



# 2021

This report summarizes the usage patterns and trends of the ValleyBike regional bicycle sharing system during calendar year 2021. It documents how Year 4 of the system compares to the previous years. 2021 was the first year during which the ValleyBike program operated throughout the entire year including the entire fall and winter period at most stations. The report also documents the post pandemic increase in utilization of the bike share service in the region. The data shows increases in the total number of rides as well as expansion of the system to provide more stations and serve 2 new member communities.

## Report on Year 4



### FINAL REPORT

Prepared in cooperation with the Massachusetts Department of Transportation, and the Federal Highway Administration and the Federal Transit Administration - U.S. Department of Transportation. The views and opinions of the Pioneer Valley Planning Commission expressed herein do not necessarily state or reflect those of the U.S. Department of Transportation.

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## INTRODUCTION

ValleyBike, the bikeshare program for the Pioneer Valley Region was developed as a result of the culmination and realization of state, regional and municipal goals articulated in the 2020 Update to the Pioneer Valley Regional Transportation Plan and the region's 2014 sustainability plan, Our Next Future. Bikeshare is an integral component of the region's path to establish a regenerative and sustainable future. ValleyBike strives to promote healthy habits amongst the residents in the region and contributes to reductions in air pollution by lowering greenhouse gas emitting vehicle trips. If managed effectively and expanded appropriately, ValleyBike could potentially mitigate the need for expensive road repairs and expansions. It also has the potential to dramatically improve the effectiveness of our region's chronically under-funded transit system. ValleyBike represents one of the lowest costs per passenger mile travel modes compared to other available active transportation systems in the Valley.

During the third year of its operation in 2020, the bike share system comprised of a network of 53 stations across 6 communities (Amherst, Easthampton, Holyoke, Northampton, South Hadley and Springfield). Two new communities Chicopee and West Springfield joined the ValleyBike Program in 2021. The annual rideshare data for 2021 was obtained along 16 new stations besides the 53 stations from previous years in the region. New stations only have partial data for the 2021 calendar year.

The locations/names of the stations or kiosks within each community are summarized in Table 1. The terms charging stations, docking stations, docks, kiosks, or simply stations are used to describe these facilities. These locations provide state of the art electric bikes which can be signed out at station kiosks or with the help of the ValleyBike Mobile App.

