COUNTING

BICYCLE AND WALKING TRIPS

WHY WE COUNT | KEY FINDINGS | HOW WE COUNT | USING THE DASHBOARD

WHY WE COUNT

BICYCLE AND WALKING TRIPS

An old adage says "you can't manage what you don't measure," and a slight variation holds that "if it isn't counted, it doesn't count." These principles help explain Arlington's practice of collecting and using data for bicycle and walking trips. Cycling and walking are woven into daily life in Arlington County, and collecting and using data is part of managing active transportation.

Arlington County has been doing innovative things with transportation policy for decades. The County is known as a leader in Smart Growth, Transit Oriented Development (TOD), and Transportation Demand Management (TDM). These are ways of moving more people with fewer motor cars, especially by reducing single-occupant-vehicle trips and providing transportation options and choice.

For nearly 50 years, Arlington has emphasized transit as an efficient way to get around in a dense urban place. In addition, Arlington has long been a leader in making cycling and walking safer and more convenient. Efforts to support and encourage cycling and walking have included extensive trail building, creating urban design standards that promote walkability, and pioneering innovative projects such as the Capital Bikeshare system. Arlington was an early member of the influential group NACTO (National Association of City Transportation Officials), a leader in developing urban design standards that put multi-modal solutions front and center.

Opinion surveys and other feedback show that Arlingtonians appreciate this approach. County trails are a favorite feature for residents and visitors; Capital Bikeshare is a popular and growing system enabling short bike trips; and a robust pedestrian "mode share" in journey-to-work studies confirms the popularity and utility of walking. Arlington is a Silver Level bicycle friendly community and a Gold Level walk-friendly community.

As part of its network of bicycle and pedestrian facilities, Arlington County has established a robust system of continuous, automated bicycle and pedestrian counters. The count data helps guide management, investment, and maintenance to strengthen active transportation. The data informs safety studies and helps set project priorities. The database of all results is not only useful immediately for planning and forecasting, but will also pay dividends for years as a record of active transportation and resource for study.

Together with the growing importance of cycling and walking in a balanced, sustainable approach to transportation, comes an appetite for documenting cycling and walking trips. Collecting baseline volume data at a variety of locations allows for gauging change over time, targeting maintenance efforts, and planning new projects. Counts help confirm the importance of connections between modes, for example "first mile / last mile" access to rail transit. When faced with disruptions such as Metrorail's extensive SafeTrack initiative, cycling and walking counts document Arlington's ability to provide riders and residents a range of options. And counts that document the variety of cycling and walking trips support arguments for clearing snow from popular trails and providing reliable nighttime lighting.

Counter technology is reliable and continuing to improve. Arlington mainly uses equipment from industry leader Eco-Counter, a company dedicated to "people counting". Before acquiring automated, continuous count equipment, Arlington gathered count from manual methods, surveys, and educated guesses. But manual counts are labor intensive and prone to inaccuracy, and provide only limited insight into everyday, widespread, long-term patterns of cycling and walking. And volunteer count events, no matter how well-planned, can be wiped out by unpredictable weather events.

On the other hand, automatic counter technology and wireless communications have made the use of permanent, continuous count devices a staple for planning and operations.

Arlington's first two permanent, continuous, automated bike and pedestrian counters were installed in the Fall and Spring of 2009-10 on the Custis Trail and Four Mile Run Trail. They use a combination of in-ground inductive loops, passive infrared detectors, and pressure-sensitive piezo technology to collect trail volumes and travel direction. (Yes, for the curious, the occasional deer might also count as a pedestrian).

As of April 2017, the County has 20 permanently installed bicycle and pedestrian counters on shared-use trails; 11 permanent bicycle-only counters in on-street bike lanes; 5 mobile counters typically used for short term sidewalk counts; and the first real-time bicycle counter on the east coast, the Bikeometer (tip: say Bike-OM-e-ter; like speed-OM-e-ter). It is installed near the intersection of Lee Highway and N Lynn Street in Rosslyn, and displays cumulative daily, monthly, and year-to-date totals at one of the busiest bicycle locations in the region. In 2016, the Bikeometer registered more than 390,000 bicycle trips.

SUMMARY OF KEY FINDINGS

- People ride a lot of bikes on County trails! Most major trails see around 500,000 bicycle trips per year.

- People ride for work commutes, for recreation and fitness, and for social and utility trips. Some trails see a balance of uses; other locations are predominantly used by commuters or recreational riders.

- Many Arlington sidewalks accommodate more than 3,000 pedestrian trips per day. Sidewalks around Metro stations can have more than 1,000 pedestrians per hour during peak periods.

- Many cyclists are not deterred by winter cold temperatures alone. But rain, snow, ice and darkness have a major deterrent effect on ridership.

- The data clearly show that trails do not serve only commuters OR recreational users. A blend of activities is typical, evident from time-of-day records. Different patterns predominate on different facilities at different times.

- Arlington enjoys a solid 6 to 7-month high season of greatest bicycle activity, with peaks dramatically higher than troughs. Pedestrian activity varies much less.

- A characteristic profile of seasonal activity allows planners to expand short-term counts into annual estimates even for locations without permanent counters. This "fingerprint" of active transportation is remarkably consistent across facility types.

DISPLAYING DATA

Arlington's longest-serving counter is on the off-street, paved, multi-use Custis Trail west of Rosslyn. It went into service in October 2009, and has performed reliably for more than seven years.

Figure 1 shows monthly activity at this location paralleling I-66 and Lee Highway.

