have zebra stripe crosswalks and the other two have continental crosswalks. All four corners have curb ramps with high-contrast tactile bump surfaces. The intersection will be upgraded to pedestrian heads on the traffic signals through Highway Safety Improvement Program funds in 2022. Travelers on the Lick Run Greenway must cross two legs of the intersection to continue their journey.

RVARC staff installed two Eco-Vision counters at four locations near the intersection (two at a time) and one TRAFx counter on the Lick Run Greenway. The 10th Street counter was selected as the reference counter because it is likely to have similar travel patterns.

Day-of-year factors were determined for the 10th Street reference counter by dividing the day's count by the average of 365 consecutive days of counts for that counter. Each day's counts on each of the temporary counters at the Orange Avenue intersection were divided by the day-of-year factor for the corresponding date. The adjusted counts were averaged to calculate the annual average daily pedestrian traffic at each counter location.

Table 1. Counter locations and dates

Location	Leg	Counter	Dates	Crosswalk
Washington Park	Northwest	Eco-Vision	November 20 – December 2, 2020	Orange Avenue crossing Burrell Street (north leg)
Education Center	Northeast	Eco-Vision	November 20 – December 2, 2020	
YMCA	Southwest	Eco-Vision	November 3 – November 17, 2020, December 4 – December 21, 2020	Orange Avenue crossing Gainsboro Road (south leg)
Lick Run Greenway	Southeast	TRAFx	November 3 – December 21, 2020	
Comfort Inn	Southeast	Eco-Vision	*Data could not be collected due to electromagnetic interference*	
10th Street	REFERENCE	Eco-Vision	December 22, 2019 – December 21, 2020	

Table 2. Average Annual Daily Pedestrian Traffic (AADT)

Location	Leg	Average Raw Counts	AADT
Washington Park	Northwest	23	32
Education Center	Northeast	24	35
YMCA	Southwest	14	21
Lick Run Greenway	Southeast	17	24
Average per site			28
Total all sites			112

Average Annual Daily Traffic

The average annual daily pedestrian traffic ranged from 10 trips per day at the YMCA to 19 trips per day across the street at Washington Park. The average of all sites was 15 trips per day, and the total of all sites was 61 trips per day (Table 2). There was not a discernable weekday pattern,
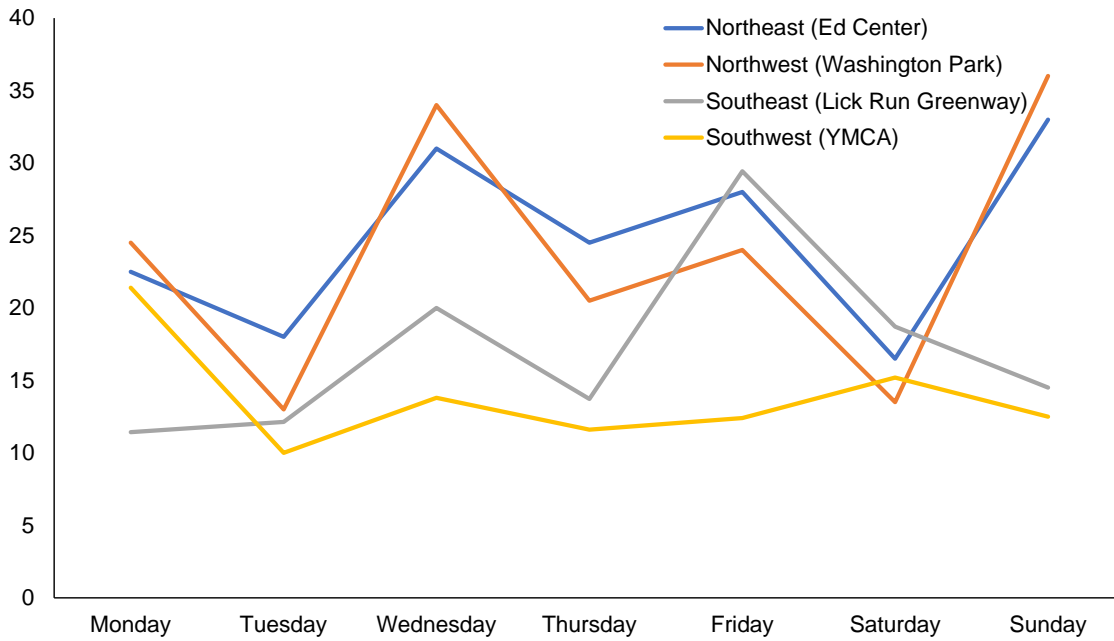
Figure 2. Average daily pedestrian activity
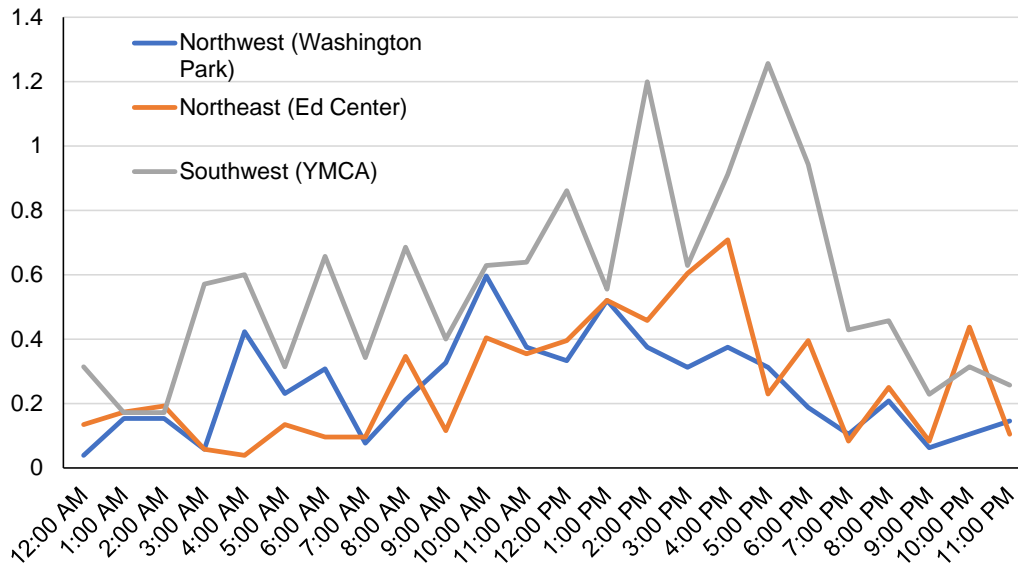
Figure 1. Average hourly pedestrian activity

likely because of the short count period (Figure 2). Pedestrian activity increased during daytime hours (Figure 2).