Figures 1 – 5 depict maps of communities with Bike Stations

Figure 1: Amherst

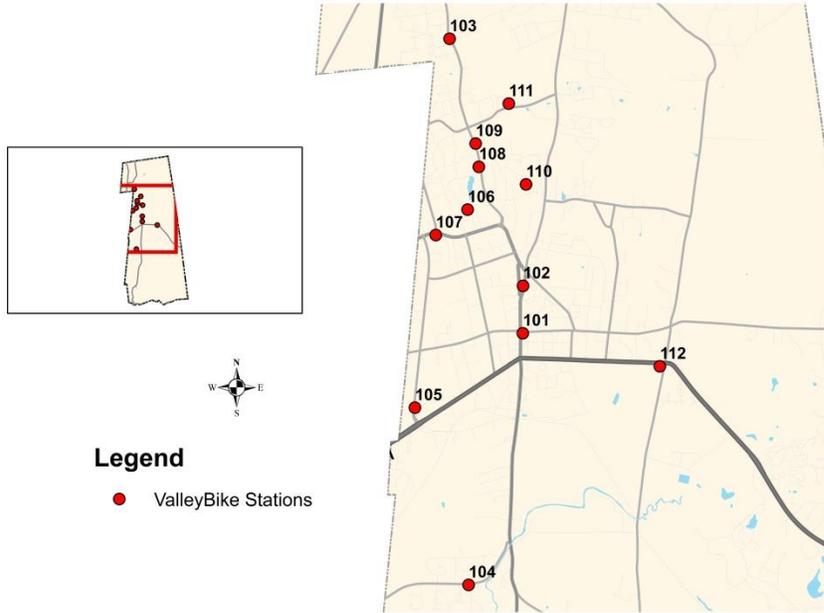


Figure 2: Northampton

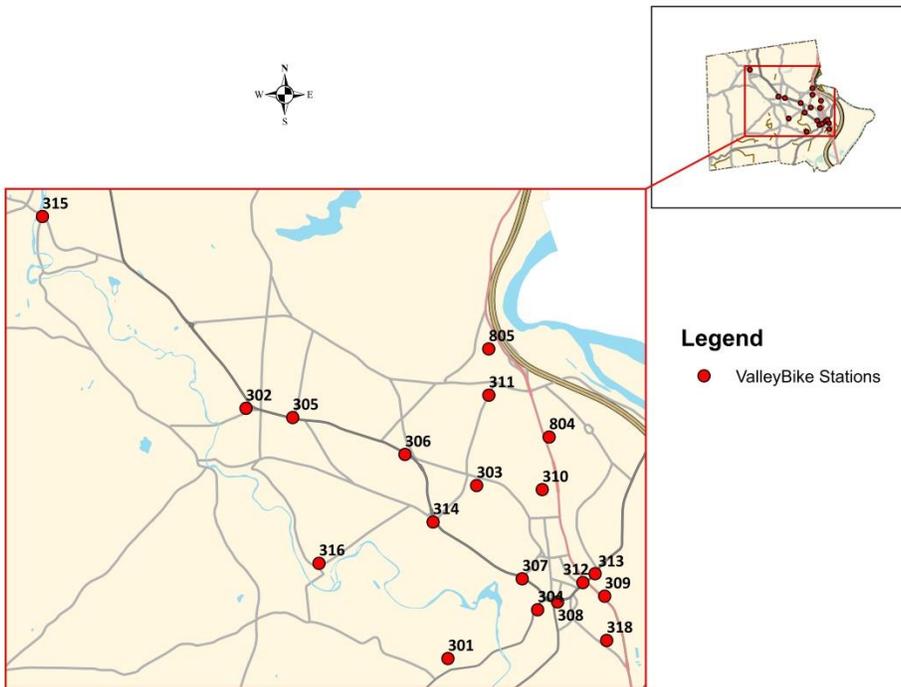


Figure 3: Easthampton, Holyoke, and South Hadley

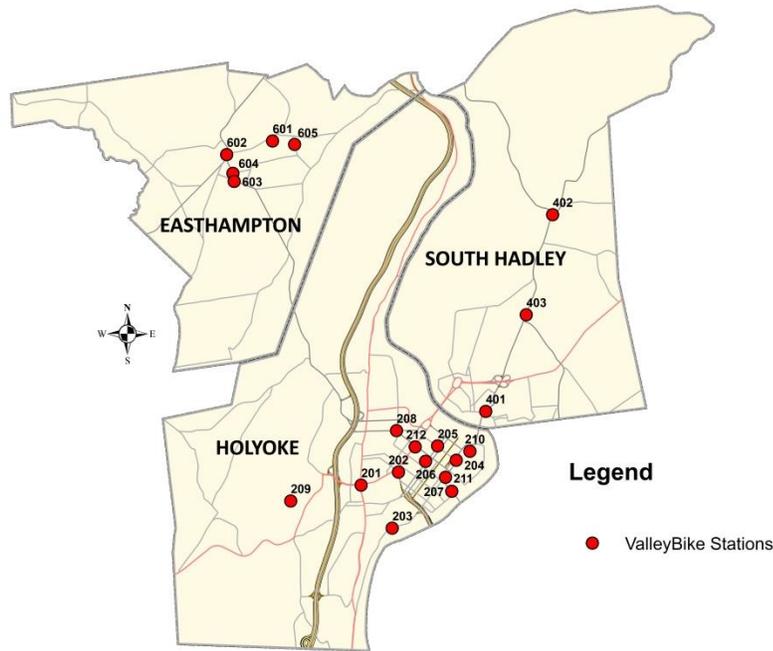


Figure 4: Springfield

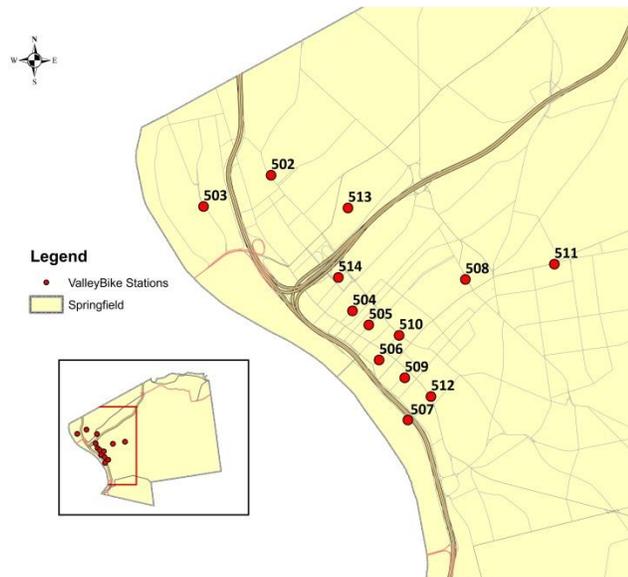
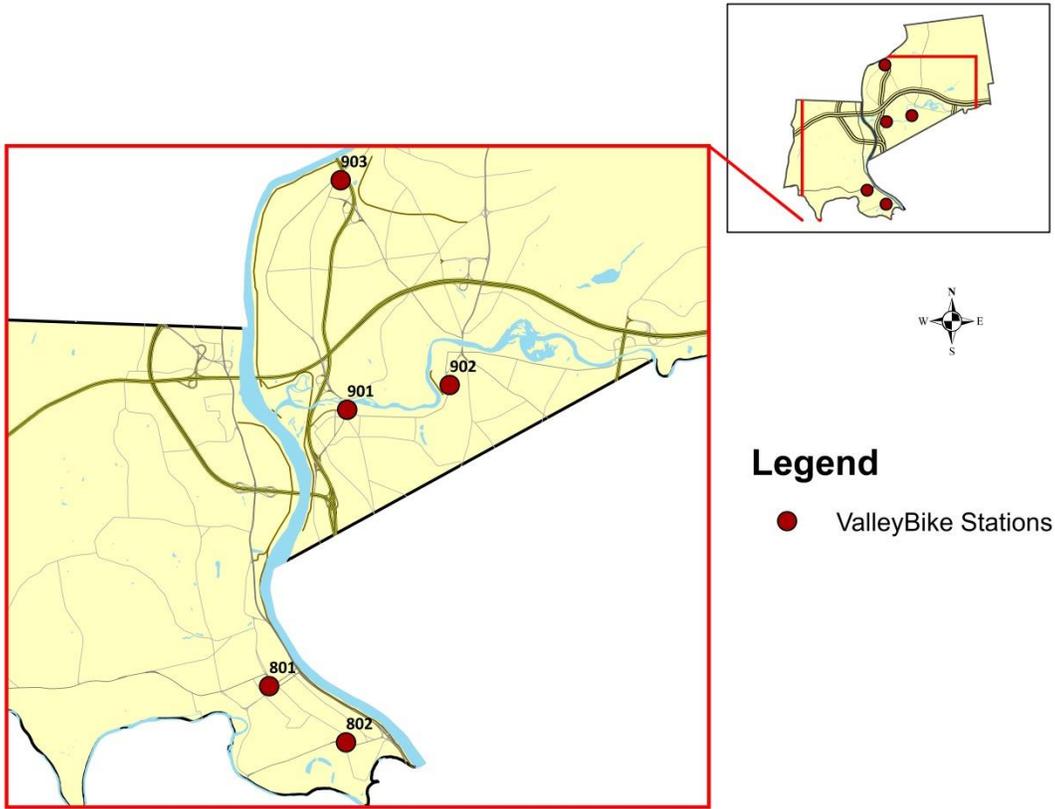


Figure 5: Chicopee and West Springfield



**Table 1: ValleyBike Stations**

No.	Station ID	Community	Station
1	101	Amherst	Amherst Town Hall
2	104	Amherst	East Hadley Road
3	102	Amherst	Kendrick Park
4	103	Amherst	North Pleasant Street
5	110	Amherst	UMass Central Residential Area
6	106	Amherst	UMass Haigis Mall
7	108	Amherst	UMass ILC
8	109	Amherst	UMass Knowlton
9	107	Amherst	UMass Southwest
10	111	Amherst	*Umass Sylvan Residential Area
11	105	Amherst	University Drive
12	112	Amherst	*South East Street
13	903	Chicopee	*Rivers Park
14	901	Chicopee	*Chicopee City Hall
15	902	Chicopee	*Chicopee Falls
16	603	Easthampton	City Hall
17	602	Easthampton	Old Town Hall
18	605	Easthampton	*Parsons Street
19	601	Easthampton	Rail Trail @ Millside Park
20	604	Easthampton	Rail Trail @ Union Street
21	204	Holyoke	Depot Square
22	205	Holyoke	Downtown
23	211	Holyoke	*El Corazon
24	210	Holyoke	*Ely Court
25	209	Holyoke	Holyoke Community College
26	206	Holyoke	Holyoke Medical Center Station
27	202	Holyoke	Mackenzie Field
28	208	Holyoke	Pleasant Station
29	207	Holyoke	South Holyoke
30	203	Holyoke	Springdale Park
31	201	Holyoke	The Pedlar Station/Crosier Field
32	212	Holyoke	*Peasants Park
33	316	Northampton	*Bay State Village
34	318	Northampton	*Conz Street
35	306	Northampton	Cooley Dickinson Health Care

No.	Station ID	Community	Station
36	302	Northampton	Florence Bank Station
37	305	Northampton	Florence Center
38	304	Northampton	Forbes Library
39	311	Northampton	Jackson Street
40	307	Northampton	John M Greene Hall/Smith College
41	804	Northampton	*King Street
42	805	Northampton	*North King Street
43	315	Northampton	*Leeds Village
44	313	Northampton	Main Street/Bridge Street
45	312	Northampton	Main Street/Court House
46	314	Northampton	Northampton High School
47	309	Northampton	Northampton Train Station
48	308	Northampton	Pulaski Park/Downtown
49	310	Northampton	State St/Mass Central Rail Trail
50	301	Northampton	Village Hill/State Hospital
51	303	Northampton	YMCA/Childs Park
52	401	South Hadley	Eink Station
53	402	South Hadley	Mount Holyoke College Station
54	403	South Hadley	Woodlawn Plaza
55	507	Springfield	Basketball Hall of Fame
56	502	Springfield	Baystate Health/Chestnut Street
57	501	Springfield	Baystate Health/Main Street
58	505	Springfield	CFWM @ Stearns Square Station
59	506	Springfield	Court Square
60	503	Springfield	Kenefick Park / North Riverfront Park
61	513	Springfield	Live Well Springfield Station
62	511	Springfield	Mason Square Library
63	504	Springfield	Mercy Medical Center Station
64	509	Springfield	MGM Springfield
65	510	Springfield	Pynchon Park/Museums
66	512	Springfield	South End/Main Street
67	508	Springfield	STCC - Springfield Armory
68	801	West Springfield	*West Springfield Library
69	802	West Springfield	*West Springfield Memorial Avenue

