



## MEMORANDUM

**TO:** TPB Travel Forecasting Subcommittee  
**FROM:** Yu Gao, Transportation Engineer  
**SUBJECT:** Findings of Arlington County Bike and Pedestrian Counters Data by Trail Types in 2020  
**DATE:** Sep 06, 2022

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## PURPOSE

This memo documents the findings of Arlington County Bike and Pedestrian Counters data before and during COVID-19 for two different types of trails: trails primarily serving during peak period and the trails primarily serving during off-peak period. The findings can also be used to supplement the existing COVID-19 Travel Monitoring Snapshot.

## BACKGROUND

Arlington has a robust system of continuous bicycle and pedestrian counting equipment. As of December 2020, there were 39 automatic bicycle & pedestrian counting stations available in Arlington County. The installation of this equipment dates back to 2009; some of the equipment was installed more recently. Due to the maintenance issues, the data quality and data availability was imperfect for most stations.

In 2021, COG staff reviewed and assessed the historical data as well as the 2020 data for all the Arlington County Bike and Pedestrian counting stations and developed a memo to document the assessment of the quality of data<sup>1</sup>. Based on the assessment, it is found that the raw data from all the stations need to be cleansed for future data applications. During the data assessment, two patterns of trails use were observed. Some trails attracted the greatest use during the peak period while others attracted the greatest use during the off-peak period. Additionally, different patterns of use before and during COVID were also unique. According to the 2017/2018 Regional Travel Survey (RTS), across all travel modes, the most common purpose for trips during peak period (5:30 – 9:30 am and 3:00 – 7:00 pm on weekdays) includes work, shop/meal, and drop off/pick up. While, for off-peak period (all other times on weekdays), the most common purpose for trips included shop/meal, work, personal business, and social/recreation.

For most of the stations before 2020, the hourly data was only available during 2011-2016; therefore, the pre-pandemic historical hourly volume is based on the 2011-2016 average hourly data from all the available stations in the data analysis. Additionally, the historical daily volume was based on the 2011-2019 average daily data from all the available stations.

## PROCEDURE

### Data Preparation

Only the quality data can be used in the data analysis, staff thoroughly cleansed the raw data with the following steps:

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<sup>1</sup>. Yu Gao. "Arlington County Bike and Pedestrian Data Assessment." Memorandum, August 11, 2021.



- The reporting period sufficiency was firstly checked. For all the years except 2017/2018 (reconstructed data with only daily counts), the raw data is in 15 minutes interval. If any hour doesn't have 4 15-minute records or any day doesn't have 24-hour records for 2011-2016, 2019 and 2020, it indicated insufficient data for that day and the data were excluded.
- The monthly volume of each station was summarized and compared with the baseline counts or the historical counts. If the monthly volume is substantially different from the historical volume for the same month of year, it indicates questionable data quality for that month. The questionable data was reviewed and excluded if it appeared to be bad.
- The monthly volume for a particular month of the year was also compared with the other monthly volumes in the same year. If any monthly volume is inconsistent throughout the year, then it is an indicator of questionable data. The questionable data was reviewed and excluded after confirming the data was bad.
- The daily volume was summarized. If the entire day's volume is zero, then it indicates the counter was not working properly and the data was excluded.
- The daily volume was also compared with the average day of week (DOW) volume of the same month of year. If any daily volume is 50 percent higher or 50 percent lower than the average DOW volume of the same month, then it is an indicator of questionable data. The outliers were reviewed and excluded after confirming that the data was bad.
- The daily volume was then compared with the Annual Average Daily Volume (AADT). If the daily volume is 10 times higher or 20 times lower than AADT, then it is an indicator of questionable data. The outliers were reviewed and excluded after confirming that the data was bad.
- The volume recorded during each hour was compared with the average hourly volume of the station, if a volume 30 times higher than the average hourly volume for an hour was recorded, then the volume was flagged as questionable. The outliers were reviewed and excluded after confirming that the data was bad.

## Data analysis

The weekday and weekend volume comparisons, and time of day volume distributions were reviewed as the key factors to determine the trail type for each station (see Table 1). It was determined that out of all the Arlington County automatic bicycle and pedestrian counting stations, 20 stations primarily serve during peak period (Peak Trail), and 13 stations primarily serve during off-peak period (Off-peak Trail). The stations using Mobile PyroBox were not assigned trail types due to possible multiple locations. Figure 1 and Figure 2 show respectively the stations primarily serving during peak period and the stations primarily serving during off-peak period.

2020 Full Year Data Availability	Counting Station	Data Type	Peak or Off-peak Trail	Pre-pandemic Volume Weekday vs Weekend
	Location 1 – Custis Rosslyn	Bike/Ped	Peak Trail	Weekday Higher
	Location 2 – Four Mile Run (FMR) Pyro 04	Total	Off-peak Trail	Weekend Higher
	Location 3 – Four Mile Run (FMR) Piezo	Total	Off-peak Trail	Weekend Higher
	Location 5 – Washington and Old Dominion (W&OD) East Falls Church	Bike/Ped	Off-peak Trail	Weekend Higher
	Location 6 – Custis Bon Air	Bike/Ped	Peak Trail	Similar
Yes	Location 7 – Washington and Old Dominion (W&OD) Bon Air East	Bike/Ped	Off-peak Trail	Weekend much Higher
	Location 8 – Key Bridge West	Bike/Ped	Peak Trail	Similar
	Location 9 – Key Bridge East	Bike/Ped	Peak Trail	Similar
	Location 10 – Mount Vernon Trail (MVT) Airport South	Bike/Ped	Off-peak Trail	Weekend Higher
	Location 11 – Crystal City Connector	Bike/Ped	Peak Trail	Similar
	Location 12 – Theodore Roosevelt (TR) Island Bridge	Bike/Ped	Off-peak Trail	Weekend Higher
Yes	Location 13 – Eads SB	Total	Peak Trail	Weekday is a little higher
	Location 14 – Washington and Old Dominion (W&OD) Columbia Pike	Bike/Ped	Off-peak Trail	Weekend Higher
Yes	Location 15 – Fairfax WB Bike Lane	Total	Peak Trail	Weekday Higher
Yes	Location 16 – Fairfax EB Bike Lane	Total	Peak Trail	Weekday Higher
Yes	Location 17 – Quincy SB Bike Lane	Total	Peak Trail	Weekday Higher
Yes	Location 18 – Quincy NB Bike Lane	Total	Peak Trail	Similar
Yes	Location 19 – Eads NB	Total	Peak Trail	Weekday is a little higher
Yes	Location 20 – Crystal NB Bike Lane	Total	Peak Trail	Weekday Higher
Yes	Location 21 – Wilson WB Bike Lane	Total	Peak Trail	Weekday is a little higher
Yes	Location 22 – Clarendon EB Bike Lane	Total	Peak Trail	Similar
	Location 23 – Military SB Bike Lane	Total	Off-peak Trail	Weekend Higher
Yes	Location 24 – Military NB Bike Lane	Total	Off-peak Trail	Weekend Higher
	Location 25 – Bluemont Connector	Bike/Ped	Peak Trail	Weekday a little Higher
	Location 26 – Ballston Connector	Bike/Ped	Peak Trail	Weekday Higher
Yes	Location 27 – Washington and Old Dominion (W&OD) Bon Air West	Bike/Ped	Off-peak Trail	Weekend Higher
Yes	Location 28 – Joyce SB	Bike/Ped	Off-peak Trail	Weekend Higher
	Location 29 – Joyce NB	Bike/Ped	Off-peak Trail	Weekend Higher
	Location 30 – Mobile PyroBox 07 (Possible multiple locations)	Total	<b>Mobile PyroBox</b>	Weekend Higher
	Location 31 – Bikeometer	Total	Peak Trail	Weekday Higher
	Location 32 – Mobile PyroBox 08 (Possible multiple locations)	Total	<b>Mobile PyroBox</b>	Weekend Higher
Yes	Location 33 – Mobile PyroBox 09 (Possible multiple locations)	Total	<b>Mobile PyroBox</b>	Weekend Higher
	Location 34 – Mobile PyroBox 10	Total	<b>Mobile PyroBox</b>	Weekday Higher
	Location 35 – 14th St Bridge	Bike/Ped	Peak Trail	Weekday Higher
	Location 36 – Roosevelt Bridge	Bike/Ped	Peak Trail	Weekday Higher
	Location 37 – 110 Trail	Bike/Ped	Peak Trail	Similar
	Location 38 – Arlington Mill	Bike/Ped	Off-peak Trail	Weekend Higher