Crosswalk activity

The Eco-Counters can detect direction of travel. Staff selected sites on opposite sides of a crosswalk to approximate crosswalk activity. An eastbound count in front of the westmost counter and an eastbound count in front of the eastbound counter in the same 15-minute period could be detecting the same pedestrian at two different locations and implies a pedestrian in the crosswalk (such as the green pedestrian in Figure 3). Pedestrians
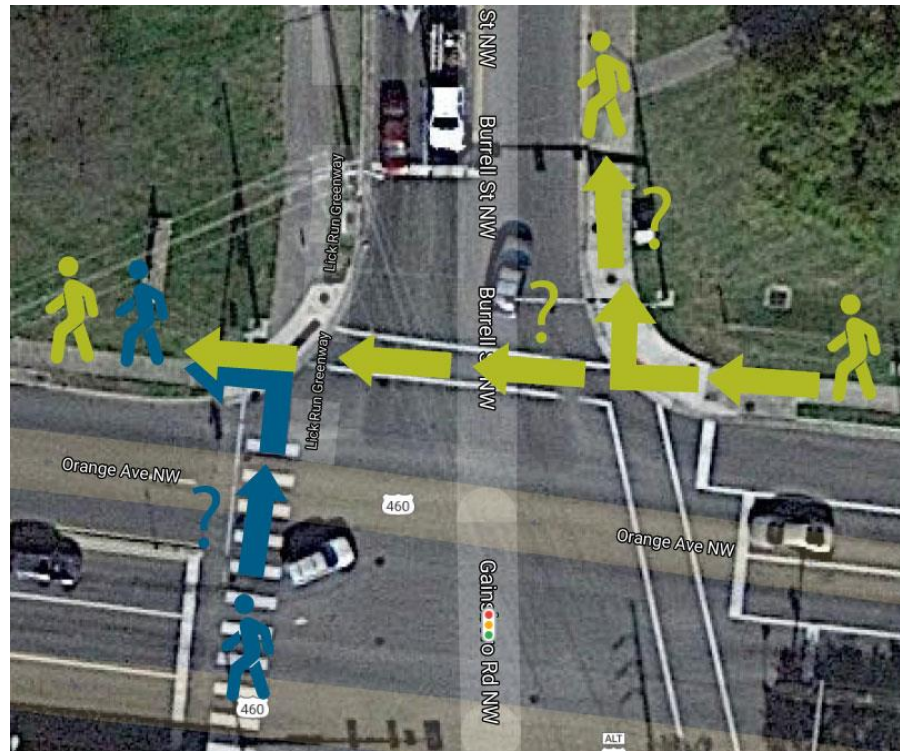
Figure 3. Approximating crosswalk activity

turning corners might use a crosswalk but pass in front of only one counter; resulting in an undercount (such as the blue pedestrian in Figure 3). Two pedestrians at the same time counted by different counters, but neither one passing through the crosswalk, would result in an overcount (such as the green pedestrian turning and the blue pedestrian in Figure 3).

Thus, the Washington Park and the Education Center sites together indirectly assess activity in the crosswalk on Orange Avenue crossing Burrell Street (the north leg of the intersection). The YMCA, Comfort Inn, and Lick Run Greenway sites indirectly assess activity in the crosswalk on Orange Avenue crossing Gainsboro Road (the south leg of the intersection). Pedestrians using this crosswalk could be coming from or going toward either the sidewalk to the east or the Lick Run Greenway, both of which pass in front of Comfort Inn. Because the Comfort Inn site on Orange Avenue was not viable because of electromagnetic interference, only the YMCA and the Lick Run Greenway sites could be used to indirectly assess crosswalk activity on the south leg. The TRAFx counter on the Lick Run Greenway cannot detect

Table 3. Approximated crosswalk activity

Counter locations	Leg	Activity
Washington Park and Education Center	North	12
YMCA and Lick Run Greenway	South	11

direction of travel and only gives daily counts, not 15-minute increments, so a rougher approximation was used by comparing the counts per day between the two counters and using the smaller count to approximate crosswalk activity.

The approximated crosswalk activities on the two legs examined were very similar, despite the differences in methodology (Table 3).

Given that the raw counts were 18-27% higher than the adjusted counts, crosswalk activity may be lower than what is calculated here for the study period.

Ogden Road

July 27, 2020

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and provided Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. Roanoke County requested Ogden Road near Tanglewood Mall to be counted because Ogden Road is a priority for sidewalks. Several planners and citizens walked along Ogden Road in 2019 as part of scoping for a sidewalk. Ogden Road has an average annual daily vehicle traffic of 8,000. The #55/#56 bus serves large apartment complexes and developments on and near Ogden Road, including:

- Honeywood Apartment Homes
- Pebble Creek Apartment Homes
- Woodland Hills Independent Living, Assisted Living, and Memory Care
- Windward condo development
- Bent Tree Apartments on Colonial Avenue
- Sunscape Apartments on Colonial Avenue

Many residents walk on Ogden Road to access Tanglewood Mall, Old Country Plaza, and other destinations nearby. These residents may use the bus as well as walk when the bus schedule doesn't serve them, such as on Sundays, later in the evening, or when the hourly bus schedule doesn't align with their travel times.

RVARC staff installed a counter on a post provided by Roanoke County on the southwest side of Ogden Road where there is a well-defined informal trail through the grass leading to Old Country Plaza (Figure 1). Pedestrian counts were collected March 17 – June 12, 2020.

Figure 1. Location of counter, standing on the southwest side of Ogden Road facing north.

The intention was to collect data for one month. Due to the onset of the COVID-19 pandemic, the decision was made to continue collecting counts longer because the next location wasn't ready. However, vegetation caused erroneous counts during the last month. Vegetation or wildlife may have also caused erroneous counts on other days. The scrubbed dataset was March 17 – May 14, 2020 with the following dates removed: April 9, April 13, April 17, April 29, and May 10 for a total of 53 days.

Ideally, permanent counters collect data for a full year so that day-of-year factors can be applied to the raw data from temporary counters such as the one on Ogden Road to calculate Average Annual Daily Traffic for that location. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters at two locations. After examining travel patterns, the two counters at 10th Street NW near the Lick Run Greenway were selected to provide day-of-year factors to the Ogden Road pedestrian counts because the travel characteristics of that location are more similar than the other location (Campbell Ave SW) to Ogden Road. Day-of-year factors were determined for each of the two 10th Street NW counters by dividing the day's count for each counter by the average of 365 days of counts for that counter. The day-of-year factor was the average of the two counters' day-of-year factors. Each day's counts on Ogden Road were divided by the day-of-year factor for the corresponding date. The adjusted counts were averaged to calculate the annual average daily pedestrian traffic at that location.

The pandemic may have altered pedestrian use. The Campbell Ave reference counters showed a dramatic change in pedestrian activity, but the 10th St NW reference counters did not show a change in pedestrian activity. It would be worthwhile to count again at this location in the future for a week or two to check the usage.
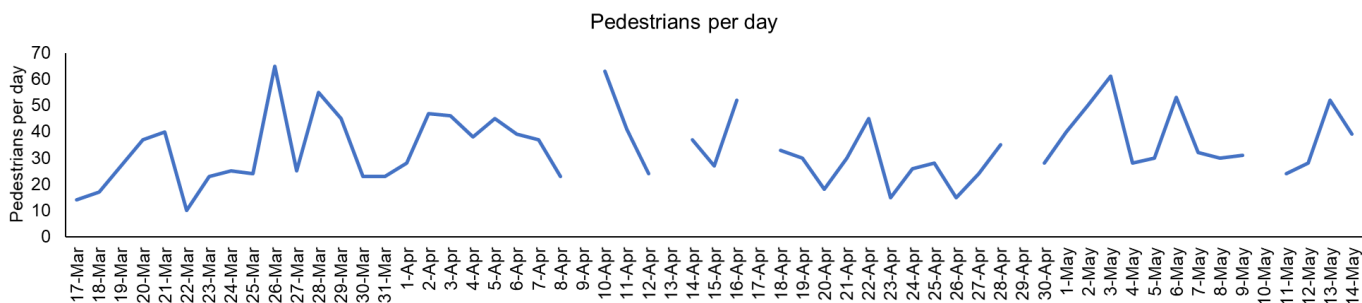

Figure 2. Daily counts of scrubbed dataset, not adjusted by day-of-year factor.

After adjusting each day's count with the day-of-year factor, the Average Annual Daily Pedestrian Traffic for Ogden Rd was 35.3. The raw counts ranged from 10 to 65 (Figure 2). During the time (approximately half hour) that the counter was being installed, five pedestrians were observed on Ogden Road. One of the five walked past the counter location and the other four walked behind it (i.e. on the other side of Ogden Road or on the other side of the counter, not turning toward Old Country Plaza). Therefore, 35.3 may be an underestimate of the actual pedestrian use of Ogden Road.