\* New Station 2021

**Table 2: ValleyBike Stations by Community**

<b>Community</b>	<b>Number of Stations</b>
Northampton	19
Springfield	13
Amherst	12
Holyoke	12
Easthampton	5
South Hadley	3
Chicopee	3
West Springfield	2
<b>Total</b>	<b>69</b>

## 2021: VALLEYBIKE IN ITS FOURTH YEAR

The 2021 calendar year was the fourth year of operation of the ValleyBike. During its first two years the operations were halted during the winter and the system operated from April - November. Also during the 2020 calendar year, ValleyBike did not start until the month of June because of the Covid-19 pandemic. The City of Springfield chose not to participate during the entire calendar year of 2020, ValleyBike service resumed in the City of Springfield in May 2021. Utilization data shows a huge increase in the number of rides throughout the summer and fall of 2021.

Table 3 summarizes the total number of rides per month and average distance travelled per ride or average length of ride in miles. The bikeshare was widely utilized throughout the summer reaching peak usage in September. There were more rides recorded each month even during the fall and early winter. These numbers are very encouraging and indicate that the bikeshare program has gained a steady following. Patronage in the region was consistently high despite the uncertainties because of the new variants of Covid-19.

**Table 3: Total Monthly Rides in 2021**

Month	Total Number of Rides	Avg. Distance travelled per Ride in Miles	Average number of bikes available	Rides/Bike
January	1,019	2.03	178	5.72
February	371	1.99	212	1.75
March	3,768	2.95	246	15.32
April	6,520	2.68	179	36.42
May	10,677	2.86	234	45.63
June	11,252	2.78	327	34.41
July	11,488	2.87	390	29.46
August	14,947	2.49	387	38.62
September	18,606	2.05	326	57.07
October	14,041	1.85	309	45.44
November	8,012	1.64	300	26.71
December	4,259	1.62	257	16.57
	<b>104,960</b>	<b>2.32</b>	<b>274.45</b>	<b>26.91</b>

YEAR TO YEAR COMPARISON

A comparison of all years of operations to date is shown in Figures 8 and 9. Despite the slower start, there was an increase in the total number of rides during the second half of 2021 over all previous years.

Figure 6: Monthly Rides Compared by Year

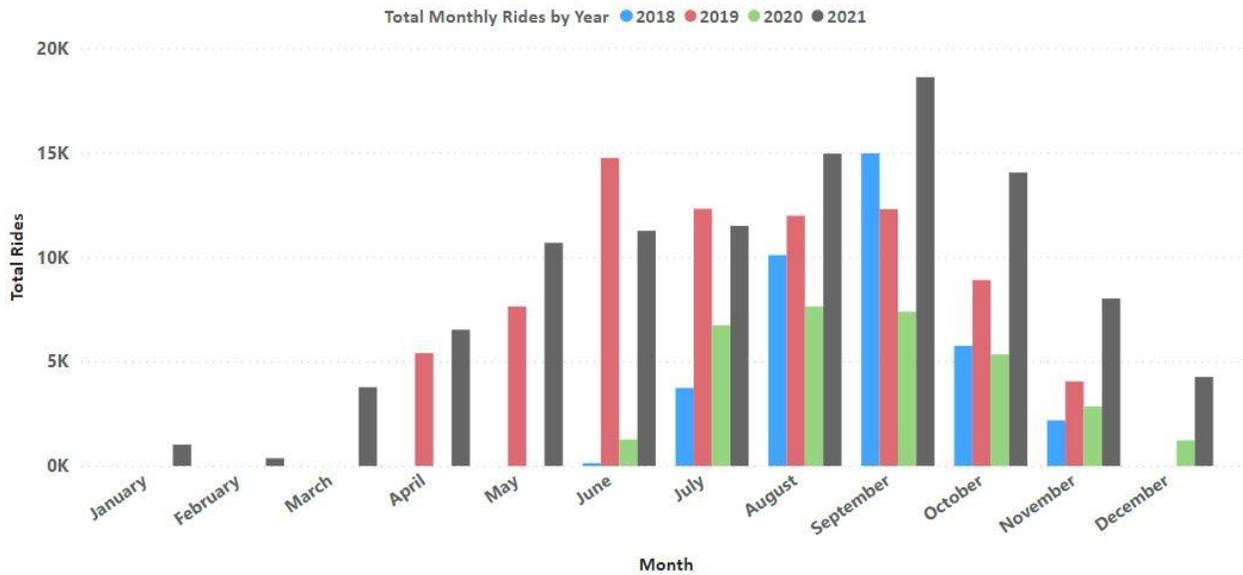
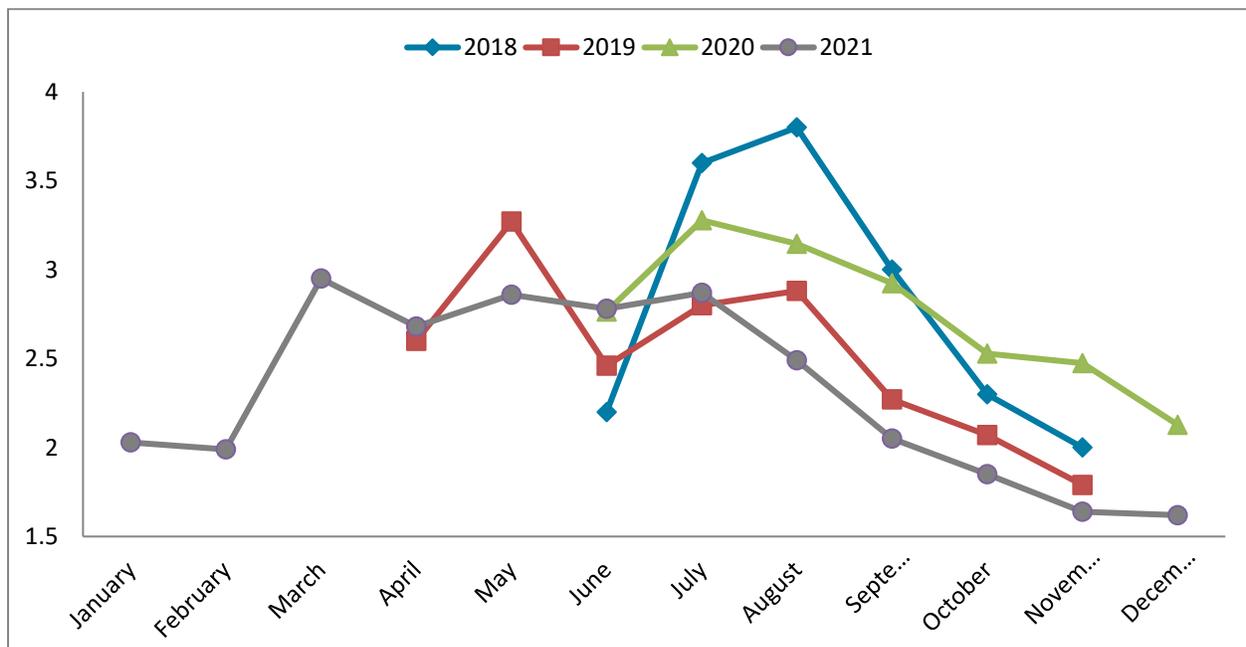