Table 1. Trail Type

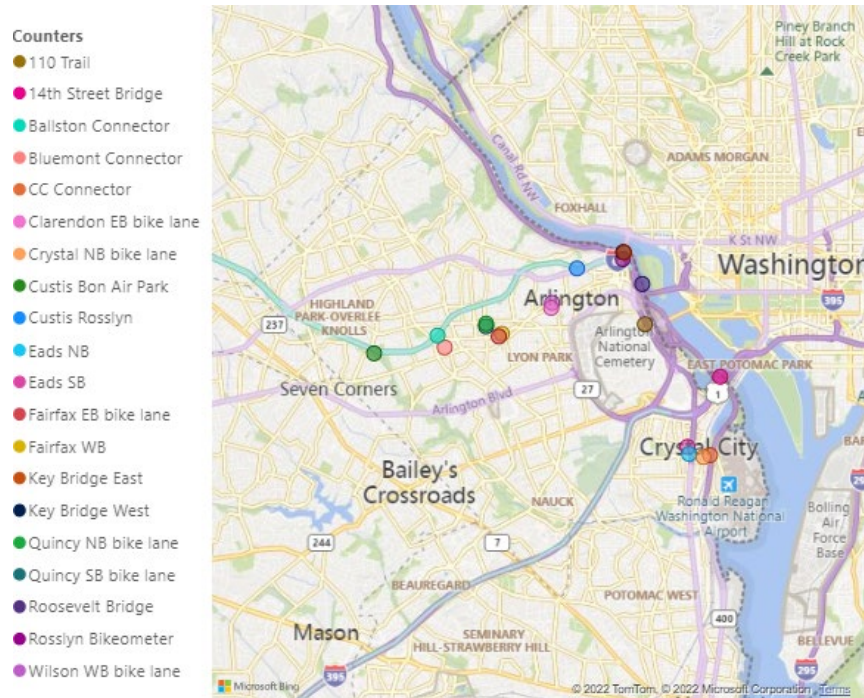


Figure 1. Stations Primarily Serving during Peak Period

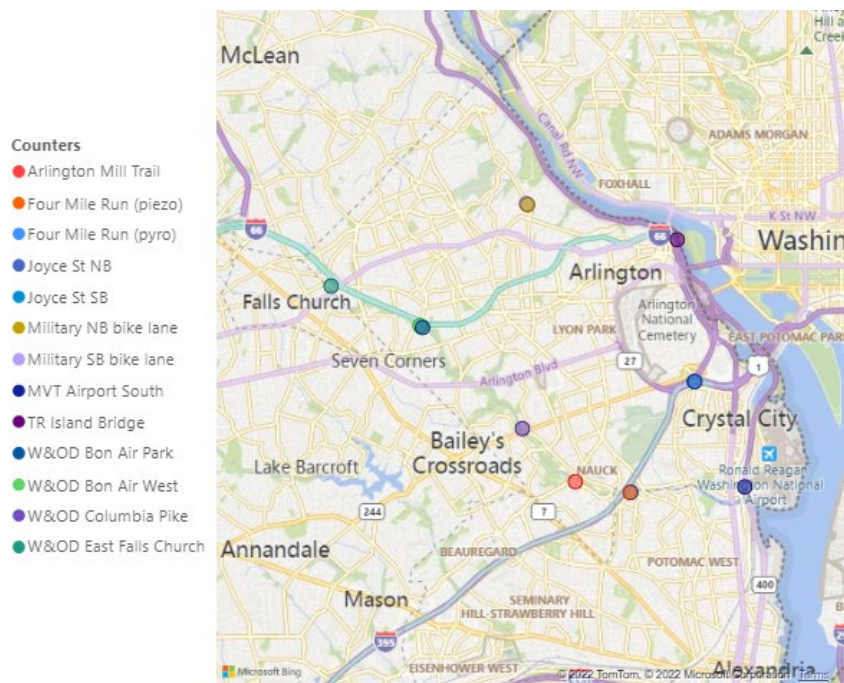


Figure 2. Stations Primarily Serving during Off-peak Period

Because this analysis mainly focused on the COVID impact on trail usage, only the 13 stations with both complete 2020 data and historical (pre-2020) data were selected for the analysis. Nine of the 13 stations belong to the Peak Trail group and four of the 13 stations belong to the Off-peak Trail group. The 2020 counts and the historical counts were summarized and compared at the daily and hourly level by weekday and weekend for each trail group to show their trail usage patterns during and before COVID. A list of comparison charts was developed (See Figure 3 through Figure 14).