Daily traffic patterns were analyzed. Pedestrian traffic was lowest on Monday, 24% lower than average, and highest on Saturday, 17% above average (Figure 3). Hourly pedestrian traffic rises showed a morning peak at 10:00 am and an evening peak at 4:00 pm (Figure 4).
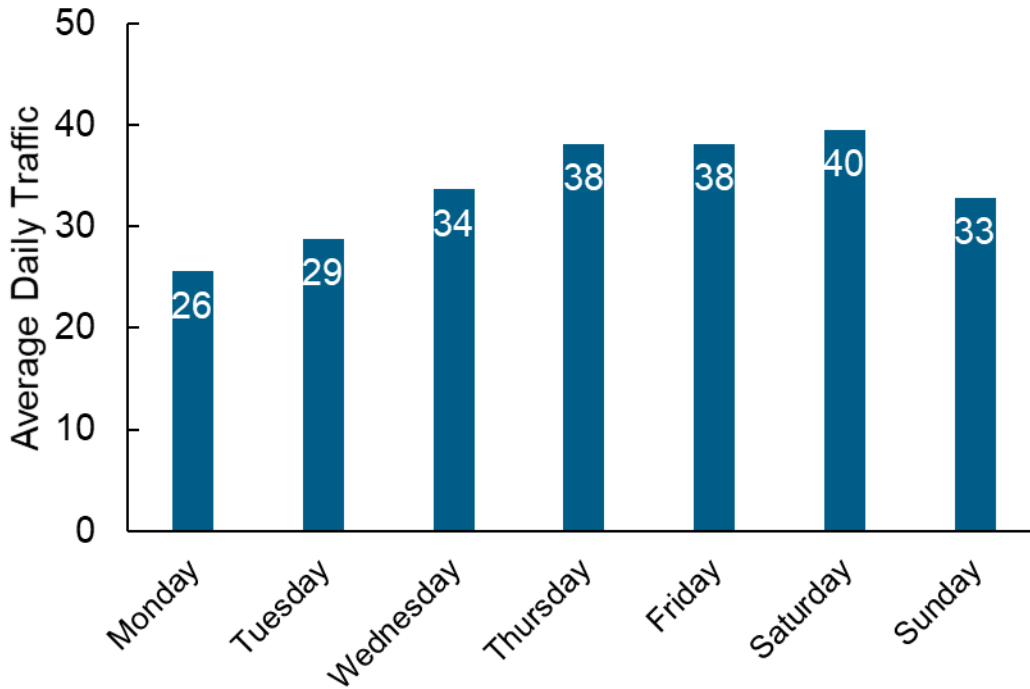

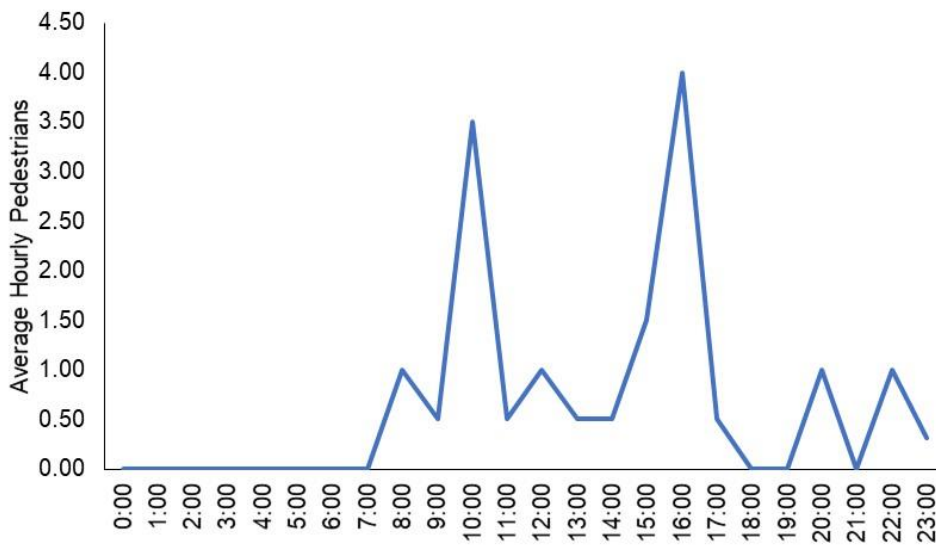Figure 3. Day of week average annual pedestrian traffic.

Figure 4. Average hourly pedestrian traffic (not adjusted for day-of-year factor which is only relevant to daily counts).

Main Street – City of Roanoke

February 15, 2021

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and provided two Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. The EcoCounters are infrared counters. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four EcoCounters. These generate provide reference counts to calculate average annual daily traffic from temporary count sites.

Pedestrian and bicycle activity was assessed on Main Street near Wasena Village. Main Street, part of U.S. 221, connects Elm Avenue to Brandon Avenue and has an Average Annual Daily Traffic of 9600 vehicles. The bridge to the north crosses two major barriers, the railroad tracks and the Roanoke River. Pedestrian and bicycle generators are the Roanoke River Greenway, businesses in Wasena Village (on Main Street and near the greenway), and bus routes #61/#62 with stops on Main Street. Towers Shopping Center on Brandon Avenue may attract bicycle pedestrian activity on Main Street. There are two bicycle shops nearby: Roanoke Mountain Adventures in Wasena Village and American Flyers near Brandon Avenue.

Main Street near Wasena Village. Red stars indicate counter locations.

When Main Street was repaved, bike lanes and crosswalks were added and curb ramps were upgraded to ADA compliance. The renovation of historic buildings has stimulated economic growth in Wasena Village, such as the upscale restaurant Bloom. During the counting period, there was an active Pedestrian Safety Campaign underway, "Every Corner is a Crosswalk".

RVARC staff installed two Eco-Vision counters with pneumatic tubes to count bicyclists in the bike lanes and the infrared sensors directed across the sidewalk to capture pedestrians. The 10th Street counters were selected as the reference counters for pedestrian counts because they are likely to have similar travel patterns to the Main Street locations. Memorial Avenue bike lane counters are the only available for bicycle counts. The pneumatic tubes were in place August 6 – September 15, 2020. The counter on the east side was moved entirely at this point as it was needed elsewhere, but the counter on the west side continued to capture pedestrian data until October 15, 2020.

Counter locations on the east (top left) and west (top right) sides of Main Street, and the counter and tubes installed (bottom).

Day-of-year factors were determined for the 10th Street reference counters by dividing the day's count by the average of 365 consecutive days of counts for that counter, then average the two counters' individual day-of-year factors. The same process was used for the Memorial Avenue bike lanes. Each day's counts on each of the temporary counters were divided by the ped or bike day-of-year factor for the corresponding date to create adjusted counts. The adjusted counts were

averaged to calculate the annual average daily pedestrian or bicycle traffic at each counter location.

Average Annual Daily Traffic

The average annual daily pedestrian traffic was higher on the west sidewalk than the east sidewalk and the average annual daily bicycle traffic was almost three times higher on the west side than the east (Table 1). While there was a preference for the west sidewalk, there was not a directional split in pedestrian travel (Figure 1). The higher bicycle traffic on the west side compared to the east died, however, did reflect a directional split favoring southbound travel as there were very few wrong-way bicyclists in either bike lane.