Figure 7: Monthly Average Distance Travelled per Ride in Miles Compared by Year

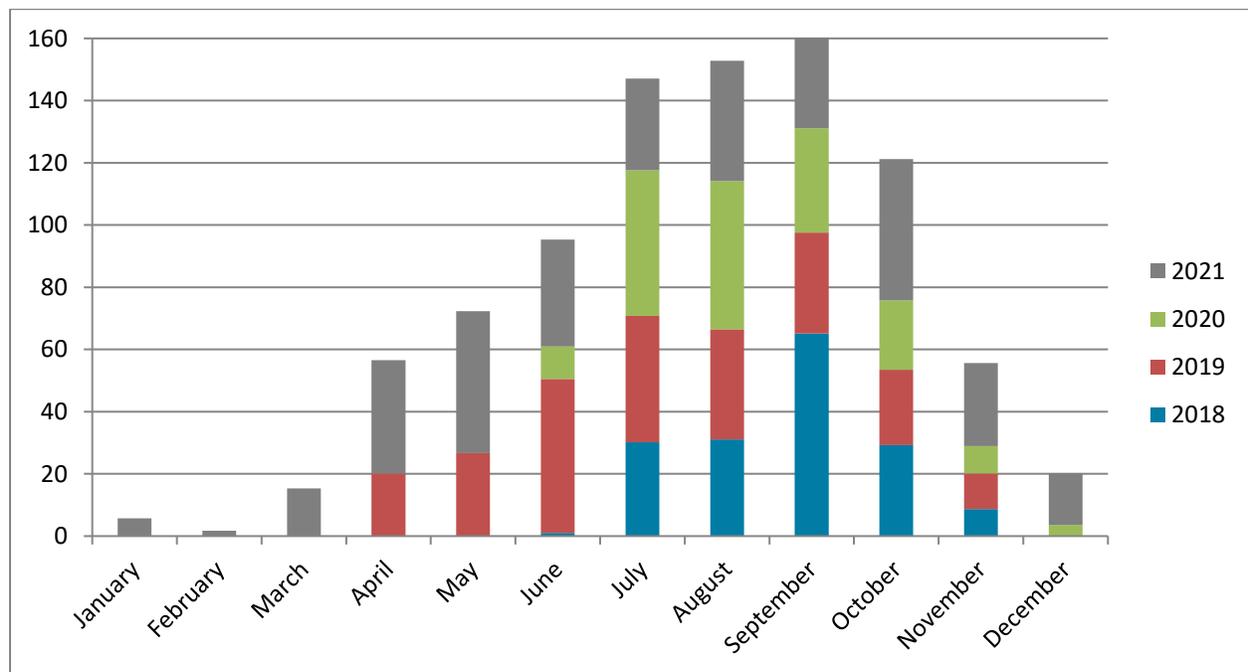


The total number of monthly rides during the months of June and July in 2019 was higher than those in 2021. However this trend did not continue and there was a huge increase in the number of rides beginning in August. This could be because of the lingering effects of the pandemic restrictions and a later startup in the City of Springfield.

One notable trend observed is the decrease in the average trip length this year. There were more short distance trips undertaken this year compared to previous years. An increase in the number of stations as well as awareness about more opportunities to utilize bikeshare for various purposes that might require short distance trips might have resulted in this trend. A 2020 report for the California Climate Investments Quantification Methods Assessment calculated the median trip length for a bikeshare program to be 2 miles<sup>1</sup>. While this average includes both traditional pedal and electric assist bikeshare systems, the average trip length for ValleyBike still exceeds the trip length for many bikeshare programs around the country.

One index of a vigorously functioning and efficient bikeshare system is comparing the number of rides per available bike. The number of bikes available each month was obtained from Bewegen’s Monthly Reports. Monthly utilization of available bicycles was fairly consistent amongst all four years. This indicates robust utilization and demand for the service as well as an efficiently functioning system which meets the requirements and encourages more users.

**Figure 8: Average Number of Rides per Bike**



<sup>1</sup> [http://ww2.arb.ca.gov/sites/default/files/auction-proceeds/sharedmobility\\_technical\\_052920.pdf](http://ww2.arb.ca.gov/sites/default/files/auction-proceeds/sharedmobility_technical_052920.pdf)

**Table 4: Monthly Total Rides and Average Distance for Each Year**

Month	Total Rides				Average Distance			
	2018	2019	2020	2021	2018	2019	2020	2021
January	N.A.	N.A.	N.A.	1,019	N.A.	N.A.	N.A.	2.03
February	N.A.	N.A.	N.A.	371	N.A.	N.A.	N.A.	1.99
March	N.A.	N.A.	N.A.	3,768	N.A.	N.A.	N.A.	2.95
April	N.A.	5,397	N.A.	6,520	N.A.	2.60	N.A.	2.68
May	N.A.	7,632	N.A.	10,677	N.A.	3.27	N.A.	2.86
June	98	14,738	1,263	11,252	2.20	2.46	2.76	2.78
July	2,836	12,309	6,736	11,488	3.60	2.80	3.28	2.87
August	7,369	11,974	7,629	14,947	3.80	2.88	3.15	2.49
September	9,889	12,291	7,382	18,606	3.00	2.27	2.92	2.05
October	4,404	8,895	5,340	14,041	2.30	2.07	2.53	1.85
November	1,757	4,047	2,842	8,012	2.00	1.79	2.47	1.64
December	N.A.	N.A.	1,223	4,259	N.A.	N.A.	2.13	1.62
<b>Totals</b>	<b>26,353</b>	<b>77,283</b>	<b>32,415</b>	<b>104,960</b>	<b>3.10</b>	<b>2.56</b>	<b>2.75</b>	<b>2.32</b>

N.A. Not Applicable as service was not provided during those months

Monthly rides and total annual rides in 2021 increased more than three times from the previous year and by more than 50% from 2019. While 2020 was impacted by limited service and pandemic restrictions, the data still shows positive improvements over the 2018 and 2019 calendar years.

## HISTORY OF BIKESHARE IN THE PIONEER VALLEY

2008: PVPC produces a Report on the state of bikeshare, 1968-2008 documenting types of programs around the world. It includes the Yellow Bike program that existed at Hampshire College as well as the Bixi (precursor to Bewegen) Bikeshare program in Montreal and encourages Pioneer Valley municipalities to look into bikeshare.

2010: UMass Amherst launches a no-cost bikesharing program on campus funded by Student Government fees.

Early 2012: Northampton Planning and Sustainability begins researching bicycle share for Northampton.

Late 2012: Northampton Mayor Narkewicz approves a single Dero bike-share station in downtown Northampton and the city raises part of the necessary funds.

Early 2013: Northampton determined that having a system that was not scaleable only made sense if it wasn't possible to have a larger system, either city-wide or region wide.

Spring 2013: Northampton Planning and Amherst Sustainability discussed what a regional system would look like.

2013-2015: PVPC secures a Massachusetts Clean Energy Center grant to work with the communities of Amherst, Hadley, Easthampton and Holyoke to advance Clean Energy Strategies, selecting advancement of a regional Bikeshare initiative as a priority for funding.