FIGURE 1: BICYCLE & PEDESTRIAN TRIPS CUSTIS TRAIL (WEST OF ROSSLYN)
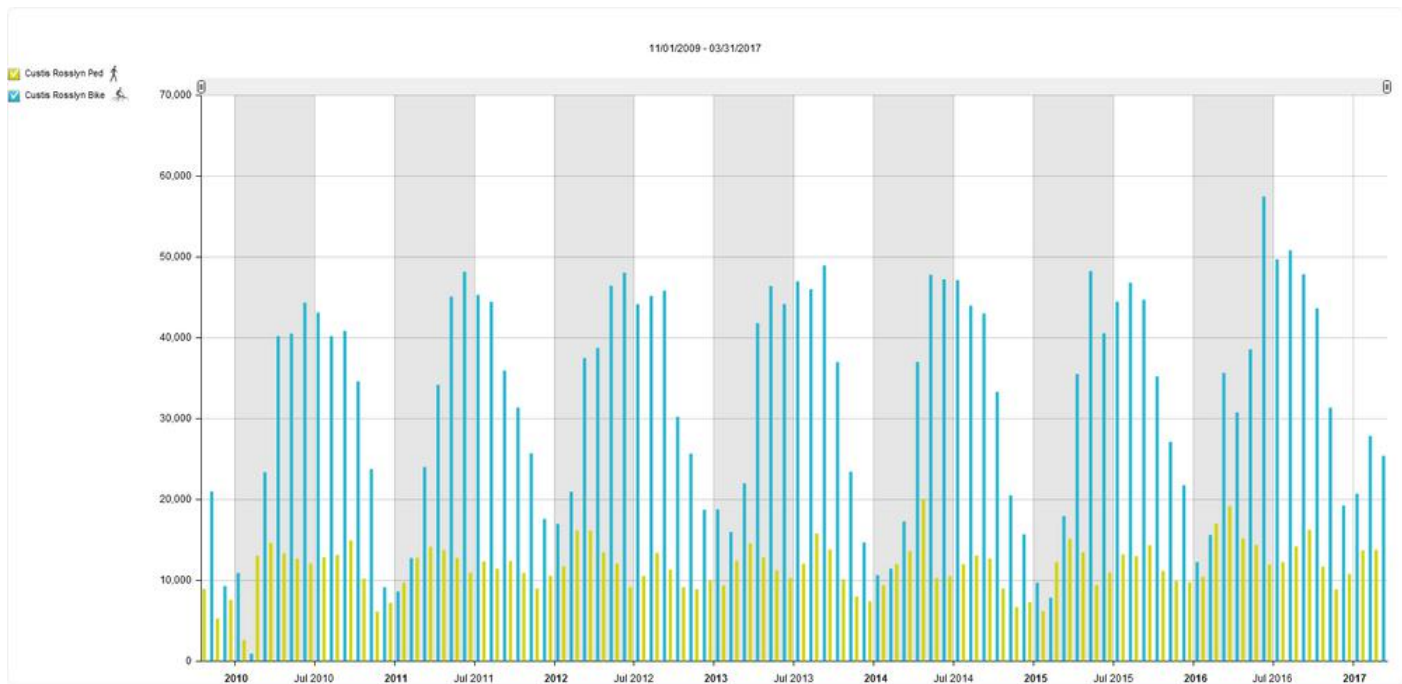
In this chart, the blue bars are monthly totals of bicycle trips, and the green bars are monthly walk trip totals. Some months see 50,000 or more bicycle trips. (Peak days are close to 2,000 trips.) Riding bikes makes a difference!

Congestion on adjacent roads would be much worse if all these people chose to drive. The highest peak, in June 2016, shows a surge in trail activity as people responded to the start of Washington Metro's SafeTrack program.