## SUMMARY OF FINDINGS

### *Weekday and Weekend Daily Volume Comparison for Peak and Off-peak Trail Groups: Pre-2020 vs 2020*

- Peak Trail group during weekdays (See Figure 3):
  - The daily volumes in 2020 are higher than pre-2020 before April.
  - The daily volumes in 2020 dropped dramatically and became much lower than pre-2020 after April, especially between April to September.
  - This aligns with a reduction in trips during the peak period across all modes triggered by stay at home orders and increased telework due to COVID-19.
- Peak Trail group during weekends (See Figure 4):
  - The daily volumes in 2020 are higher than pre-2020 for all the months.
  - While the primary use of these trails is during the peak period on weekdays, the types and kinds of trips may be different on the weekends. So, while the volume of travel on these trails declined on weekdays during the peak period, the use of these trails increased on weekends.
- Off-peak Trail group during weekdays (See Figure 5):
  - The daily volumes in 2020 are higher than pre-2020 for all the months except February.
  - COVID-19 corresponded with an increase in Off-peak Trail usage.
- Off-peak Trail group during weekends (See Figure 6):
  - The daily volumes in 2020 are higher than pre-2020 for all the months, similar to the observation from weekdays.
  - COVID-19 corresponded with an increase in use of the Off-peak Trail group.