Late 2013: PVPC solicits partners for a state District Local Technical Assistance (DLTA) funded effort to advance regional bike share.

2014-2016: PVPC works with a group of member municipalities: Amherst, Holyoke, Northampton, and Springfield, to research and advance regional bikesharing.

2016: Northampton, with PVPC and regional support, applies for and obtains Congestion Mitigation Air Quality (CMAQ) funds for regional bike share for four communities. This was later amended to increase funding to five communities, adding South Hadley.

2017: Northampton, with PVPC and regional support and consensus, releases a bike share RFP and awards the contract to Bewegen Technology for a 500-bike, 50-station, five municipality system.

June 2018: ValleyBike Share opens.

November 2018: ValleyBike Share closes for the 2018 season.

December 2018: Easthampton obtains a Massachusetts Housing Choice grant for ValleyBike and joins the regional consortium, growing it to six municipalities.

2019: A second CMAQ project to increase ValleyBike service and expand into Chicopee and West Springfield receives funding.

2020: The ValleyBike program, delayed by the Covid-19 Pandemic, opens in June 2020. The City of Springfield opts to keep their ValleyBike stations closed during the 2020 calendar year. Winter service begins at select locations.

2021: Chicopee and West Springfield become two new member communities to participate in the program. Additional Phase 2 expansion begins. The City of Holyoke receives funding under the Shared Streets and Spaces Grant Program to fund station pads and electrical supply. 2021 becomes the first year with the service available for all 12 months.

## MEMBERSHIP TYPES

ValleyBike offered nine different types of memberships for sale during the 2021 season. The rates and prices were similar to 2020. Most of the rides taken during 2021 were purchased by occasional riders: those using Pay per Ride Passes (35.09%). There was no fee for an Access Pass in 2021.

**Table 5: Membership and Purchase Types**

Membership Purchase Type	Rides	Percentage of Total Rides	Average Ride Length	Cost
1 Pay Per Ride Pass	36,835	35.09%	2.79	\$2 registration at Kiosk, \$2/ride
2 Monthly Membership	22,759	21.68%	2.11	\$20/mo, for first 45 mins of each ride
3 Access Pass	16,731	15.94%	2.09	No fees
4 Student Annual Membership	10,797	10.29%	1.44	\$60/yr, first 45 mins of each ride included
5 Day Pass	9,388	8.94%	3.33	\$6/day, unlimited 45 min trips per day
6 Founding Member	4,518	4.30%	1.87	\$90/yr, first 60 mins of each ride included
7 Annual Membership	3,372	3.21%	2.21	\$80/yr, first 45 mins of each ride included
8 Discounted Corporate Membership	557	0.53%	1.15	Discounted Rates
9 Go Pass Mobile Upgrade	4	Negligible	1.18	Discounted Rates

With each type of membership or ride purchase there is a time limit of either 60 minutes or 45 minutes of paid ride. If the bike is not returned to a kiosk by that time, additional charges are applied.

A majority of ValleyBike riders (more than 83%) purchased their passes and memberships either via phone or computer through the mobile app. Almost 15% of people utilized the website. This is a continuing pattern since the commencement of the ValleyBike program in 2018.

**Table 6: Membership / Ride Purchase Modes**

<b>Month</b>	<b>Kiosk</b>	<b>App</b>	<b>Website</b>
<b>January</b>	0	60	28
<b>February</b>	0	23	13
<b>March</b>	0	677	105
<b>April</b>	0	957	177
<b>May</b>	18	1,335	226
<b>June</b>	97	1,070	285
<b>July</b>	44	1,134	341
<b>August</b>	29	1,579	338
<b>September</b>	36	1,661	1,930
<b>October</b>	50	1,164	3
<b>November</b>	4	470	0
<b>December</b>	5	229	0
<b>Total</b>	<b>283</b>	<b>10,359</b>	<b>1,930</b>
<b>Percentage</b>	<b>2.25%</b>	<b>82.40%</b>	<b>15.35%</b>

# UTILIZATION AND TRENDS

## PEAK SERVICE PERIOD

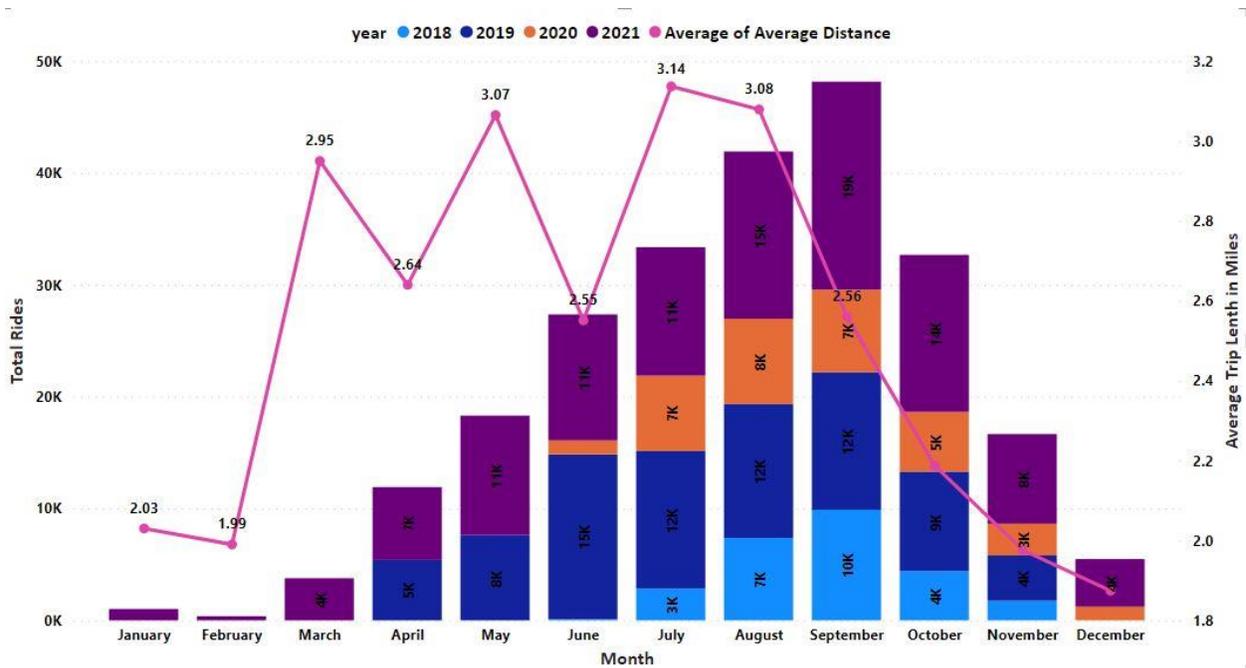
The ValleyBike system attracts most riders during the summer months. PVPC distributed the total numbers of rides into 15 day intervals. The peak time of service for ValleyBike in 2021 was during the months of August and September; however, the longest trips were recorded in the months of July and March.

**Figure 9: 15-Day Intervals for Total Number of Rides and Average Duration of Trips**



When the monthly totals with average trip lengths are compared across all four years of service it can be seen that July had the longest rides. September had the maximum number of trips; however the trip distance was shorter on average compared to spring and early summer. A higher number of trips were observed during the early fall in 2021. This is likely a result of a special student membership promotion. The longest trips were observed in early spring which indicates that users are utilizing this service outside of the peak summer period.