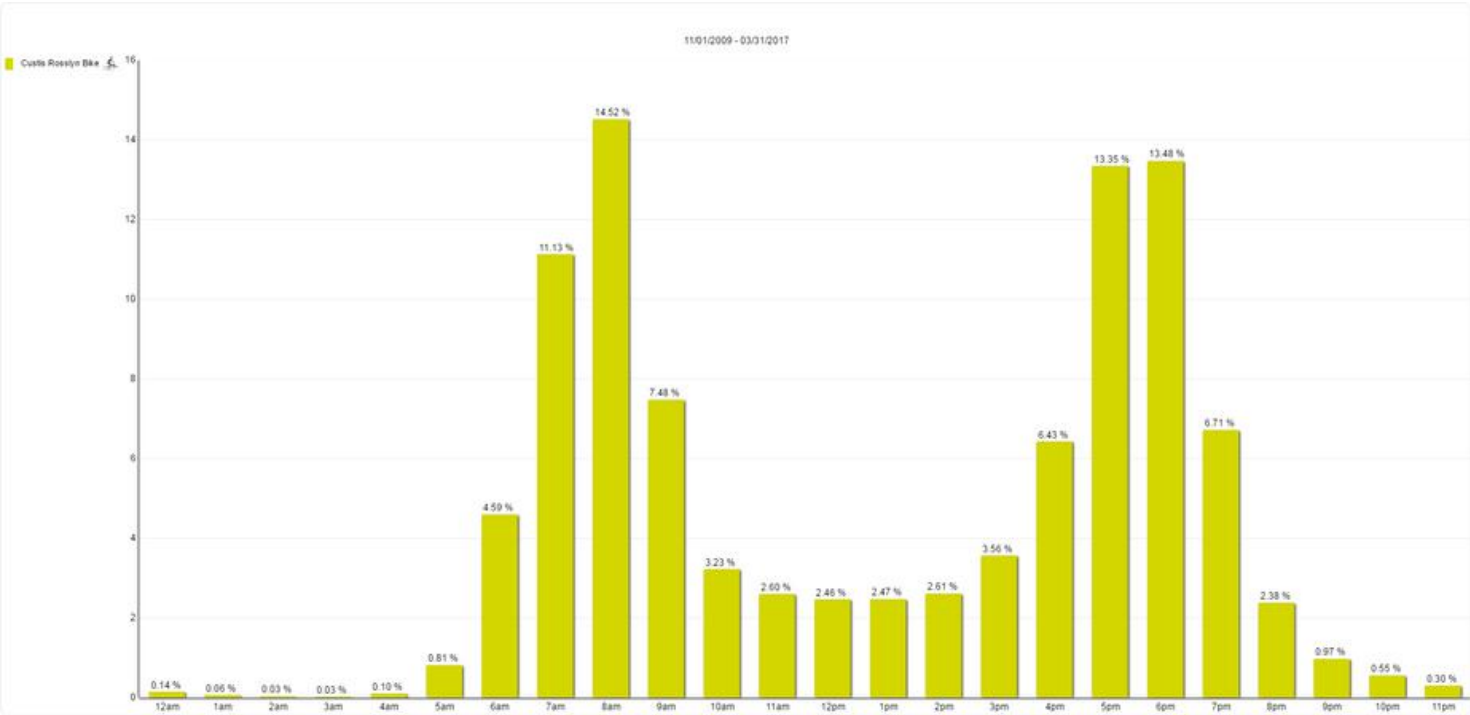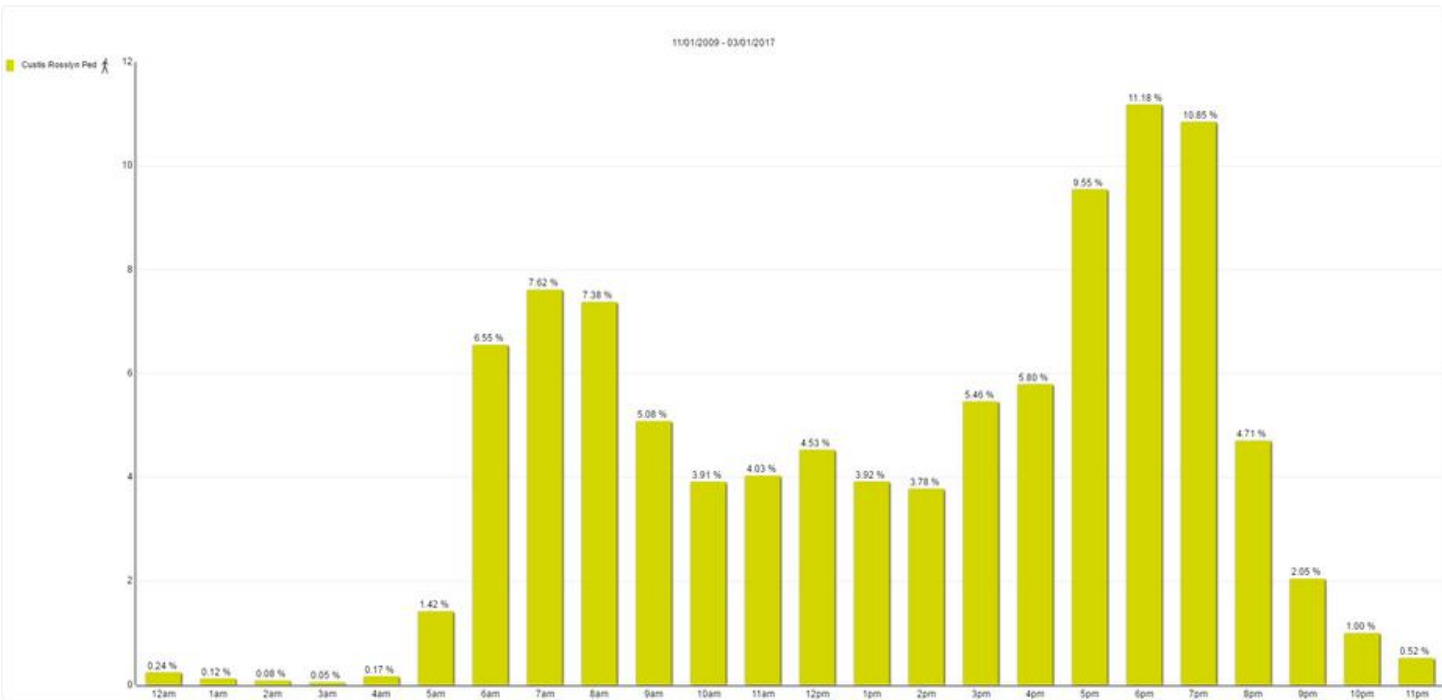## FIGURE 2: AM/PM WEEKDAY PEAKS ASSOCIATED WITH BIKE COMMUTING

FIGURE 3: AM/PM WEEKDAY PEAKS ASSOCIATED WITH WALK COMMUTING

Figures 2 and 3 illustrate the very pronounced morning and evening peaks for bicycle and walk trips on the Custis Trail on weekdays. The charts summarize 7 ½ years of continuous counts, and show real, significant transportation activity.