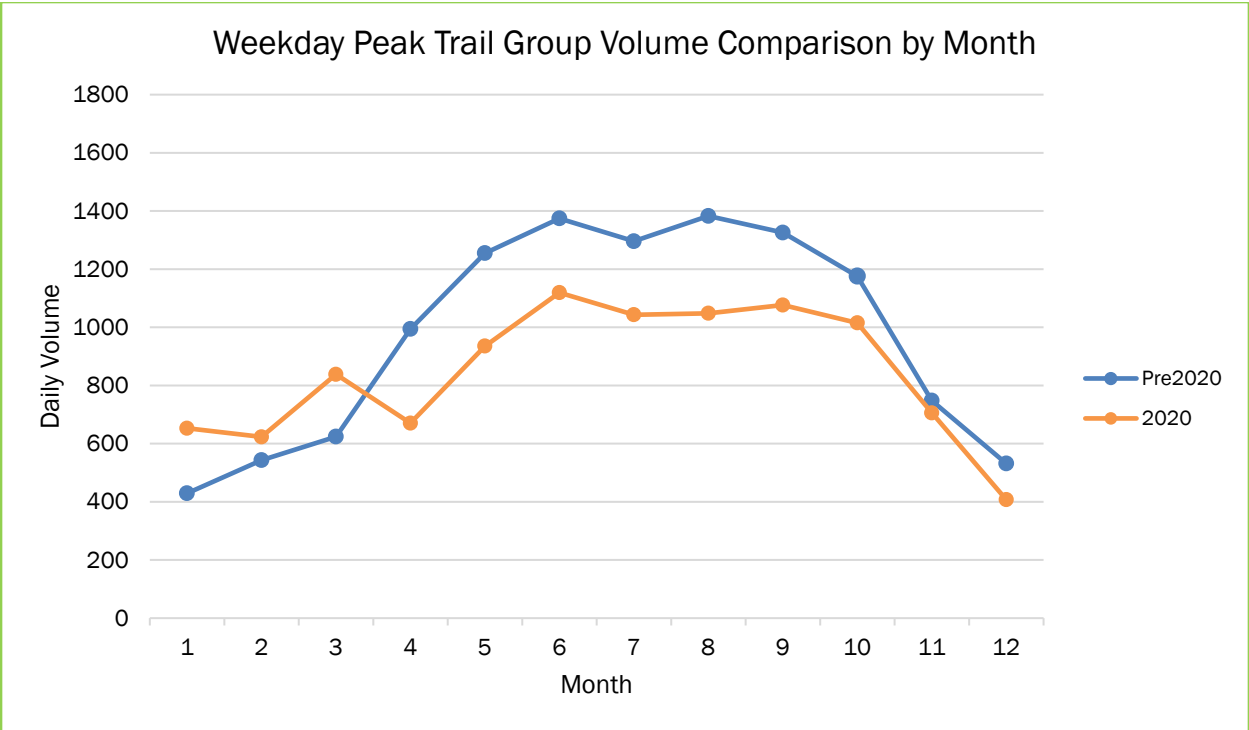


Figure 3. Weekday Volume Comparison by Month for Peak Trails: Pre-2020 vs 2020

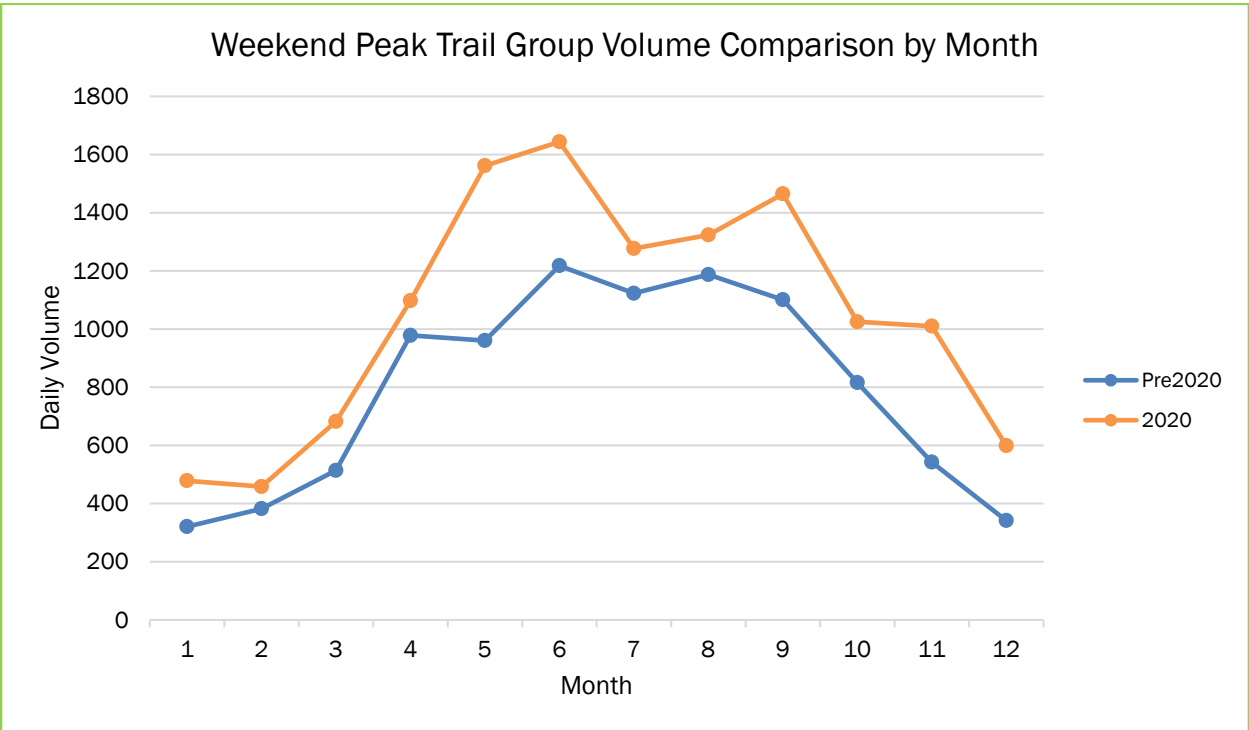


Figure 4. Weekend Volume Comparison by Month for Peak Trails: Pre-2020 vs 2020

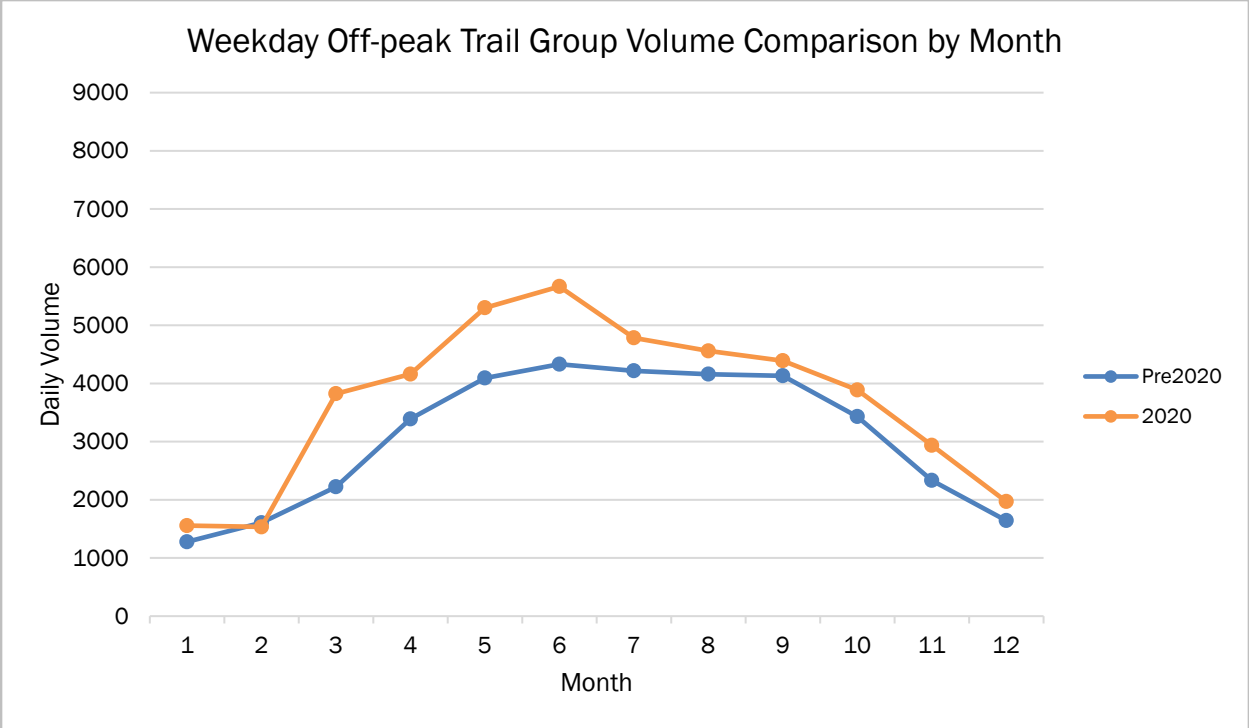


Figure 5. Weekday Volume Comparison by Month for Off-peak Trails: Pre-2020 vs 2020

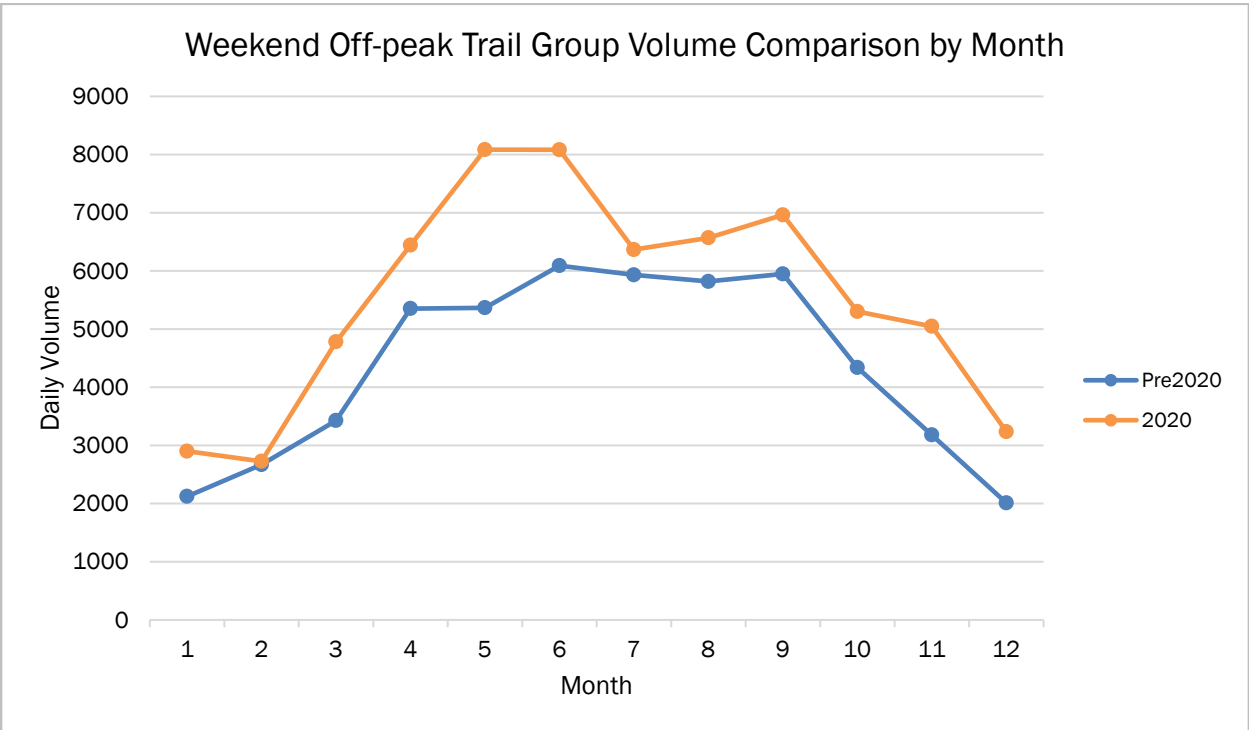


Figure 6. Weekend Volume Comparison by Month for Off-peak Trails: Pre-2020 vs 2020

### Weekday and Weekend Hourly Volume Comparison for Peak and Off-peak Trail Groups: Pre-2020 vs 2020

- Peak Trail group during weekdays (See Figure 7):
  - The hourly volumes in 2020 are more evenly distributed compared with pre-2020.
  - The AM peak period and PM peak period volumes in 2020 are much lower than pre-2020.
  - The mid-day (11am-3pm) volumes in 2020 are higher than pre-2020.
  - Fewer people used these trails during peak periods and more people used these trails for during off-peak periods in 2020 due to COVID-19.
  