Figure 10: Comparing Peak Service Times between 2018, 2019, 2020 and 2021



DAILY TRENDS

While ridership was fairly consistent over an average week during the 2021 season, the bikeshare was utilized slightly more on Fridays and Saturdays. This suggests that the bicycles may have been used more for recreation than for commuting purposes. While the number of rides steadily increased throughout the morning hours, most rides took place after 12 PM. The majority of rides occurred from 3:00 PM – 6:00 PM.

Figure 11: Average Number of Rides by Days of Week

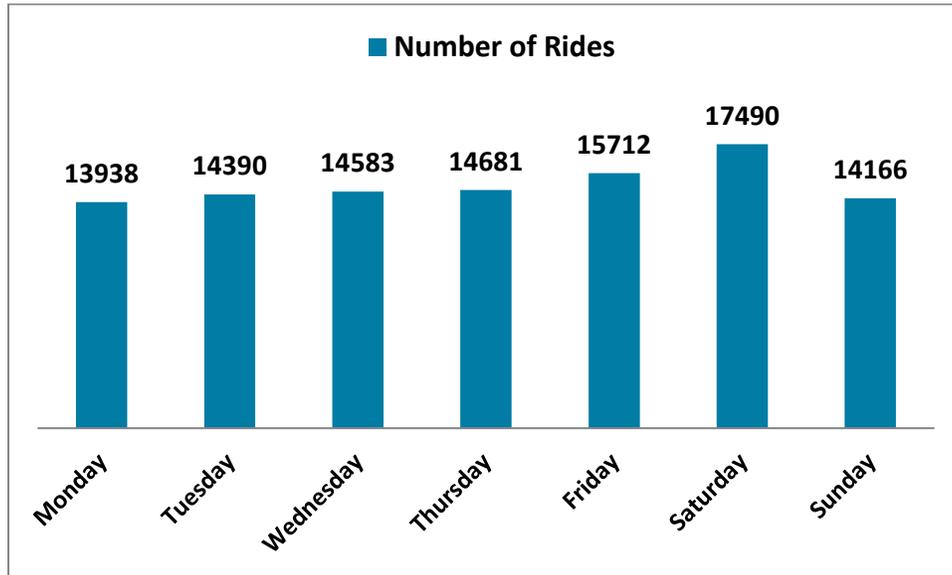
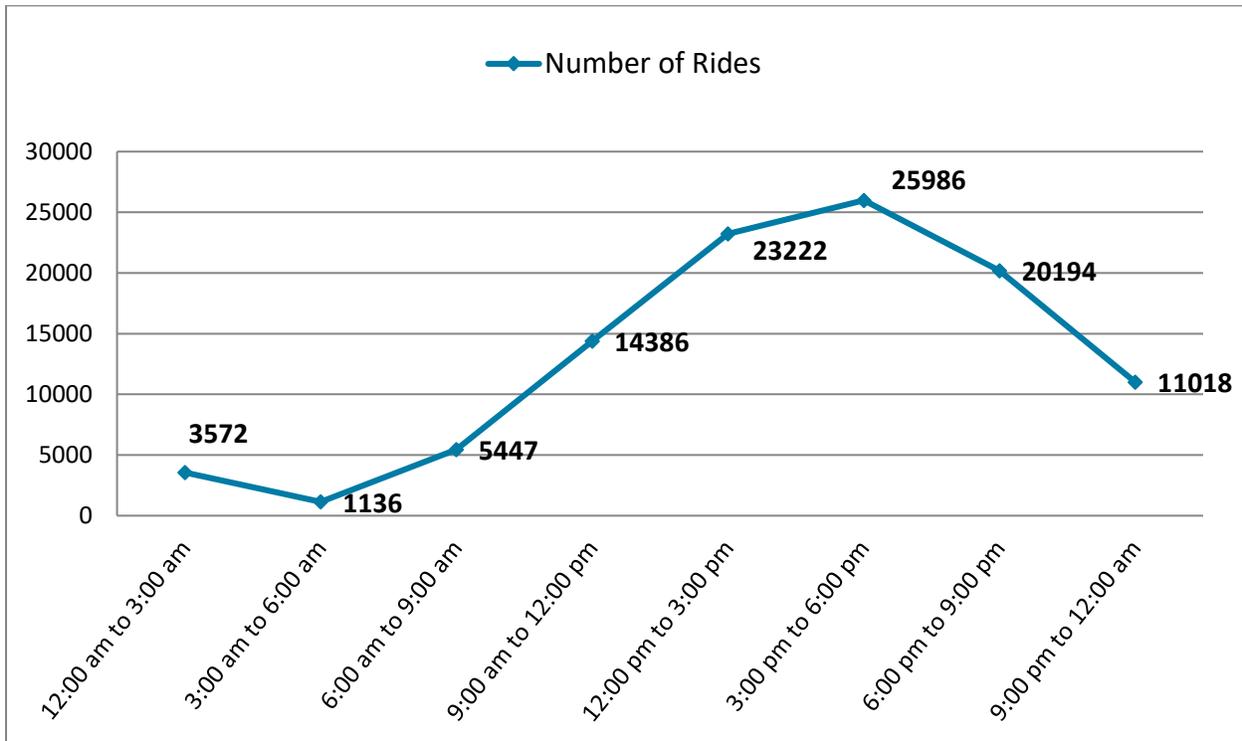


Figure 12: Average Number of Rides during a Typical Day



## DURATION OF RIDES

More than 70% of the total rides were of short duration, lasting 30 minutes or less. However, some users did rent bikes for longer periods of time to go for lengthy rides as evidenced by the figure below. A total of 93% of all rides lasted less than an hour.

**Figure 13: Duration of Rides in 5 Minute Intervals**



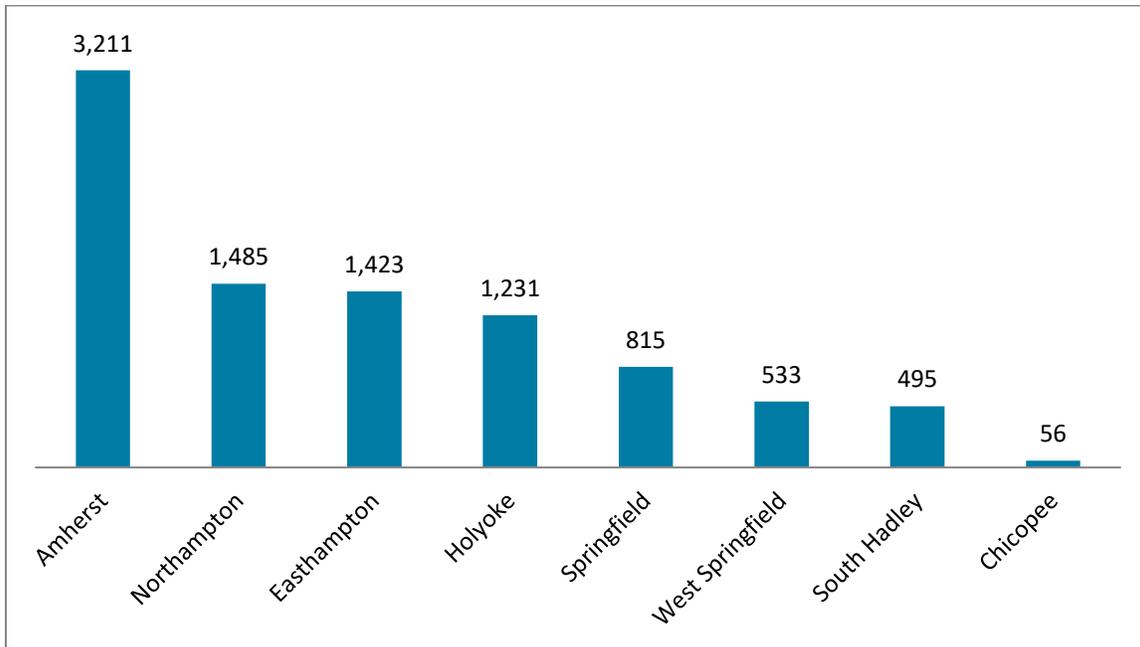
## STATION WIDE DATA

A total of 69 stations were open during the 2021 season of ValleyBike in the communities of Amherst, Chicopee, Easthampton, Holyoke, Northampton, South Hadley, Springfield, and West Springfield. There were some temporary stations which operated for short periods and registered a relatively low amount of total trips. Amherst, Northampton, and Easthampton experienced the highest per station ridership.