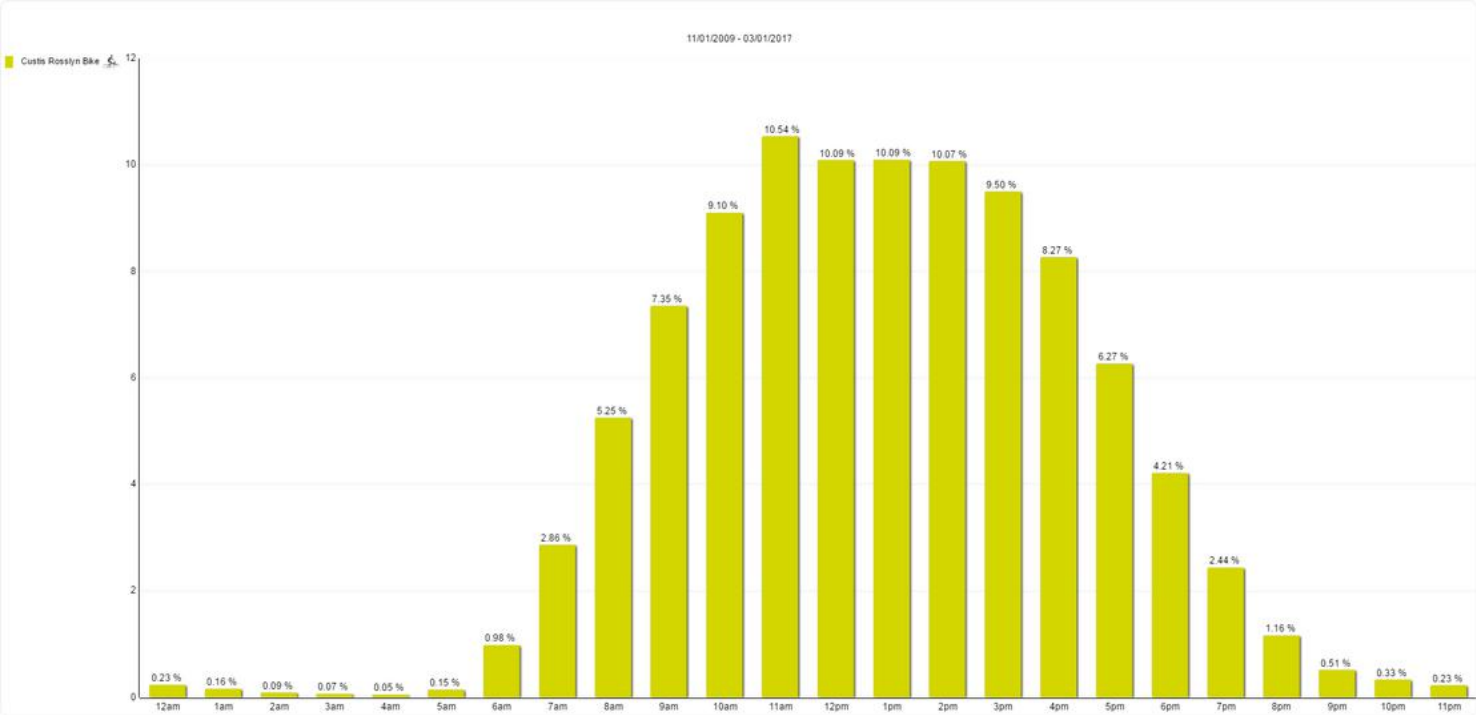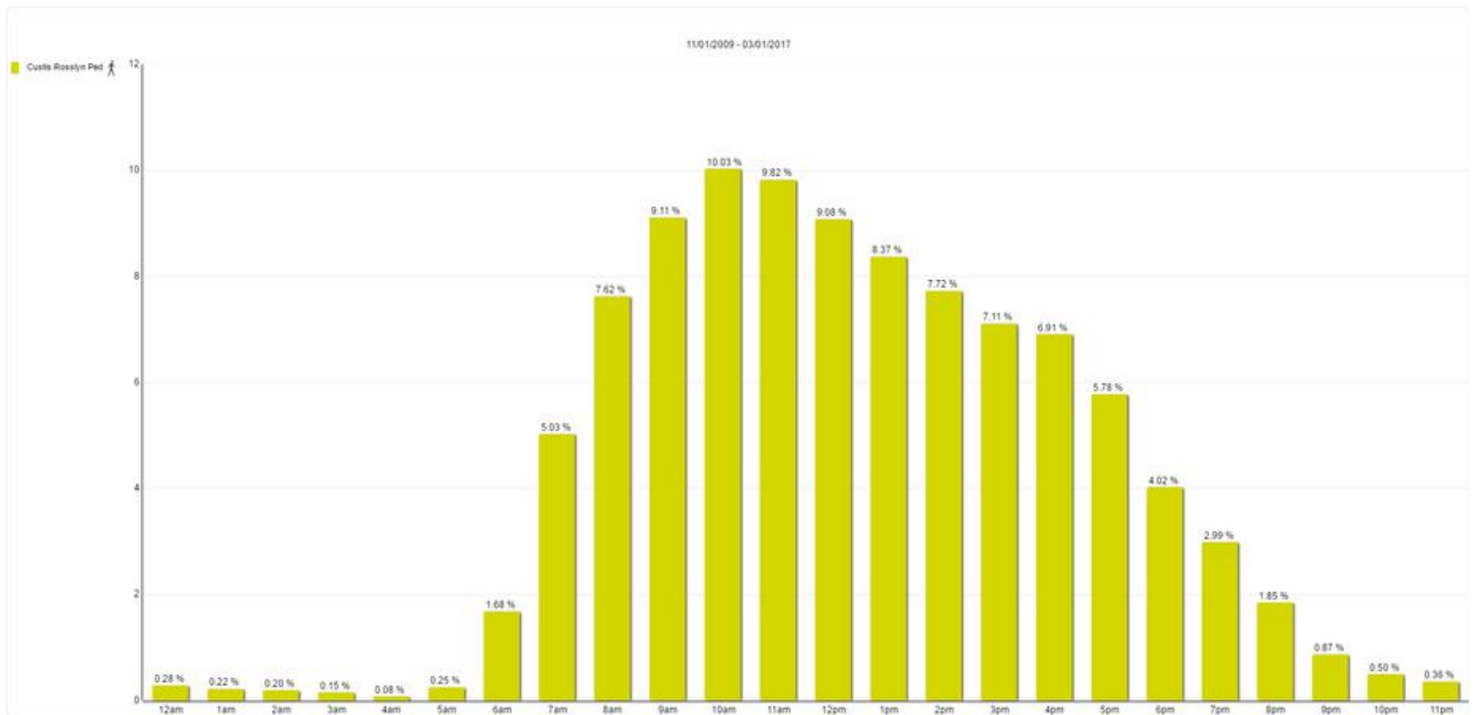## FIGURE 4: SINGLE MIDDAY WEEKEND PEAK ASSOCIATED WITH BIKE RECREATION/FITNESS

FIGURE 5: SINGLE MIDDAY WEEKEND PEAK ASSOCIATED WITH WALK RECREATION/FITNESS

Figures 4 and 5 show a completely characteristic single mid-day weekend peak for both bicycle and walking trips at the same location on the Custis Trail as above. Again, the count data is displayed as hourly averages drawn from 7 ½ years of continuous counts. Not only does the magnitude and regularity of the use demonstrate the popularity of the trail, and the contrast between the weekday and weekend patterns confirms the importance of active transportation facilities for a variety of users for a variety of purposes throughout the year.