Table 1. Average Annual Daily Pedestrian Traffic (AADT)

Mode	Side	Average Raw Counts	AADT
Pedestrian	East	56	46
Pedestrian	West	76	74
Total Pedestrian			120
Bicycle	East	11	9
Bicycle	West	30	25
Total Bicycle			33

While neither pedestrian nor bicycle activity showed a dramatic response to the day of the week, pedestrian activity peaked on weekends and bicycle activity was higher on weekdays (Figure 2).

Both pedestrian and bicycle activity was high throughout the day with a mid-afternoon slump and an evening peak (Figure 3).
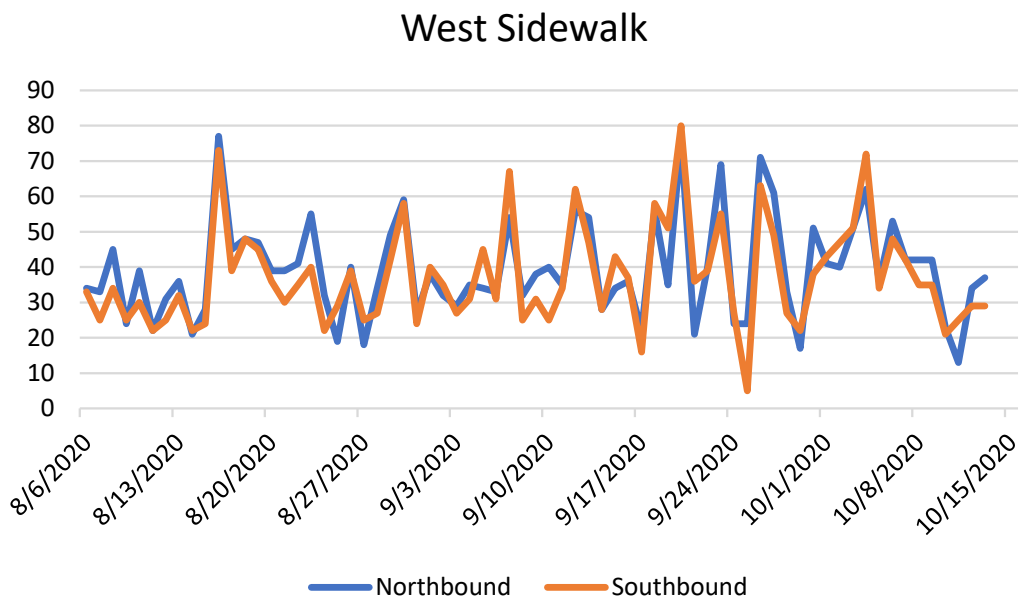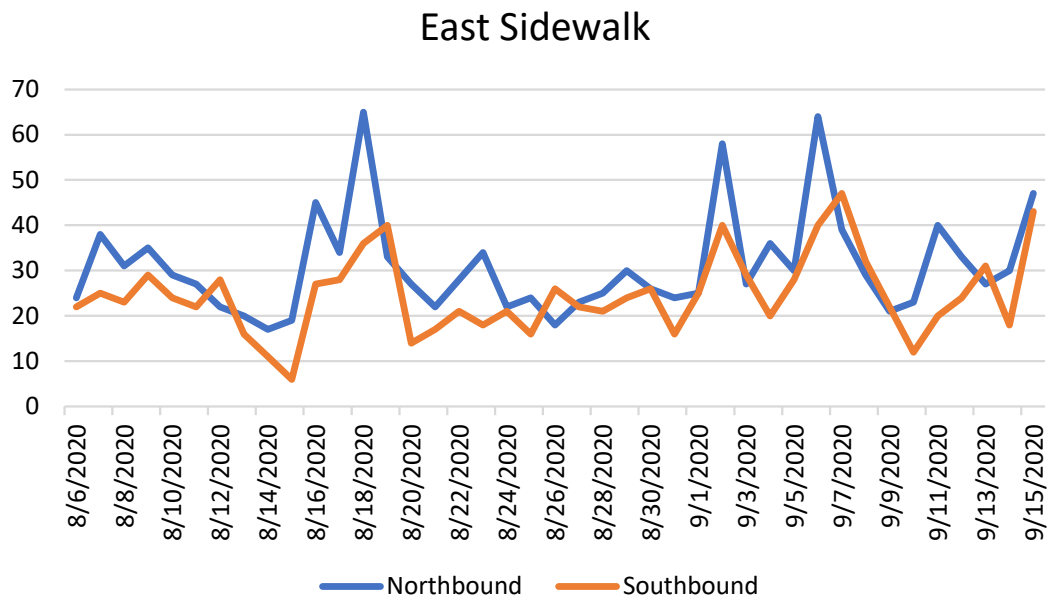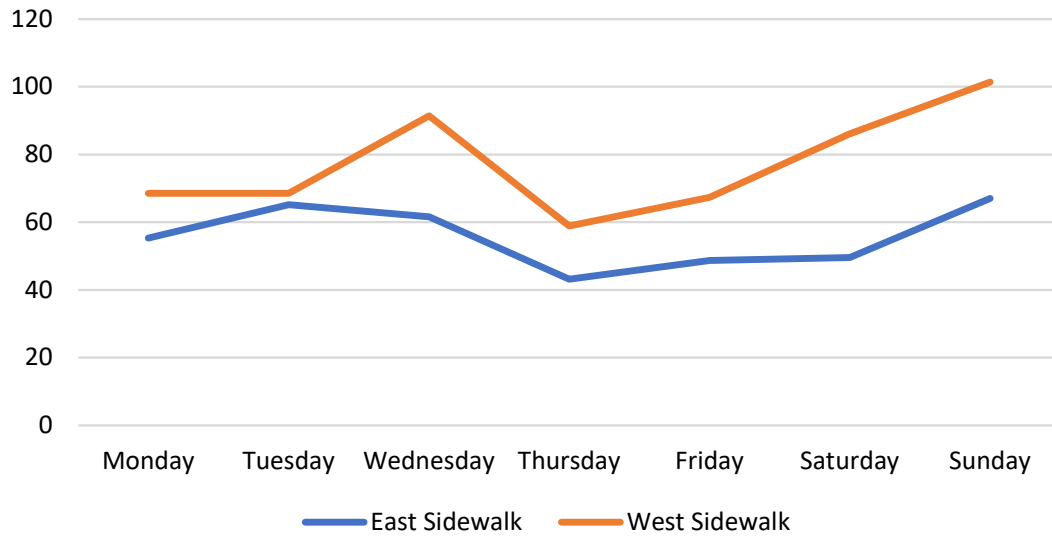
East Sidewalk

West Sidewalk

Figure 1. Directional split of pedestrian traffic
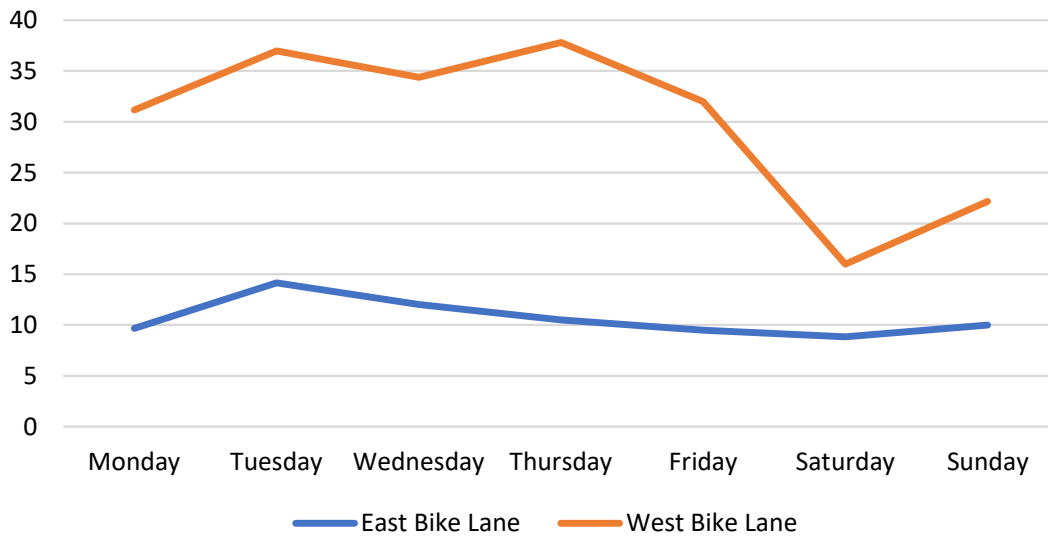
Figure 2. Day of Week