- Peak Trail group during weekends (See Figure 8):
  - The hourly volumes in 2020 are higher than pre-2020 for most hours (especially 11am-6pm).
  - While there were fewer weekday trips, more trips occurred on weekends in 2020.
  
- Off-peak Trail group during weekdays (See Figure 9):
  - The hourly volumes in 2020 are much higher than pre-2020 between 9am to 5pm.
  - For the rest of the day, the hourly volumes in 2020 are similar to pre-2020.
  - COVID-19 corresponded with an increase in use of the Off-peak Trail group.
  
- Off-peak Trail group during weekends (See Figure 10):
  - The hourly volumes in 2020 are higher than pre-2020 for all hours (especially 8 am-8 pm), similar to the observation from weekdays.
  - COVID-19 corresponded with an increase in the use of the Off-peak Trail group.



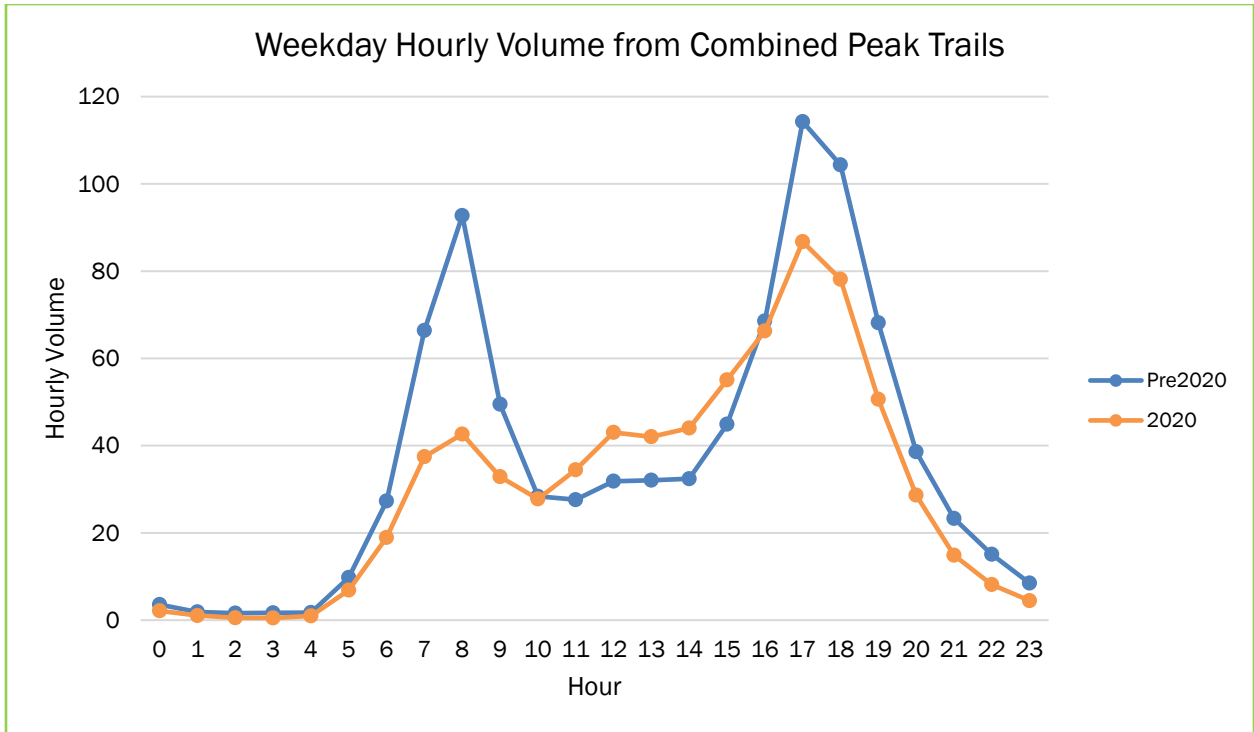


Figure 7. Weekday Hourly Volume Comparison for Peak Trails: Pre-2020 vs 2020

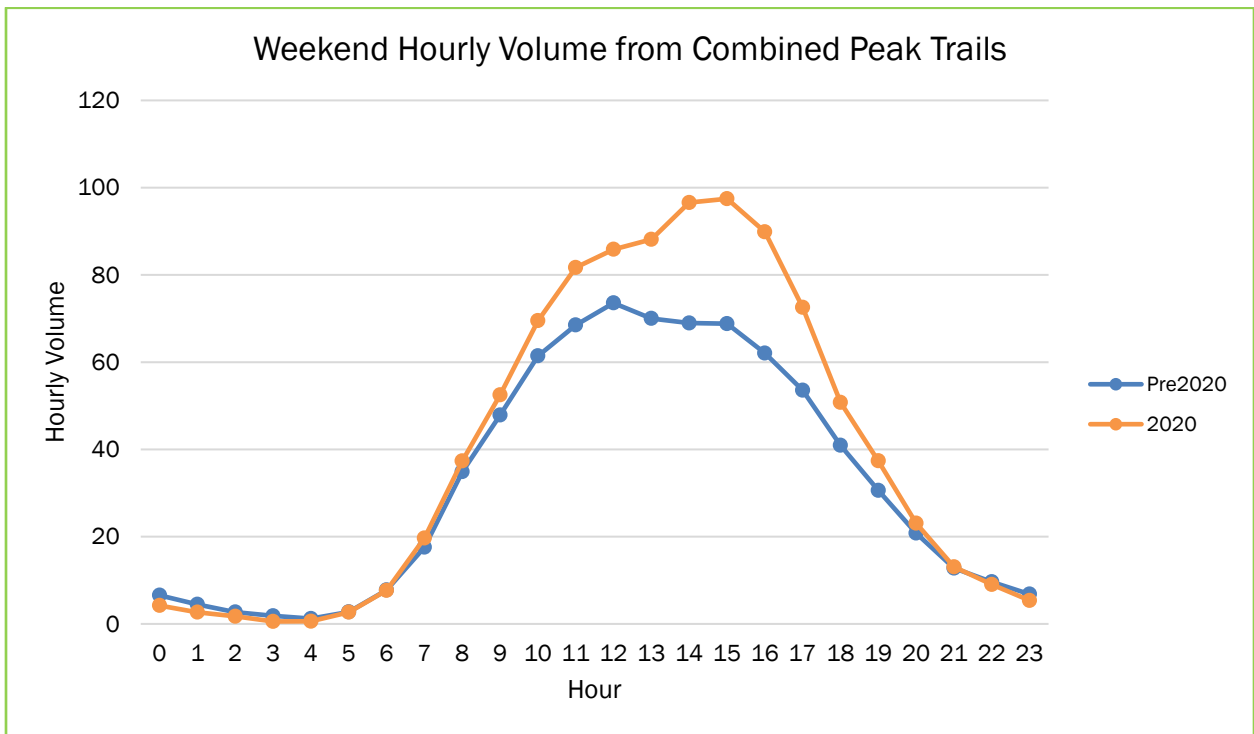


Figure 8. Weekend Hourly Volume Comparison for Peak Trails: Pre-2020 vs 2020

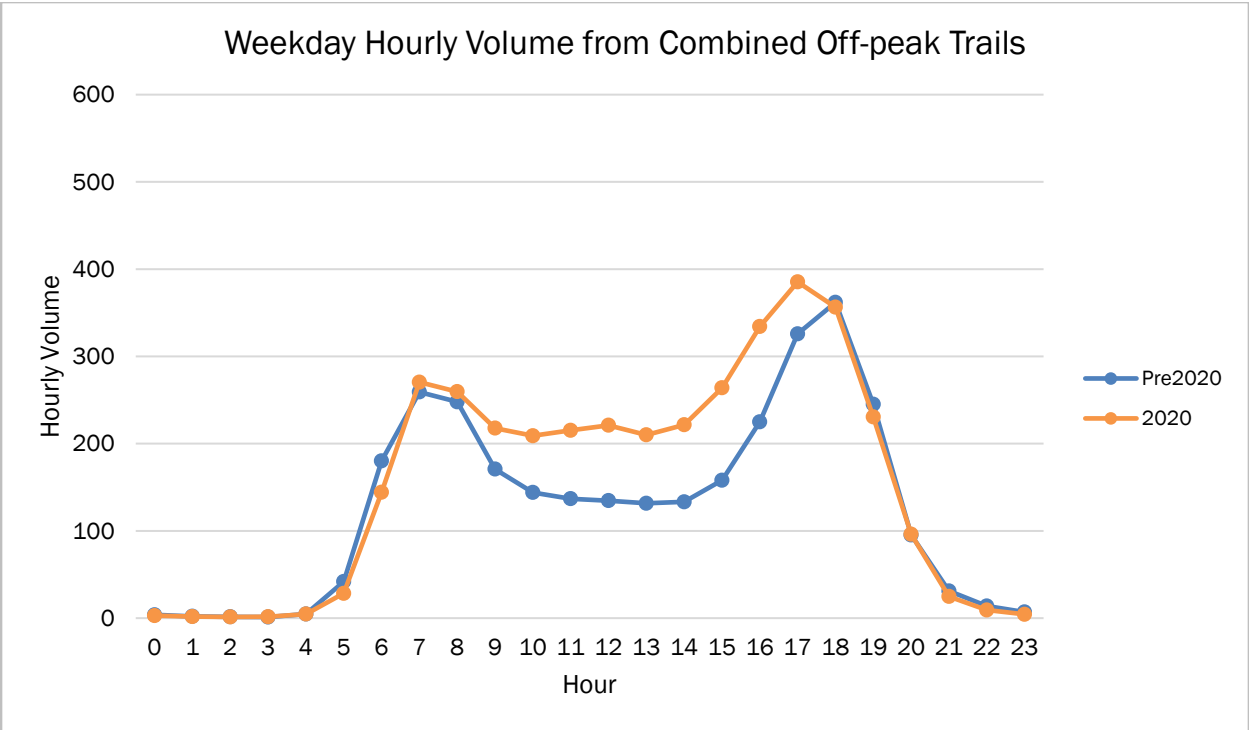


Figure 9. Weekday Hourly Volume Comparison for Off-peak Trails: Pre-2020 vs 2020

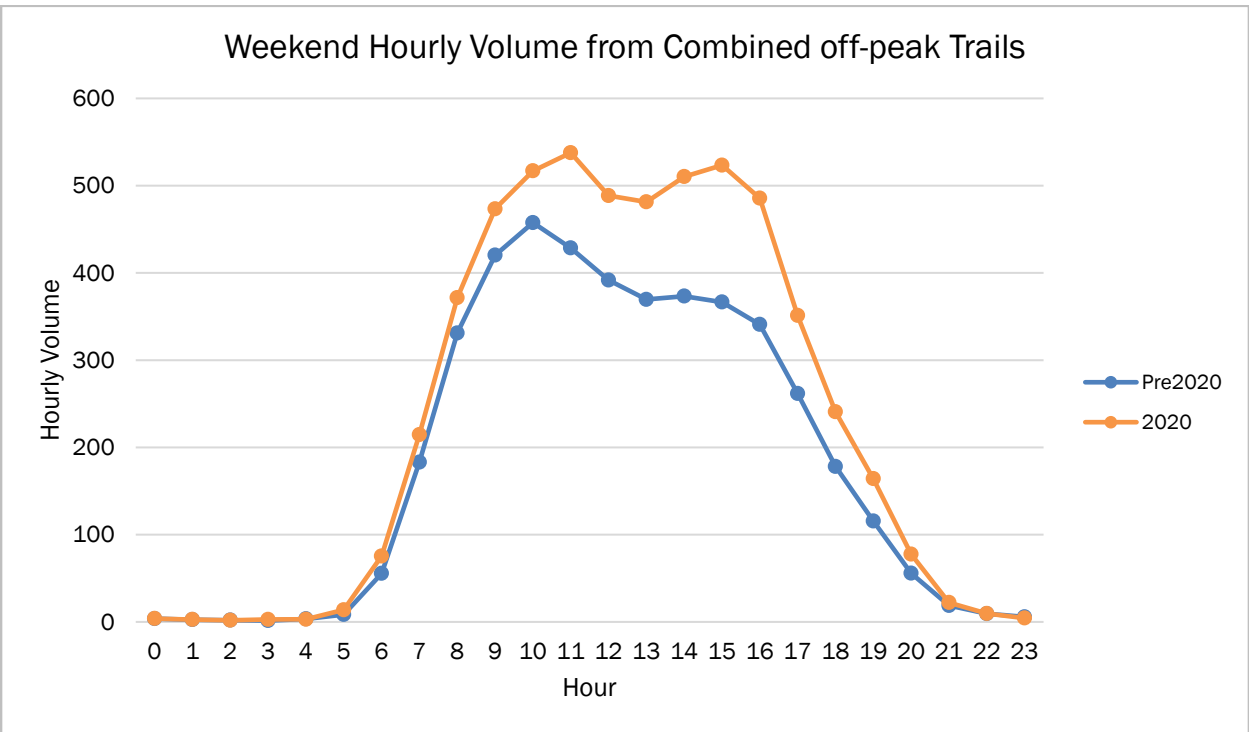


Figure 10. Weekend Hourly Volume Comparison for Off-peak Trails: Pre-2020 vs 2020