FIGURE 6: ONE ENTIRE WEEK ON THE CUSTIS TRAIL
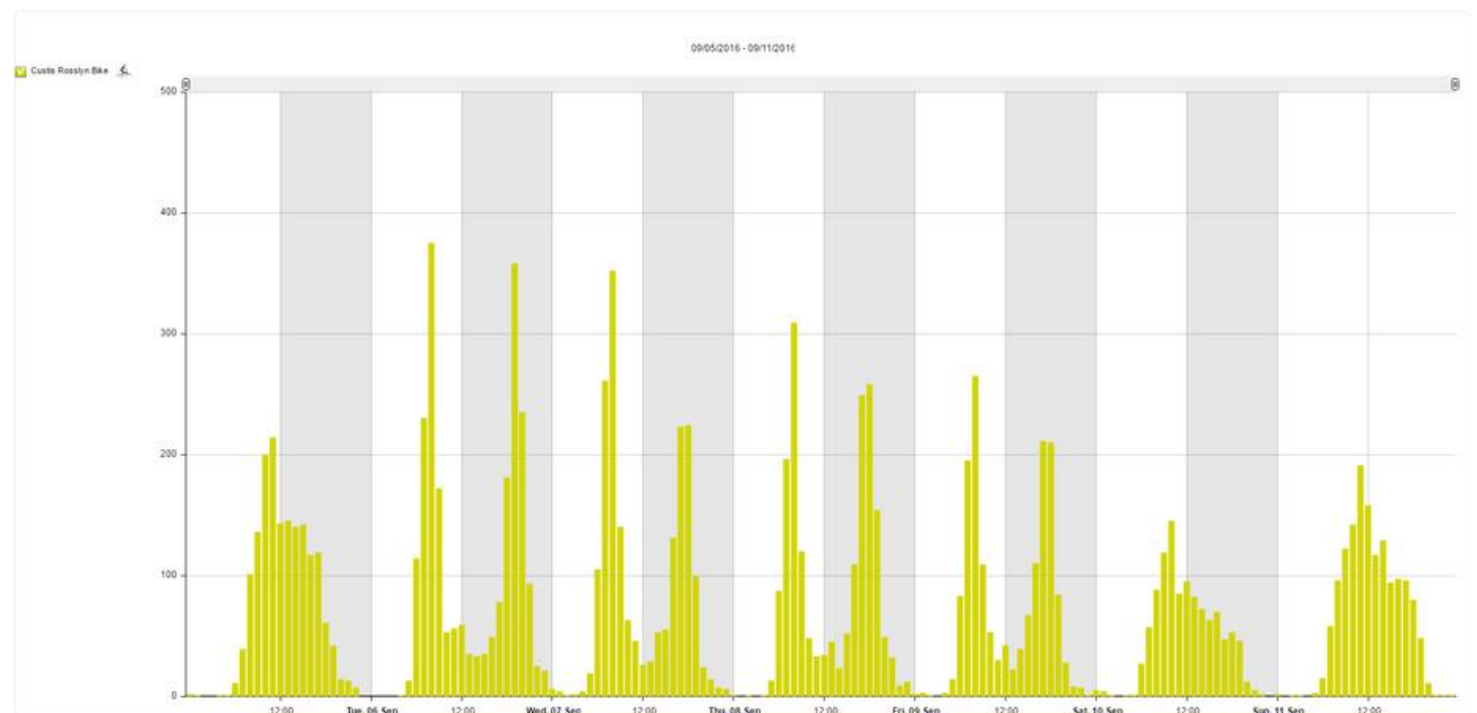
To illustrate the dominant weekday and weekend patterns in context, Figure 6 shows an entire week of bicycle data from the Custis Trail. There are clearly four days with the strong morning and evening peaks characteristic of weekday commuting, and three days with a single mid-day peak that signals a weekend. The secret here is that the day on the far left is Labor Day, Monday, September 5, 2016, a federal holiday. In active transportation data, holidays usually look like weekends.

FIGURE 7: THE EFFECT OF WEATHER (1)
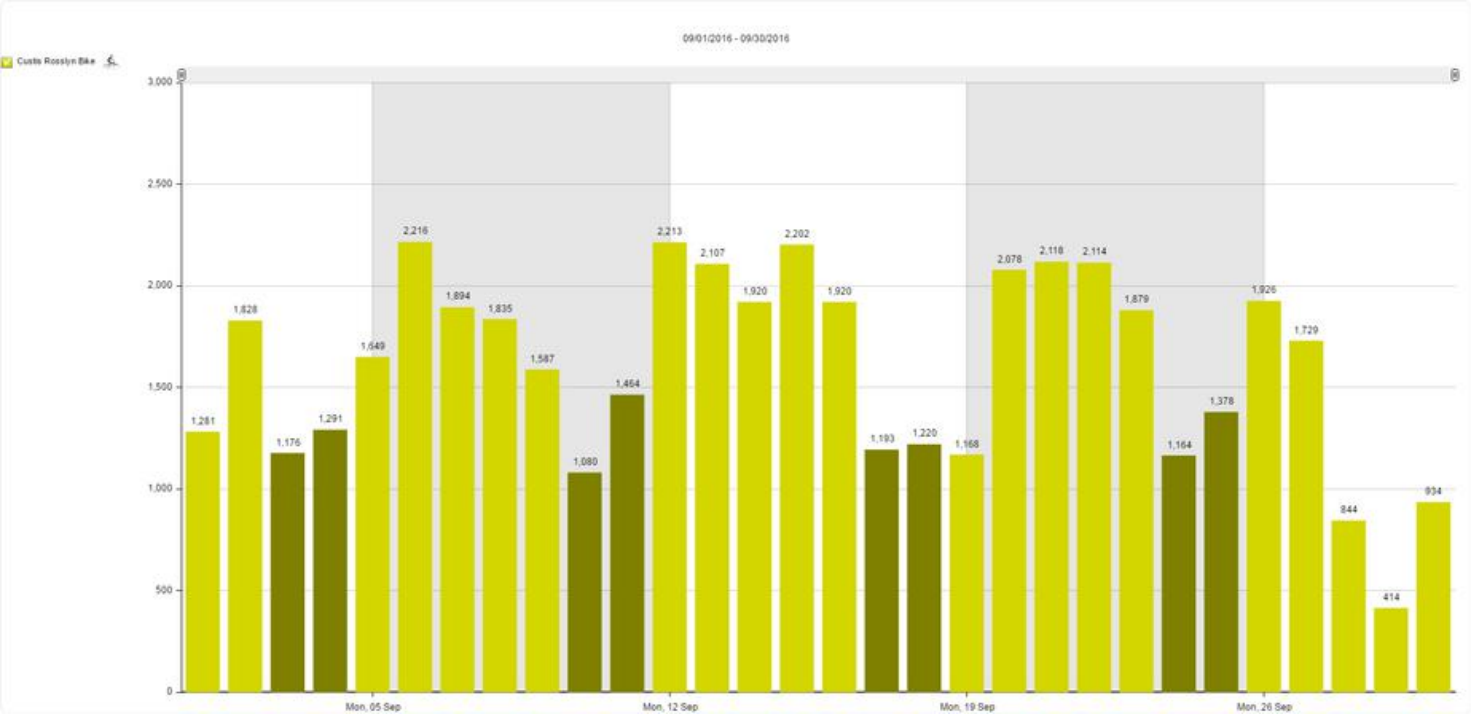
Now consider that there seems to be something odd about the very low value in the far right of Figure 7. This is from the same month of September, 2016, at the same Custis Trail counter as in the previous example. What happened on Thursday, September 29?