Time of Day Pedestrian Activity

Legend: East Sidewalk, West Sidewalk
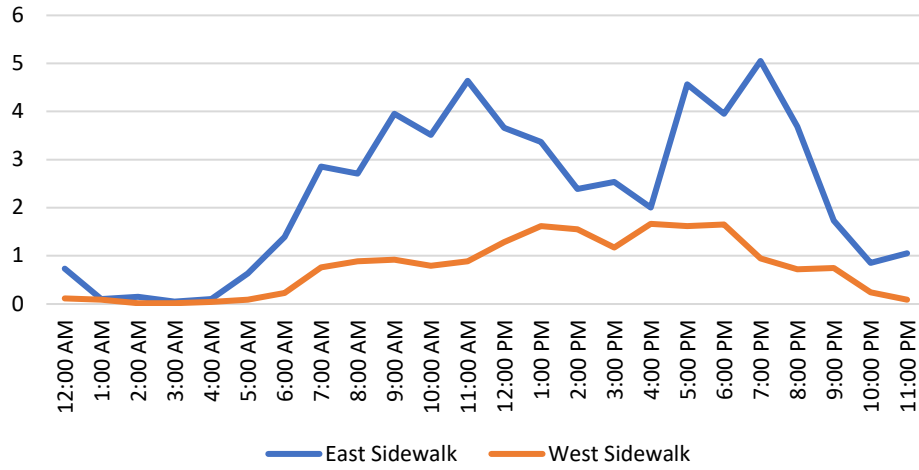
Time of Day Bicycle Activity

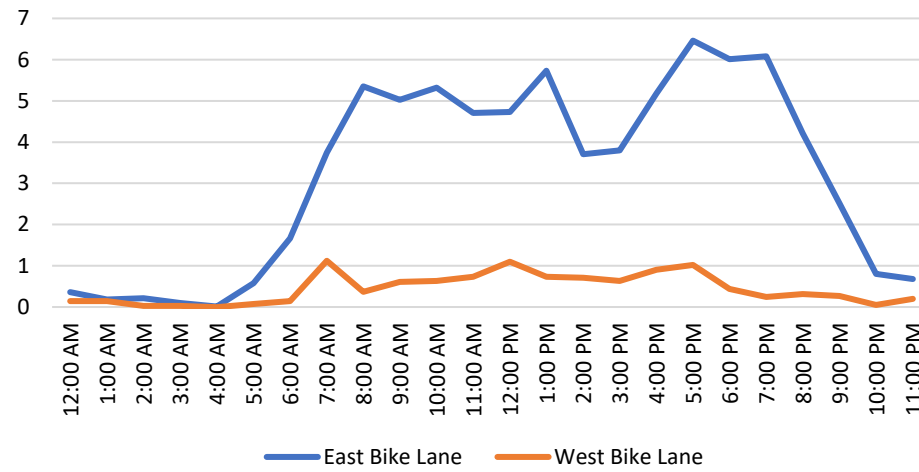Legend: East Bike Lane, West Bike Lane

Figure 3. Time of Day

Elm Avenue

February 20, 2020

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and has provided Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. The City of Roanoke requested several sites to be counted and RVARC staff identified Elm Avenue and 5th Street as a logical inaugural count location because of its proximity to the RVARC office. Elm Avenue has an average annual daily traffic of 11,000. When it was repaved in 2018 it received new bike lanes. It is an important connector and primarily residential.

City staff and RVARC staff installed the counters on lampposts in the 500 block of Elm Avenue, one on the north side and one on the south side of the street. Pedestrian counts were collected for October 30 – February 3. Bicycle counts were obtained for October 30 – December 10. The pneumatic tubes for bicycle counts are not designed for long term use, so the bicycle counts were discontinued after five weeks when one tube was damaged.

Ideally, permanent counters collect data for a full year so that day-of-year factors can be applied to the raw data to calculate Average Annual Daily Traffic. In 2018, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four pedestrian counters on 10th Street and on Campbell Avenue[1]. In 2015, the Virginia Department of Transportation installed permanent bicycle counters in the bike lanes on Memorial Avenue[2].

Day-of-year factors calculated from the 10th Street and Campbell Avenue pedestrian counters were applied to the Elm Avenue pedestrian counts. Day-of-year factors calculated from the Memorial Avenue bike lanes were applied to Elm Avenue bicycle counts.

Pedestrian traffic is much higher than bicycle traffic (preliminary mode split data from the Greenways suggests bicycle traffic volume is 25-30% of pedestrian traffic volume). Pedestrian traffic was higher on the south side of the street than the north side. Bicycle traffic was the opposite, higher on the north side than the south side.