Weekday and Weekend Hourly Volume Comparison for Peak and Off-peak Trail Groups: by Month of Year: Pre-2020 vs 2020

- Peak Trail group during weekdays (See Figure 11):
  - In January and February, the hourly volume distributions in 2020 and pre-2020 are very similar, however, the hourly volumes of 2020 are higher than pre-2020.
  - In March, the hourly volumes of 2020 in AM hours are similar to pre-2020 and the hourly volumes of 2020 in PM hours are higher than pre-2020.
  - From April to December, both of the AM and PM peak period volumes in 2020 are much lower than pre-2020 and the mid-day volume in 2020 is higher than pre-2020, which corresponds with other changes in travel behavior during COVID-19.
  
- Peak Trail group during weekends (See Figure 12):
  - The hourly volumes in 2020 are higher than pre-2020 for daytime hours for all the months, especially for March to June and September to December.
  - COVID-19 corresponded with an increase in trips on weekends.
  
- Off-peak Trail group during weekdays (See Figure 13):
  - In January, February and March, the hourly volume distribution in 2020 and pre-2020 are very similar, and the hourly volumes of 2020 are much higher than pre-2020 especially during 6AM-6PM.
  - In April and May, the hourly volumes in 2020 are higher than pre-2020 for most hours, except during 5AM-8AM.
  - In June and July, the hourly volumes in 2020 are much higher than pre-2020 in the morning and the hourly volumes in 2020 are similar to pre-2020 in the afternoon.
  - In August and September, the hourly volumes in 2020 are similar to pre-2020 before 9AM, however, the hourly volumes in 2020 are slightly lower than pre-2020 in the evening.
  - In October, November and December, the hourly volumes in 2020 are similar to pre-2020 in the morning, however, the hourly volumes in 2020 are much higher than pre-2020 in the late afternoon around 4pm.
  - COVID-19 corresponded with an increase in use of the Off-peak Trail group.
  
- Off-peak Trail group during weekends (See Figure 14):
  - The hourly volumes of 2020 are higher than pre-2020 for most of the daytime hours for all the months, similar to the observations from weekdays.
  - COVID-19 corresponded with an increase in use of the Off-peak Trail group.

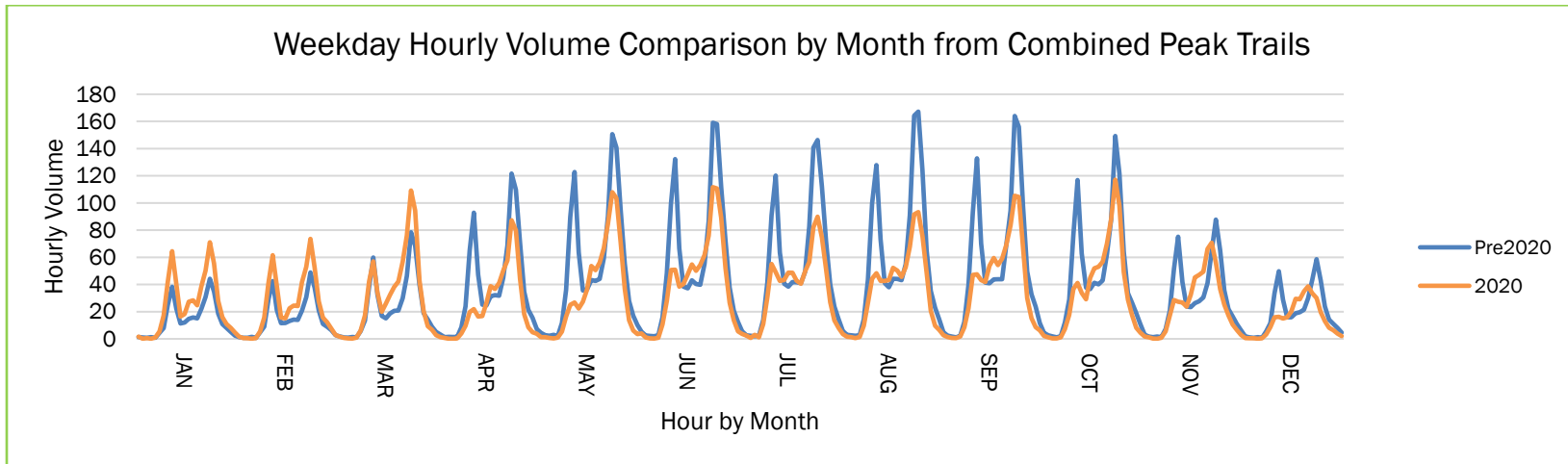


Figure 11. Weekday Hourly volume comparison for Peak Trails by month of year: Pre-2020 vs 2020