FIGURE 8: THE EFFECT OF WEATHER (2)
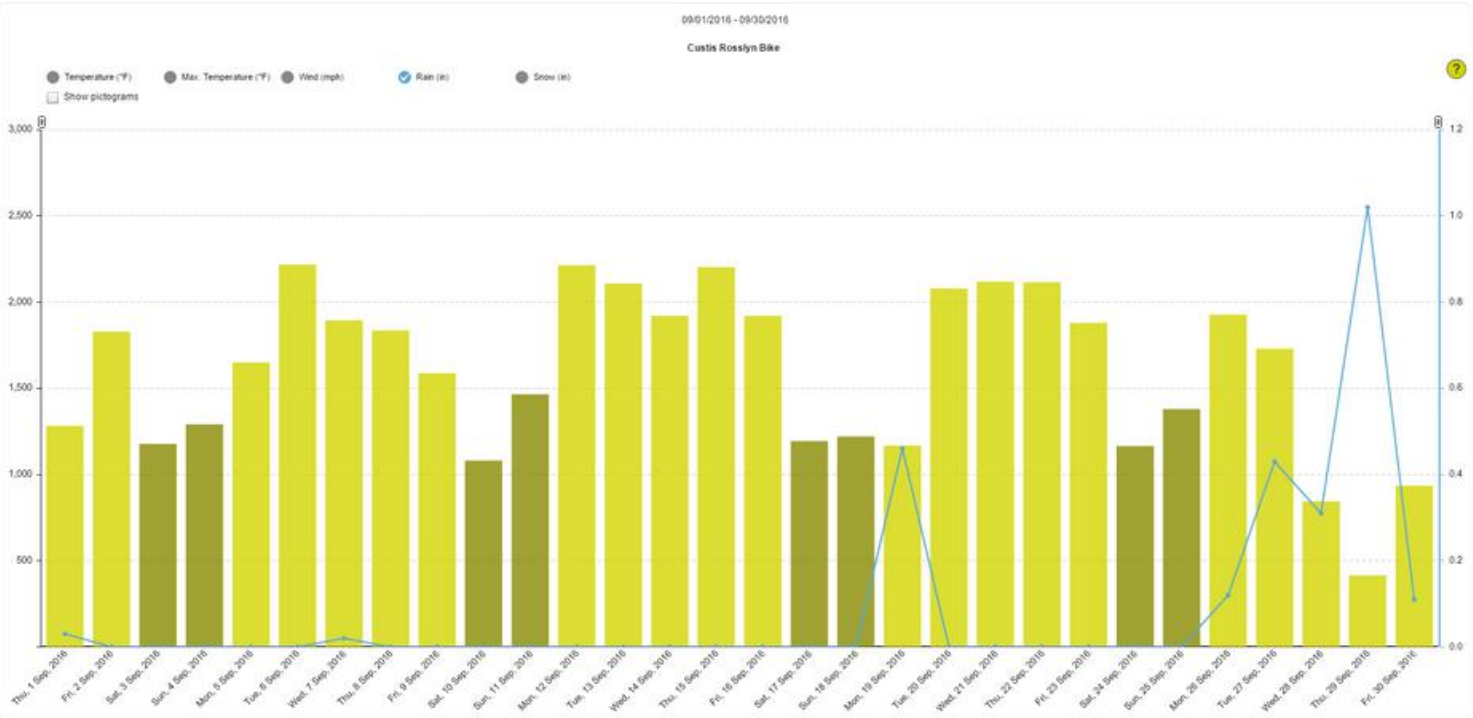
Figure 8 illustrates that by adding a weather record, the count data is shown to reflect more than 1" of rainfall that day. After many such observations, it is abundantly clear that trail users tend to stay off their bikes in very wet conditions.

However, Arlington cyclists are clearly more averse to rain than to merely cold temperatures. Count data helped strengthen the case for maintaining trails and clearing snow throughout the winter. When trails are kept clear, many people choose to ride even despite the cold. A relatively small investment in snow clearing keeps people on their bikes, which contributes to fewer cars on the road, and less crowding on Metro buses and trains.

HOW WE COUNT

BICYCLE AND WALKING TRIPS

Arlington County maintains a system of continuous automatic counters that detect and record bicycle and pedestrian trips at selected locations. The County then shares that data on a public "dashboard" (see below). Collecting and sharing information on active transportation encourages and builds support for this key aspect of Arlington's approach to transportation choice.