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[1] Although a full year of data is not yet available, day-of-year factors were calculated using six months of data. When a full year is available, day-of-year factors will be recalculated.
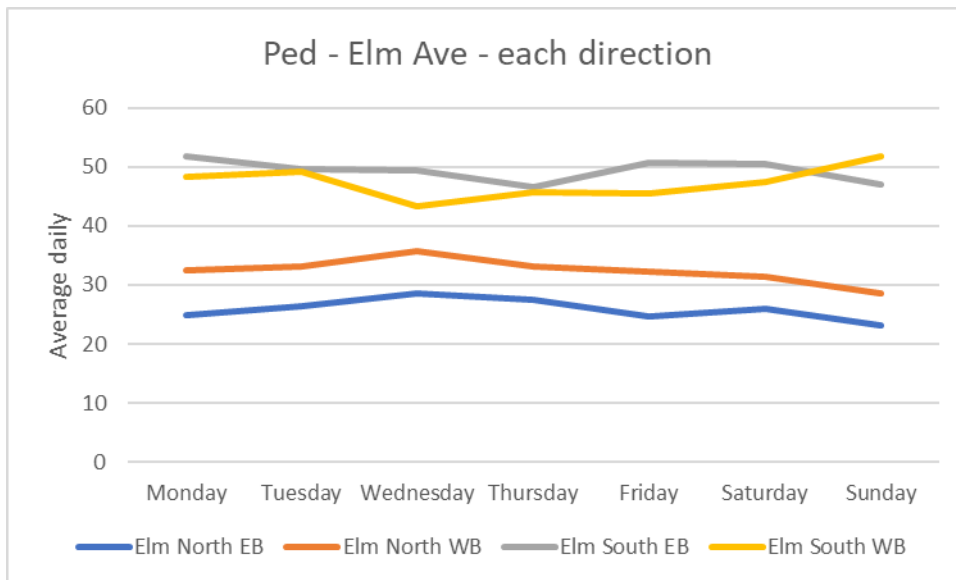
[2] Comparison to a 3-month count of bicycle traffic on 10th Street bike lanes, on Memorial Avenue bike lanes, and on the Roanoke River Greenway adjacent to Memorial Avenue showed that the bike lanes on Memorial Avenue are influenced by the proximity to the Greenway in that traffic patterns are similar with peaks on weekends (something not seen on 10th Street). Ideally, day-of-year factors should be calculated from a site more similar to Elm Avenue and less heavily influenced by the Greenway. However, this is the best available reference site.
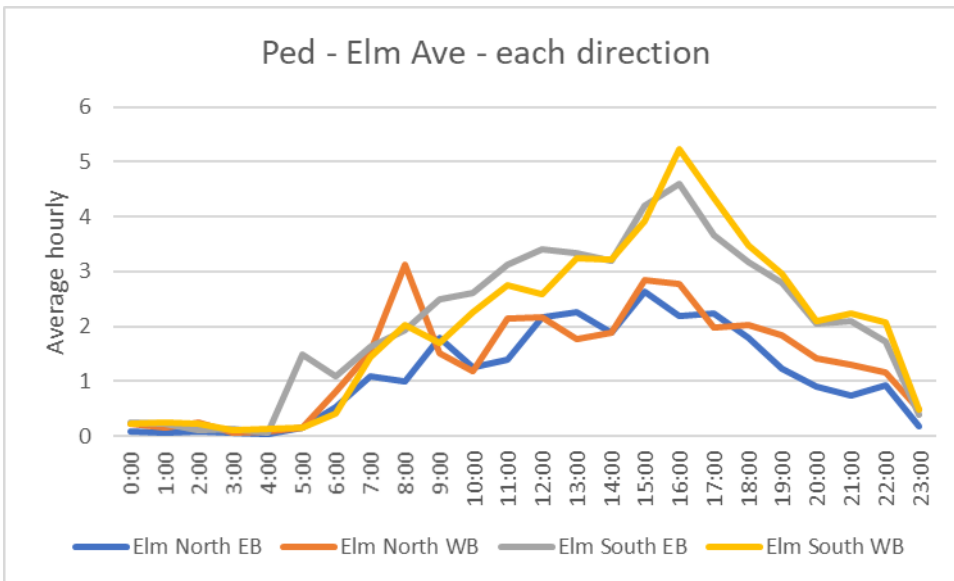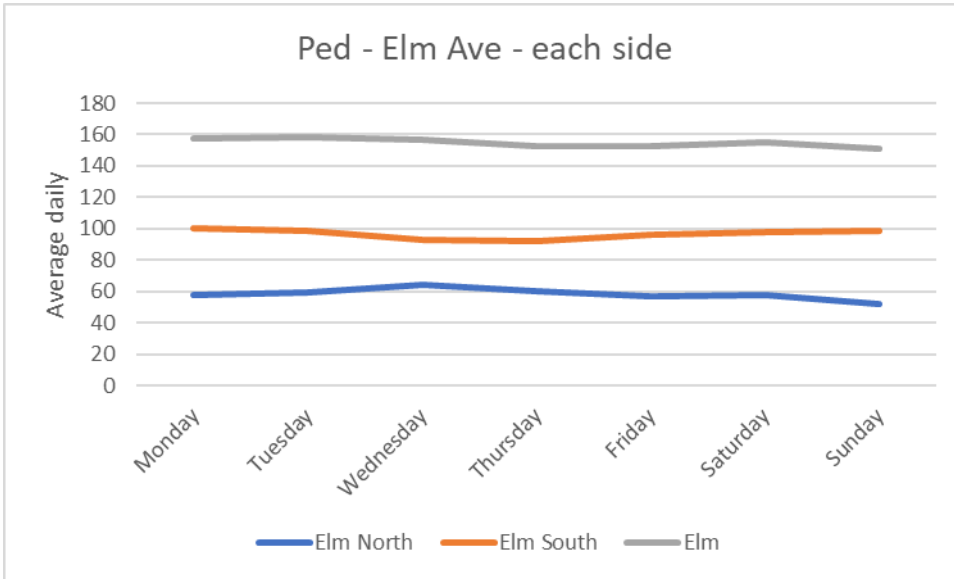
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Table 1. Average Annual Daily Traffic on Elm Avenue near 5th Street. EB=Eastbound, WB=Westbound

	Elm North EB	**Elm North WB**	**Elm South EB**	**Elm South WB**	**Elm North (both directions)**	**Elm South (both directions)**	**Elm (both sides, both directions)**
Pedestrian	23	29	44	42	52	85	137
Bicycle	4.2	3.4	3.1	1.0	7.6	4.0	11.6

Weekly and daily traffic patterns were analyzed. Pedestrian traffic was higher on the south side of the street than the north side. The south side of Elm Avenue has destinations including a bus stop that has moderately high activity and a convenience store. There was not a discernable day-of-week pattern.

Hourly pedestrian traffic rises steadily from 6 am to 4 pm and then declines until midnight. The exception was westbound pedestrian traffic on the north side which had an extra spike at 8 am.
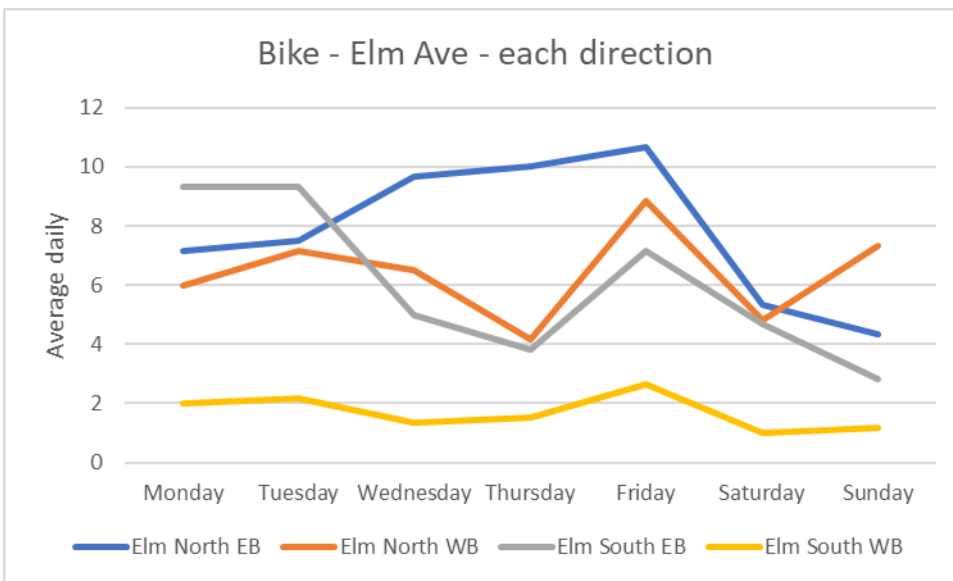
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Ped - Elm Ave - each side