**Table 7: Community Wide Data**

Community	Stations	Total Trips	Percentage Total Trips	Total Trips Per Station	Round Trips	Percentage Round Trips	Round Trips Per Station
Amherst	12	38,534	36.71%	3,211.17	8,097	25.50%	674.75
Northampton	19	28,214	26.88%	1,484.95	8,075	25.43%	425.00
Holyoke	12	14,775	14.08%	1,231.25	6,193	19.51%	516.08
Springfield	13	10,594	10.09%	814.92	5,517	17.38%	424.38
Easthampton	5	7,114	6.78%	1,422.80	2,370	7.46%	474.00
South Hadley	3	1,485	1.41%	495.00	903	2.84%	301.00
West Springfield	2	1,065	1.01%	532.50	493	1.55%	246.50
Chicopee	3	167	0.16%	55.67	102	0.32%	34.00

**Figure 14: Average Rides per Station per Community**



**TOP TEN STATIONS**

UMass Southwest and Knowlton were the top two origin locations for the most bikeshare rides in 2021. Eight of the top 10 locations for bike share are located in Amherst which is not a surprise. The students at UMass utilize the ValleyBike service frequently because of conveniently located stations in the vicinity of the campus and downtown Amherst.

The Northampton Train Station was the third location. This is very encouraging as one of the objectives of ValleyBike was to increase connectivity with transit locations and other modes of transportation to increase the utilization of the system. This location is also conveniently located in downtown Northampton in close proximity to the shared use paths and commercial business district.

**Table 8: Top Ten Origin of Ride Stations**

No.	Station Name	Community	Total Rides Started	Round Trips	One Way Trips
1	UMass Southwest	Amherst	6973	1979	4994
2	UMass Knowlton	Amherst	6063	956	5107
3	Northampton Train Station	Northampton	5574	2077	3497
4	North Pleasant Street	Amherst	4340	949	3391
5	State St/Mass Central Rail Trail	Northampton	3656	924	2732
6	UMass Haigis Mall	Amherst	3525	657	2868
7	Amherst Town Hall	Amherst	3337	919	2418
8	Kendrick Park	Amherst	3101	650	2451
9	University Drive	Amherst	2998	688	2310
10	UMass ILC	Amherst	2894	317	2577

## ROUND TRIPS

Over 2/3<sup>rd</sup>s of all rides using the ValleyBike system were one-way trips: rides that began and ended at different stations. This suggests that people used the bikes for utilitarian purposes and appreciated being able to drop their bikes at new stations, rather than holding onto them for the entirety of their ride and dropping them back off at their point of origin.

The remaining 30% of rides were round trips. These are rides that had the same bike returned to its original docking station at the end of the trip. A vast majority of these trips are of shorter duration. The top round trip origin stations are many of the same locations that are in the overall top ten for total rides. One notable exception was the Holyoke Medical Center Station which ranked 4<sup>th</sup> in total round trip rides.

**Table 9: Type of Trips**

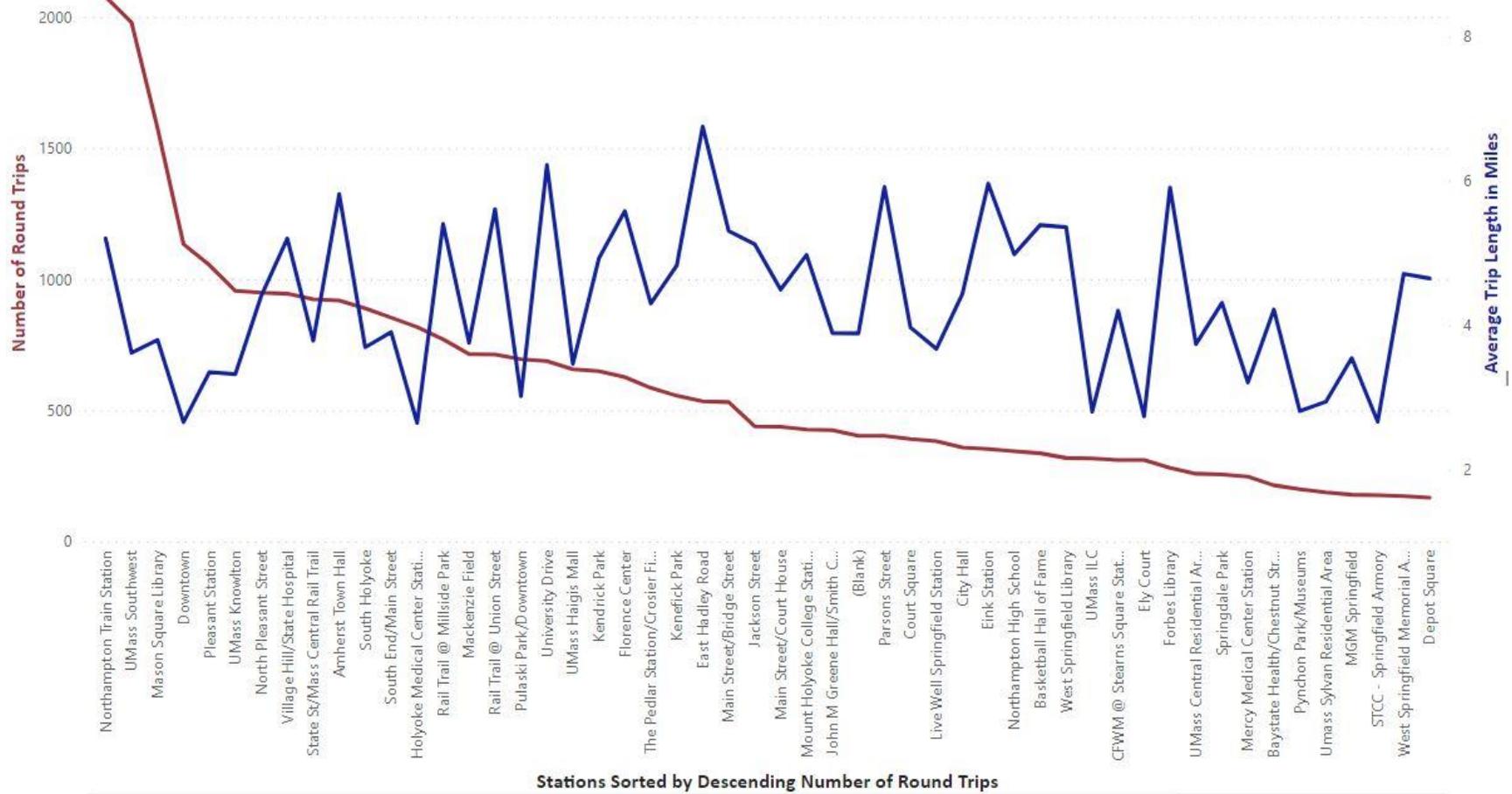
Type of Rides	Number of Rides	Percent of Rides
One Way	72,807	69.37%
Round Trip	32,153	30.63%
<b>Total</b>	<b>104,960</b>	<b>100.00%</b>