Reliable data help assure that bicycle and pedestrian needs are always represented at the planning table. And when operational disruptions such as WMATA's SafeTrack program come along, Arlingtonians can respond flexibly to changes.

To monitor active transportation use and demand, the County currently has 32 permanent counter sites, and six portable counters. Data is shared with the public on the Bicycle and Pedestrian Counter Dashboard on BikeArlington.com, which allows residents and researchers to review, download, analyze, and comment. The dashboard shows the total number of bicyclists and/or pedestrians counted at each location during a selected time period. It allows for a number of "filtering" parameters, such as mode (bicycle and/or pedestrian), direction, and day(s) of the week, and correlates counts with weather conditions.

Count data from each device can be displayed within the Dashboard application, or exported to an Excel spreadsheet for further study.

Development of the Dashboard continues, and we welcome the public's help to improve it. The counters generate "planning level" data direct and "raw" from the counting equipment. No claim is made that the data is "accurate", "precise", or "true".

FACTORS THAT INFLUENCE

DASHBOARD QUERY

Reliable active transportation data is a relatively recent innovation, and Arlington is a leader in the field. Count results are subject to a number of factors that can affect accuracy and usefulness. Some user queries might return "No Data," for reasons that include, but are not limited to: the particular technology in use; the age and generation of the devices; and extrinsic factors such as damage, interference from insects (!), extreme weather, and vandalism. We work diligently to limit sources of machine downtime, and systematic and random error.

TYPE OF DEVICE

Arlington's automatic counters come in several varieties. Most of the devices installed on shared-use trails distinguish between bicycles and pedestrians, generate separate totals for the two modes, and detect direction of travel. Other counters, such as those in on-street bike lanes, only count bicycles, and assume a single direction of travel. If a query asks for direction of travel, but the counter does not have that capability, the search will return "No Data." Similarly, if a query asks for either bicyclists or pedestrians, and the selected counter does not distinguish between the modes, the search will return "No Data."

DATE OF COUNTER INSTALLATION

Arlington's automatic counters have been installed over more than seven years. Data will only be returned for the period each counter has been in operation. A query for periods outside the dates of service will return "No Data'.

DOWNTIME

Counters can and do go offline for a variety of reasons, including routine maintenance, insect infestation, or damage. If a counter was offline for any reason during the time selected for a query, results will not include any activity that occurred during the down time. We are working to develop normalized or reconstructed data "patches" to fill such gaps, and will flag them as such.

INSTALLED COUNTERS,

INSTALLATION DATES, MODELS

TRAIL AND BRIDGE COUNTERS

- Custis Rosslyn, October 2009, EcoMulti, bicycles and pedestrians, no direction detection
- * Four Mile Run, March 2010, PyroBox, does not distinguish between bicycles and pedestrians
- * Four Mile Run, April 2010, MetroCount MC 5720 piezo, bicycles only
- W&OD East Falls Church, December 2010, EcoCombo, bicycles and pedestrians, with direction detection
- W&OD Bon Air Park East, December 2010, EcoCombo, bicycles and pedestrians, with direction detection
- Custis Bon Air Park, December 2010, EcoCombo, bicycles and pedestrians, with direction detection
- Key Bridge West, August 2011, EcoCombo (urban post), bicycles and pedestrians, with direction detection
- Key Bridge East, August 2011, EcoCombo (urban post), bicycles and pedestrians, with direction detection
- Mt. Vernon Trail Airport South, September 2011, EcoCombo, bicycles and pedestrians, with direction detection
- Crystal City Connector, September 2011, EcoCombo, bicycles and pedestrians, with direction detection
- Theodore Roosevelt Island (at concrete bridge to Rosslyn), September 2011, EcoCombo, bicycles and pedestrians, with direction detection

- W&OD Columbia Pike, October 2011, EcoCombo, bicycles and pedestrians, with direction detection
- Bluemont Connector, December 2012, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops
- Ballston Connector, December 2012, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops
- W&OD Bon Air West, December 2012, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops
- South Joyce Street, Southbound, December 2012, EcoCombo (urban post), bicycles and pedestrians, with direction detection, four pavement loops
- South Joyce Street, Northbound, December 2012, EcoCombo (urban post), bicycles and pedestrians, with direction detection, four pavement loops
- 14th Street Bridge, November 2014, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops
- Roosevelt Bridge, December 2014, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops
- 110 Trail, July 2015, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops
- Arlington Mill Trail, July 2015, EcoCombo, bicycles and pedestrians, with direction detection, four pavement loops

Note: The "piezo" device counts only bicycles. Pedestrian values can be approximated by subtracting the "piezo" count from the "pyro" count, which includes both bicycles and pedestrians.

ON-STREET BIKE LANES

- Wilson Blvd, in the 2500 block, near Earl's Sandwich Shop, between N Cleveland and N Danville (Westbound)
- Clarendon Blvd, in the 2600 block, at N Danville near Starbucks (Eastbound)
- Military Rd, in the 2500 block, near 25th Place N (Northbound)
- Military Rd, in the 2500 block, near 25th Place N (Southbound)
- N Quincy St, in the 1100 block, just S of Washington Blvd. (Northbound)
- N Quincy St, in the 1100 block, just N of 11th Street N (Southbound)
- Fairfax Dr, in the 3600 block, at the Latitude (Westbound)
- Fairfax Dr, in the 3700 block, at St. George's Episcopal Church (Eastbound)

- Crystal Dr, in the 1800 block, just S of 18th Street S (Northbound)
- S Eads St, in the 1500 block, just S of 15th Street S (Southbound)
- S Eads St, in the 1600 block, N of 18th Street S (Northbound)

ADDITIONAL COUNTERS

- Five mobile "Pyrobox" counters used for short- and medium-term counts. These do not distinguish between bicyclists and pedestrians.
- Arlington's Bikeometer, the first Eco-Totem on the east coast, launched April 1, 2014. Westbound Lee Highway near N Lynn Street, Rosslyn. Bicycle-only detection and display in real time. Shows cumulative daily, monthly, and year-to-date values. With direction detection, four pavement loops
- One "tube" counter used for short-term bicycle counts.