Ped - Elm Ave - each direction

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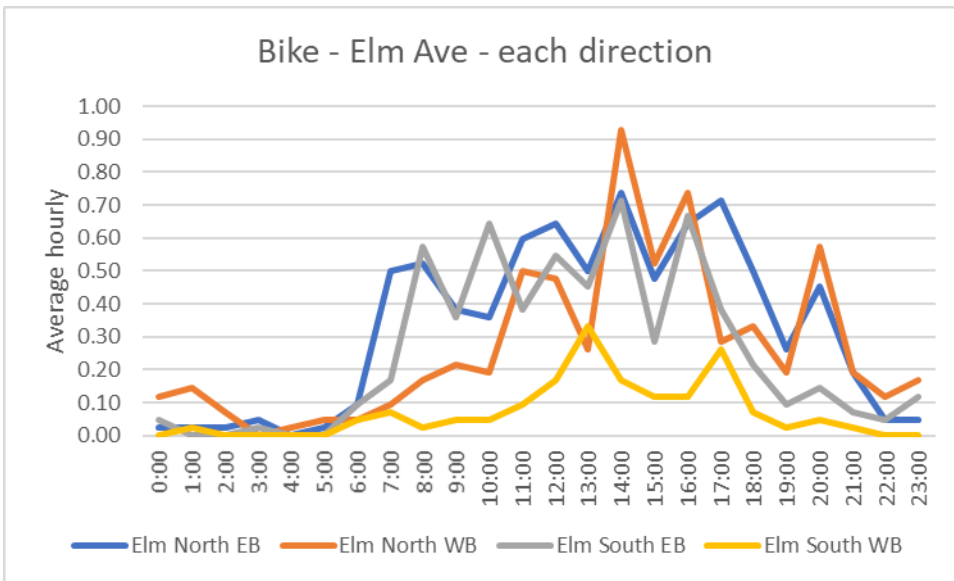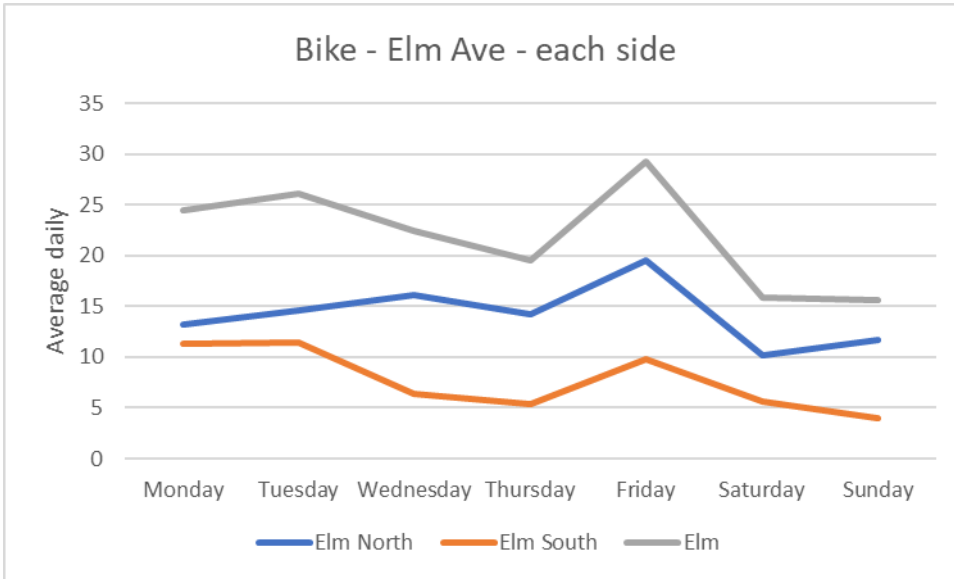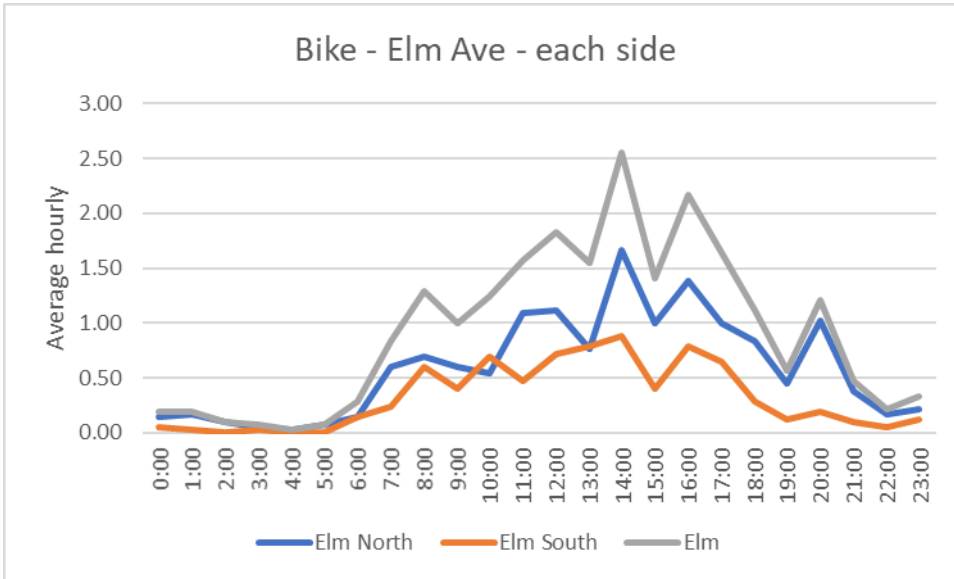**rvtpo.org**

Ped - Elm Ave - each side

Bicycle traffic was lowest on weekends, about 2/3 of typical weekday volume. Almost as many bicyclists travel opposite the direction of traffic (westbound) in the bike lane on the north side of the street as in the direction of traffic (eastbound). On the south side of the street most bicyclists travel in the direction of traffic (eastbound).

Hourly bicycle traffic rises from 6 am and is highest from 12 pm to 5 pm with a peak at 2 pm.

Bike - Elm Ave - each direction

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Bike - Elm Ave - each side

Legend: Elm North, Elm South, Elm

Bike - Elm Ave - each direction

Legend: Elm North EB, Elm North WB, Elm South EB, Elm South WB

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Bike - Elm Ave - each side

Elm Avenue was of interest because of its new bike lanes. It provides an important connection from Downtown Roanoke to Wasena and the Roanoke River Greenway. Main Street in Wasena was also recently restriped with bike lanes. As more data is collected, this will contribute to an understanding of pedestrian and bicycle traffic in the region. Correcting the data with day-of-year factors allows meaningful comparison with other count locations performed at different times and with future counts at the same location to assess trends over time.

Lessons learned from counting Elm Avenue and data analysis will facilitate our ongoing bike/ped count program.
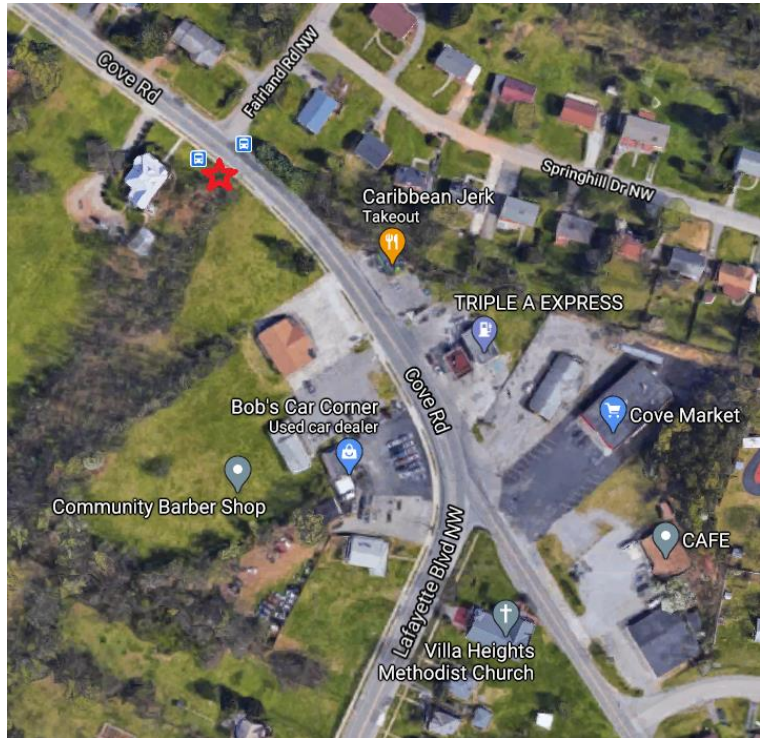
Cove Road

February 16, 2021

The Virginia Department of Transportation launched a statewide bike/ped count program in the fall of 2020 and provided two Eco-Vision MultiModal EcoCounters, some accessories, training, and data management to RVARC. The EcoCounters are infrared counters. In July 2019, Virginia Tech professor Dr. Steve Hankey partnered with RVARC to install four EcoCounters. These generate provide reference counts to calculate average annual daily traffic from temporary count sites.