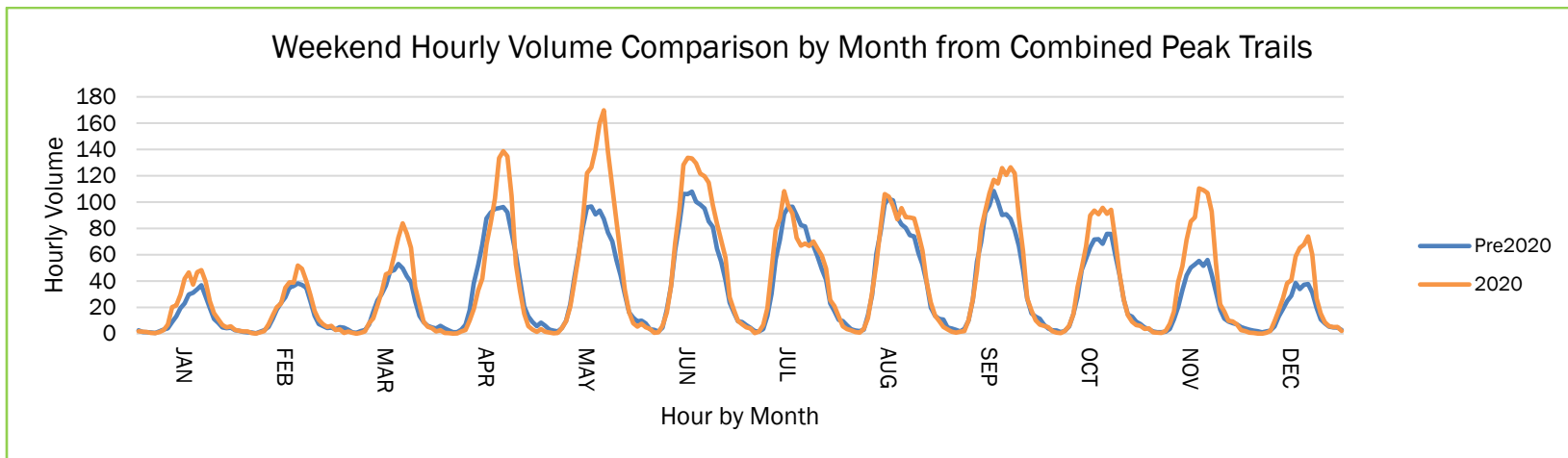


Figure 12. Weekend Hourly volume comparison for Peak Trails by month of year: Pre-2020 vs 2020

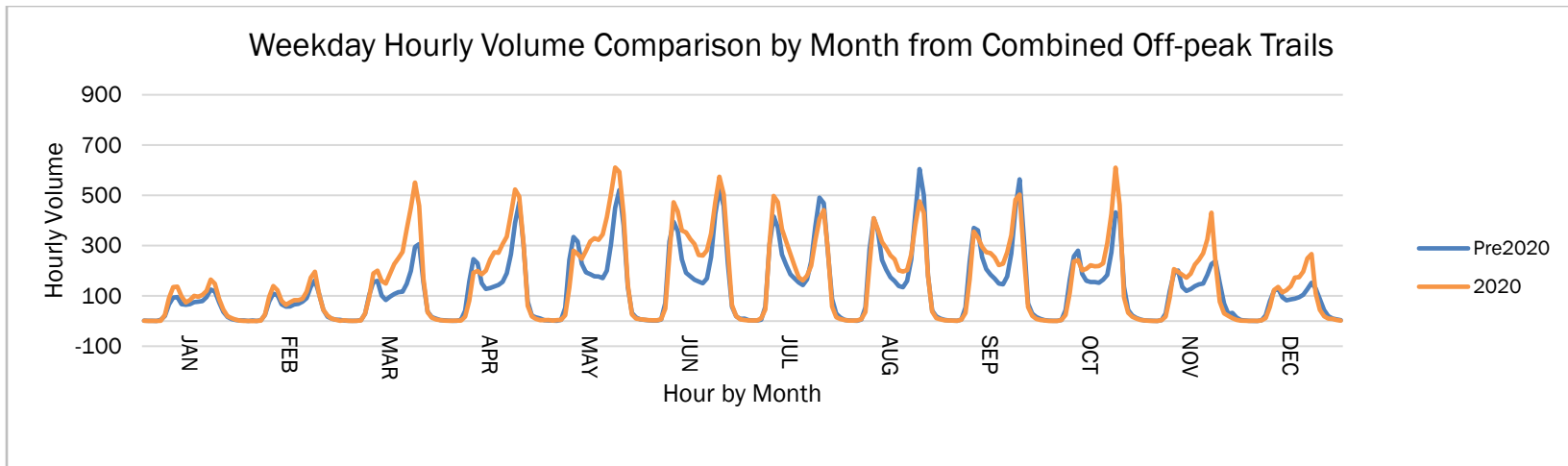


Figure 13. Weekday Hourly volume comparison for Off-peak Trails by month of year: Pre-2020 vs 2020

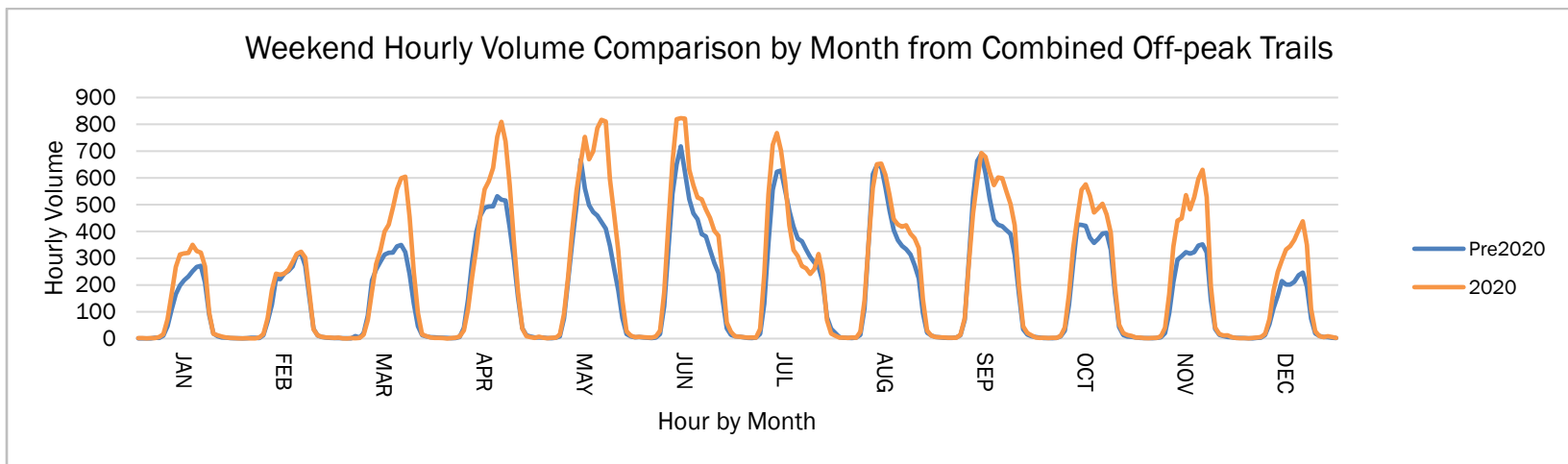


Figure 14. Weekend Hourly volume comparison for Off-peak Trails by month of year: Pre-2020 vs 2020



ATTACHMENTS

1. Map of Arlington Automatic Bicycle and Pedestrian Counting Equipment

**ATTACHMENT 1. ARLINGTON AUTOMATIC BICYCLE AND PEDESTRIAN COUNTING EQUIPMENT MAP**