DATA FOR DEVELOPERS

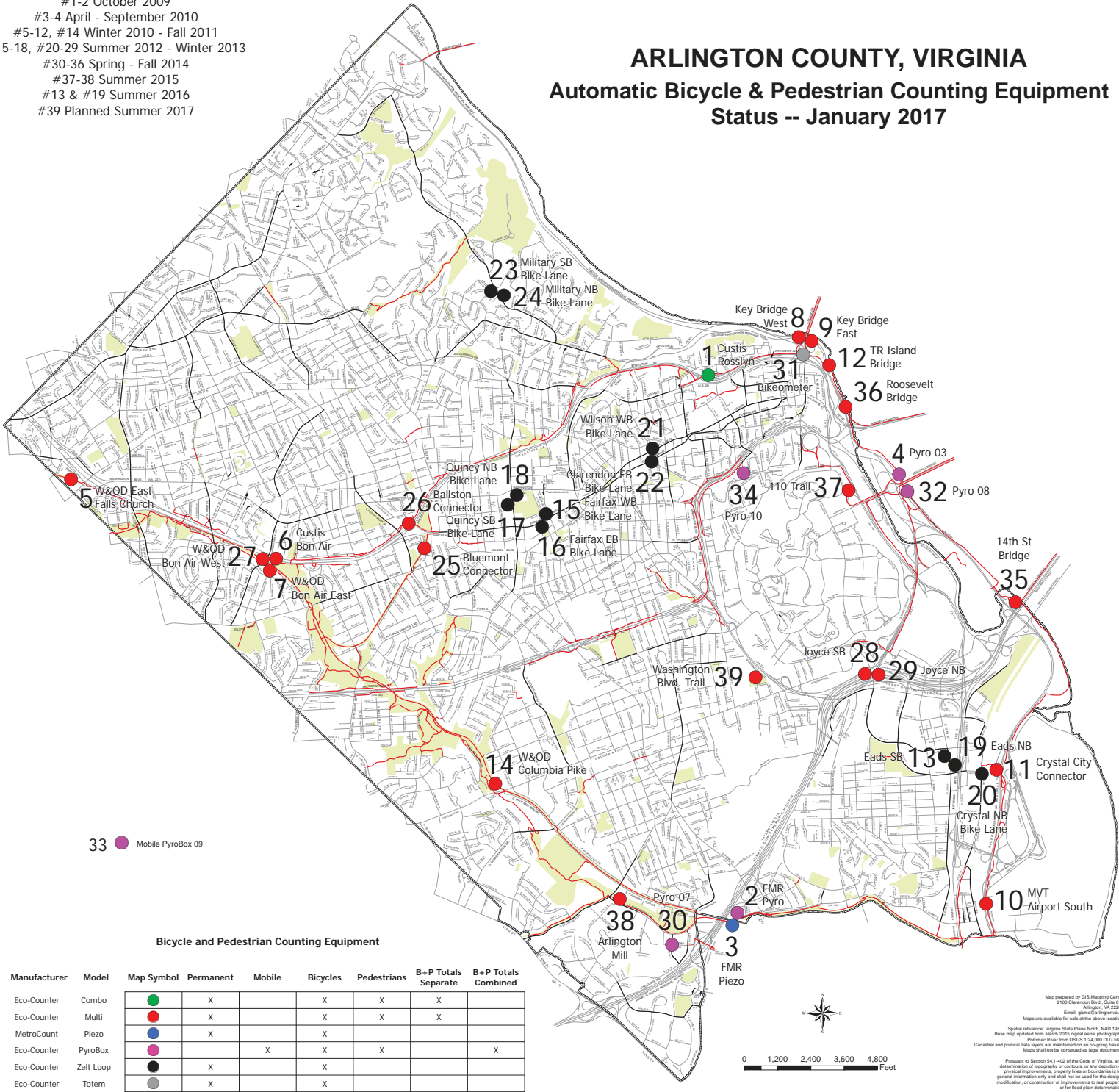- Data from Arlington's automatic bike-pedestrian counters is available for researchers and application developers.

Download a larger version of this map here.

ARLINGTON COUNTY, VIRGINIA
Automatic Bicycle & Pedestrian Counting Equipment
Status -- January 2017

23 Military SB Bike Lane
24 Military NB Bike Lane

Key Bridge West 8
9 Key Bridge East
1 Custis Rosslyn
12 TR Island Bridge
31 Bikeometer
36 Roosevelt Bridge

Wilson WB Bike Lane 21
4 Pyro 03
Quincy NB Bike Lane 18
Clarendon EB Bike Lane 22
32 Pyro 08
26 Ballston Connector
15 Fairfax WB Bike Lane
34 Pyro 10
110 Trail 37
17 Quincy SB Bike Lane
16 Fairfax EB Bike Lane
5 W&OD East Falls Church
6 Custis Bon Air
27 W&OD Bon Air West
25 Bluemont Connector
7 W&OD Bon Air East

14th St Bridge
35

Joyce SB 28
29 Joyce NB
Washington Blvd. Trail 39

14 W&OD Columbia Pike

Eads SB 13
19 Eads NB
11 Crystal City Connector
20 Crystal NB Bike Lane

33 Mobile PyroBox 09

38 Pyro 07 30
2 FMR Pyro
3 FMR Piezo
10 MVT Airport South

Arlington Mill

Bicycle and Pedestrian Counting Equipment

Manufacturer	Model	Map Symbol	Permanent	Mobile	Bicycles	Pedestrians	B+P Totals Separate	B+P Totals Combined
Eco-Counter	Combo	(green)	X		X	X	X	
Eco-Counter	Multi	(red)	X		X	X	X	
MetroCount	Piezo	(blue)	X		X			
Eco-Counter	PyroBox	(magenta)		X	X	X		X
Eco-Counter	Zelt Loop	(black)	X		X			
Eco-Counter	Totem	(gray)	X		X			

0 1,200 2,400 3,600 4,800 Feet

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