Pedestrian and bicycle activity was assessed on Cove Road near Lafayette Boulevard. Cove Road and Lafayette Boulevard connect Melrose Avenue and Hershberger Road. Cove Road Average Annual Daily

Cove Road counter location (red star)

Traffic is 12,000. It is mostly residential other than Cove Market at the intersection of Cove Road and Lafayette Boulevard.

When Cove Road and Lafayette Boulevard were repaved, bike lanes were added on one side, crosswalks were added, and curb ramps were upgraded to ADA compliance. The zebra crosswalks at the intersection of Cove Road and Lafayette are marked with additional visible signs. At the location counted, there is a bike lane and a sidewalk on the southwest side only.

RVARC staff installed two Eco-Vision counters with pneumatic tubes to count bicyclists in the bike lane and the infrared sensor directed across the sidewalk to capture pedestrians. A counter on 10th Street and a counter on Campbell Avenue were used as the reference counters for pedestrian counts and Memorial Avenue bike lane counters for the bike counts because these locations had a complete year of counts. An initial site closer to Lafayette Boulevard did not work because vehicles frequently encroached into the bike lane due to the curve in the road and caused extra counts. The pneumatic tubes were in place September 26 – October 26, 2020 and the counter captured pedestrian data from Setember 25 – October 27, 2020.

Day-of-year factors were determined for the reference counters by dividing the day's count by the average of 365 consecutive days of counts for that counter, averaging multiple counters' individual day-of-year factor. Each day's counts on each of the temporary counters were divided by the ped or bike day-of-year factor for the corresponding date to create adjusted counts. The adjusted counts were averaged to calculate the annual average daily pedestrian or bicycle traffic at each counter location.

Table 1. Average Annual Daily Pedestrian Traffic (AADT)

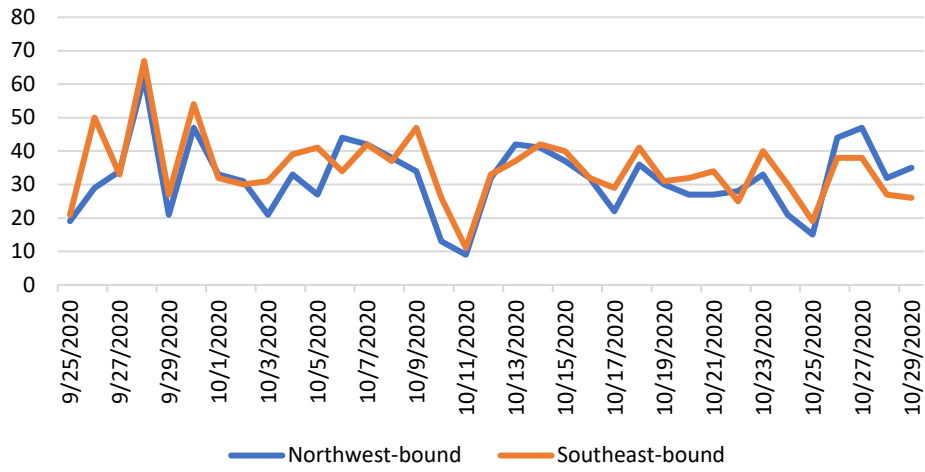| Mode	Average Raw Counts	AADT
Pedestrian	67	95
Bicycle	9	12

Average Annual Daily Traffic

There was not a directional split in pedestrian travel (Figure 1). There were almost no wrong-way bicyclists in the bike lane. While the counter was being installed, a child on a manual scooter passed by and the counter picked up the scooter. The lack of wrong-way bicyclists in the bike lane suggests that bicyclists (or scooters) traveling the direction that does not have a bike lane use the travel lane or the sidewalk.

Pedestrian activity was highest at the beginning of the week and steadily declined through the week while bicycle activity was steady throughout the week with a peak on Saturday (Figure 2).

Pedestrian and bicycle activity were highest between 7:00 a.m. and 9:00 p.m. (Figure 3).

Sidewalk Directional Split

— Northwest-bound   — Southeast-bound
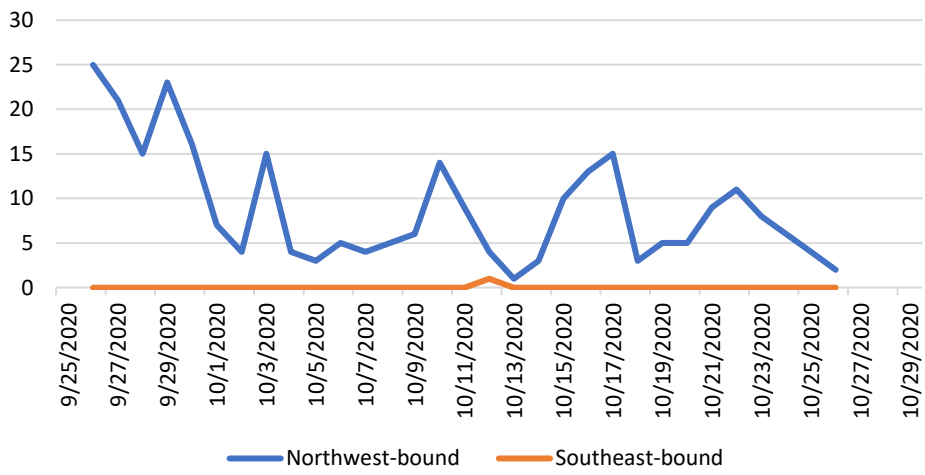
Bike Lane Directional Split

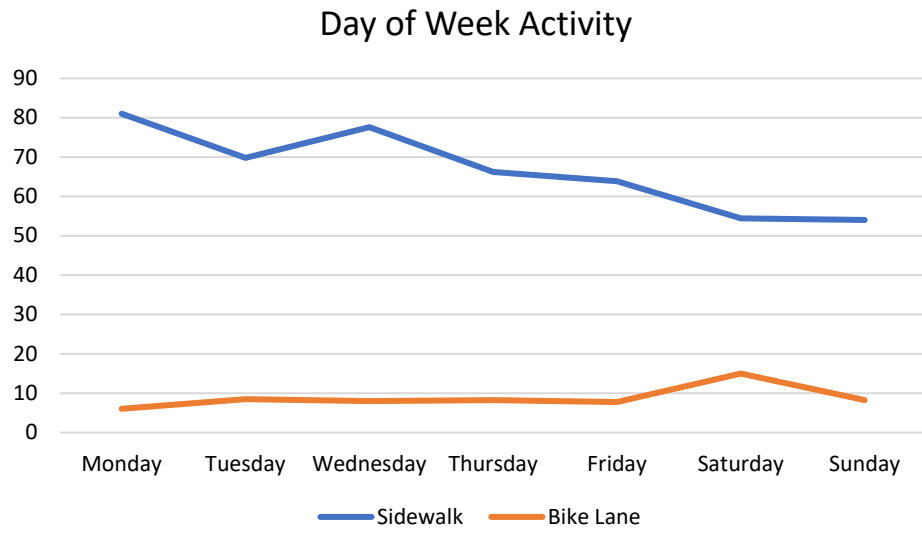

— Northwest-bound   — Southeast-bound

Figure 1. Directional split

Day of Week Activity

Figure 2. Day of Week

Time of Day Activity

Figure 3. Time of Day