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## THE IMPACT OF BICYCLE INFRASTRUCTURE IN WINNIPEG

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**I**n the spring of 2007 two members of the newly formed bicycling advocacy organization, Bike to the Future (later renamed Bike Winnipeg) decided to go out and count the number of cyclists at two of the bridges across the Assiniboine River that take traffic in and out of downtown. Our goal was to document the number of regular commuter cyclists in Winnipeg and to see whether the number was increasing. This quickly evolved into a larger effort involving many volunteers and locations. Thanks to a core of volunteers we have now been counting cyclists for ten years.

Winnipeg is a typical sprawling prairie city organized around motor vehicle transportation. The Red and Assiniboine Rivers cut the city into quadrants and act as barriers to transportation. Rail lines and rail yards, especially the large CPR yards that separate the “north end” from the rest of the city are also major barriers. People who wish to cycle to work, school or other destinations must share key bridges and underpasses with motor vehicles, especially if they are traveling in or out of the downtown area or across the city. Most of these bridges and underpasses do not have bicycle-friendly infrastructure and cyclists are generally required to share the roadway with motor vehicles, or ride illegally on sidewalks. These “choke points” have been the main focus of our bicycle counts, but over the years we have added other locations either because we want to broaden the picture, or because they are locations where new bicycle infrastructure is being planned or has been built.

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## I. HOW WE COUNT

The timing and locations are designed to broadly capture commuter traffic. Counts are done either during the morning or afternoon rush hour on Tuesday, Wednesday or Thursday. Volunteers are asked to count for a two-hour period either between 6:30 and 9:00 AM or between 3:30 and 6:00 PM.

From 2007 through 2016 Bike Winnipeg volunteers have completed 679 counts at 118 locations in Winnipeg. Using a tally sheet, volunteers count cyclists passing a given point, usually for a two-hour period within five minute blocks, separately identifying those traveling on the street, on the sidewalks and on bicycle paths (where they exist). Volunteers may also count pedestrians, they may keep track of the apparent gender of the cyclists and they may keep track of whether cyclists wear helmets, depending on how busy the location is and whether the volunteer is willing to add these extra elements. We follow a standard “screen line” counting method; volunteers count all cyclists who cross an imaginary line on the road, whether they are riding on the sidewalk, the street, or a bicycle path/trail.

The survey manager coordinates the counting process and assignment of locations and provides forms, information on counting procedures, and other information to the volunteer counters. Volunteers usually deliver their counts by email. The survey manager responds to questions from volunteers to clarify methodology and locations. With the help of volunteers, the survey manager enters the data and analyzes the results.

Data from the individual counts is entered into a data base, including:

- Location
- Date
- Start and end times
- Total count (not always exactly two-hours)
- Two-hour count or estimate
- Number traveling “in” and “out” (defined according to local traffic flows)
- Number riding on the road, on the sidewalks or on a bike path
- Pedestrian count (if counted)
- Number of men and women, with or without helmets (if counted)
- Weather conditions at 7:00 AM (for morning counts) or 4:00 PM (for afternoon counts), including temperature, wind speed, and precipitation, based on official Environment Canada weather data

## II. FACTORS AFFECTING COUNTS

Counts vary widely among locations and at any given location. These variations are related to weather conditions, time of year and time of day and year.

### Weather Conditions

Weather data is incorporated into the bike counts data base as a set of categories combining temperature, precipitation and wind speed (see box).

Weather Categories	
<b>Poor:</b>	Rain or Snow, or Temperature less than 0° Celsius
<b>Fair:</b>	Temperature = 0° to 8° Celsius, or wind of 40 km/hr or more (without rain or snow)
<b>Good:</b>	Temperature = 9° to 17° Celsius with wind less than 40 km/hr (without rain)
<b>Excellent:</b>	Temperature ≥ 18° Celsius with wind less than 40 km/hr (without rain)

There is a clear relationship between weather conditions and numbers of cyclists, as shown in figure 1 below. Based on 25 pairs of comparable counts under different weather conditions at the same location, in the same year, at the same time of day and time of year, there is a direct, straight line relationship between weather and numbers of cyclists. If 100 cyclists are likely to travel at a given location in “good” weather, then 38 are likely to travel at the same location in “poor” weather, 71 in “fair” weather, and 130 in “excellent” weather.