**Table 10: Top Ten Round Trip Stations**

No.	Station Name	Community	Sum of Round Trips	Total Rides Started	One Way Trips
1	Northampton Train Station	Northampton	2077	5574	3497
2	UMass Southwest	Amherst	1979	6973	4994
3	Mason Square Library	Springfield	1577	2106	529
4	Downtown	Holyoke	1134	2534	1400
5	Pleasant Station	Holyoke	1054	2119	1065
6	UMass Knowlton	Amherst	956	6063	5107
7	North Pleasant Street	Amherst	949	4340	3391
8	Village Hill/State Hospital	Northampton	945	2038	1093
9	State St/Mass Central Rail Trail	Northampton	924	3656	2732
10	Amherst Town Hall	Amherst	919	3337	2418

A majority of round trips in the region were short distance trips with an average trip length of around 5 miles. However certain round trips at stations in Holyoke and Amherst were even longer than 6 miles. Many weekend and round trips to the same station are recreational in nature and provide public health benefits while supporting the system. A larger number of round trips at stations in areas with a lot of surrounding consumer options could be an indication that ValleyBike trips are replacing automobile trips for short errands.

Figure 15: Round Trips per Station and Average Ride Length in Miles



## CONGESTION MITIGATION AND AIR QUALITY

Using the Congestion Mitigation and Air Quality (CMAQ) Analysis Worksheet provided by MassDOT, the Pioneer Valley Planning Commission calculated the estimated reduction in four major air pollutants in the region during 2021 because of the ValleyBike program. Based on cost estimates for reducing each type of pollutant, a cost effectiveness value was derived.

**Table 11: Estimated 2021 Reduction in Pollutant Emissions**

<b>Pollutant</b>	<b>Reduction in Emissions in Kilograms</b>	<b>Year 4 Estimated Cost Effectiveness for Reducing Emissions per Kilogram</b>
Carbon Dioxide [CO <sub>2</sub> ]	17,187.85	\$126.82
Carbon Monoxide [CO]	216.59	\$10,064.09
Volatile Organic Compounds [VOC]	17.66	\$123,406.14
Nitrogen Oxide [NO <sub>x</sub> ]	13.00	\$167,722.15

In the calendar year 2021, ValleyBike accounted for an estimated 17,187.85 kilograms of CO<sub>2</sub> emissions eliminated by the project. In order to estimate the impact of the cost effectiveness of the CMAQ investment, a 10% annual depreciation factor was applied to the original cost of the project. This value was added to the Phase 2 project cost of \$1,200,000.00 to arrive at an estimated project value of \$2,179,755.00 after 4 years of operation of ValleyBike.

A copy of the CMAQ analysis for Year Four of ValleyBike is presented on page 23.

CMAQ Air Quality Analysis Worksheet for Bike Sharing Project						
FILL IN SHADED BOXES ONLY						
TIP YEAR:						
MPO:			Municipality:			
Project:						
<b>Step 1: Details of Project:</b>						
					User Input (blank for default)	Default
A. Number of Bikes in Project:			279	Bikes		
B. Average Bike Trip Length:			2.3	Miles	2.3	1.1
C. Average Number of Trips per Bike per Day:			1.0	Trips	1.0	3.7
D. Bike Sharing Operating Days per Year:			365	Days	365.0	251
<b>Step 2: Mode Substitution by Bike Sharing Project:</b>						
Note: A bike sharing project would attract new riders from different modes. Actual surveys can determine the extent of the transition from different modes to such program. If site specific data is unavailable, use the defaults provided below.						
E. Percentage of Bikes Used Shifted from Walking:			25%	Percent		25%
F. Percentage of Bikes Used Shifted from Public Transit:			41%	Percent		41%
G. Percentage of Bikes Used Shifted from Taxis:			5%	Percent		5%
H. Percentage of Bikes Used Shifted from Cars:			12%	Percent		12%
I. Percentage of Bikes Used Shifted from Private Bikes:			8%	Percent		8%
J. Percentage of Bikes Used Shifted from Motorcycles:			4%	Percent		4%
K. Percentage of Bikes Used Shifted from Other/New Trips:			5%	Percent		5%
L. Total Percentage of Bikes Used Shifted from Other Modes (Must be 100%):			100%	Percent		
M. Public Transit Vehicle Occupancy:			40	Persons		40
N. Taxi Vehicle Occupancy:			1.18	Persons		1.18
O. Car Vehicle Occupancy:			1.18	Persons		1.18
P. Motorcycle Vehicle Occupancy:			1.16	Persons		1.16
<b>Step 3: Emission Factors for Average Commuter Travel Speed:</b>						
Note: Use 25 MPH as a default if average speed is not known. Speed Used: 25 MPH						
		Summer VOC Factor	Summer NOx Factor	Summer CO Factor	Summer CO2 Factor	
		grams/mile	grams/mile	grams/mile	grams/mile	
	2016 Bus	0.014	0.023	0.150	22.645	
	2016 Auto	0.169	0.252	2.879	398.914	
	2016 Motorcycle	1.362	0.466	13.331	342.739	
<b>Step 4: Calculate emissions reductions in kilograms per year (Seasonally Adjusted):</b>						
		Summer VOC	Summer NOx	Summer CO	Summer CO2	
		17.7	13.0	216.6	17,187.8	
<b>Step 5: Calculate cost effectiveness (first year cost per kg of emissions reduced)</b>						
	Project		Emission Reduction		Fourth year cost	
Emission	Cost		in kg per year		per kilogram	
Summer VOC	\$2,179,755	/	17.7 =		\$123,406	
Summer NOx	\$2,179,755	/	13.0 =		\$167,722	
Summer CO	\$2,179,755	/	216.6 =		\$10,064	
Summer CO2	\$2,179,755	/	17,187.8 =		\$127	

## CONCLUSION

The fourth year of the ValleyBike utilization data depicts a very robust and encouraging picture. The bikeshare program recovered well from the pandemic related decrease in 2020. The slow but steady rise in ridership and full year availability of the service are signs for an even better future.

To improve the effectiveness of the ValleyBike system, more members must join and use the system more frequently. It is also important to continue efforts to identify funding to provide discounted memberships to ValleyBike for economically disadvantaged residents of the region.

Moving forward it will be important to review the 2022 calendar year to identify how the new stations in Chicopee and West Springfield are performing to determine if they are properly located to maximize ridership. A full year of data from all member communities will also be a good indicator of the future growth potential for ValleyBike in the Pioneer Valley region.

Several communities that chose not to participate in the earlier phases of ValleyBike have recently indicated they may now have an interest in joining if they are able to secure adequate funding. This is an indication of the success of ValleyBike in that the system has transitioned from a niche market to one with a broader appeal.