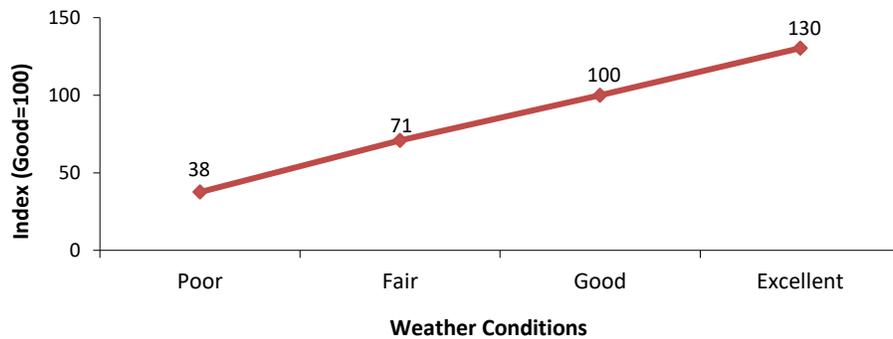


Figure 1. Impact of weather on number of commuter cyclists controlling for location, year, spring timing and time of day (Winnipeg 2007-2016)

### Time of Day: Morning vs. Afternoon

Afternoon rush hour bicycle counts are consistently higher than morning rush hour counts. We have completed 60 pairs of AM and PM counts at the same location on the same day. The morning and afternoon counts were compared for a standard two-hour period, and in 57 of the 60 comparisons the afternoon counts were higher. The total of the 60 afternoon counts was 32 percent higher than total of the 60 morning counts.

### Seasonal Trends

After investigating different ways of identifying the timing of spring weather it was found that the last day of snow on the ground provided a good measure of the arrival of spring as it affects cyclists. The following categories were created based on the number of days elapsed between the last day of snow on the ground and the date of each bicycle count.

<b>Late Winter</b>	Before Last Day of Snow on the Ground
<b>Early Spring</b>	0-14 Days After Last Day of Snow on the Ground
<b>Mid Spring</b>	15-45 Days After Last Day of Snow on the Ground
<b>Late Spring</b>	46+ Days After Last Day of Snow on the Ground

### III. TRENDS IN BICYCLE COUNTS

Two-hour bike counts at specific locations are not the best way to track trends in cycling over time because of the high variability between different locations, time periods and weather conditions. Still, in the absence of other systematic data collection in Winnipeg concerning cycling levels, an analysis was carried out based on year-over-year comparisons controlling for location, time of day, seasonal timing and weather conditions. Average counts were computed for each specific location and an overall weighted average percentage change was then calculated for all the locations for which year-to-year comparisons were available. Annual percentage changes were converted to an index, with 2007 set at 100. See figure 2 below.

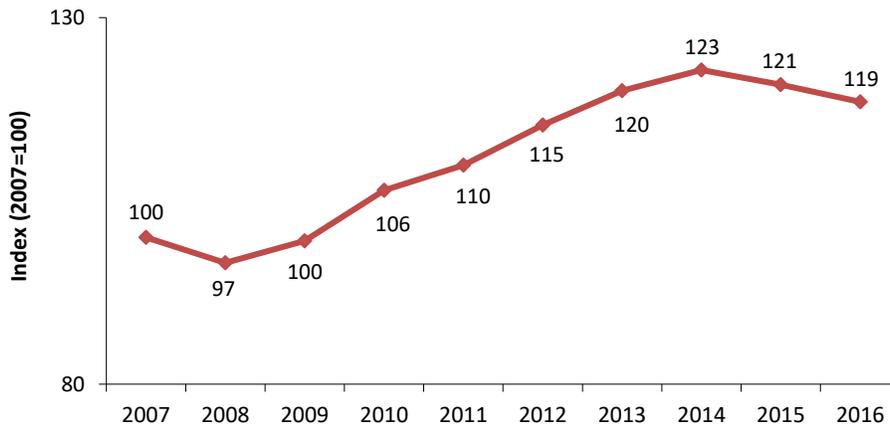


Figure 2. Commuter Cycling Index, 2007-2016 at 26 locations controlling for weather, time of day and season

The results suggest that, when weather, time of day and season are all the same, commuter bicycling numbers in Winnipeg increased by 23 percent from 2007 to 2014, and then declined by 4 percent from 2014 to 2016.

#### IV. BICYCLE INFRASTRUCTURE PROJECTS

Why was there steady growth in commuter cycling in Winnipeg from 2008 through 2014, followed by a decline in the last two years? One possible explanation is an increase in the amount of infrastructure designed to separate bicycles from motor vehicles. Separated bike lanes are generally perceived as safer and may encourage more people to travel by bicycle.

Some of our counting locations have clearly benefited from new infrastructure, while other locations have not. There are also locations where new infrastructure may have diverted traffic away and reduced the number of cyclists. In order to explore this theory, counting locations that benefited from new bicycle infrastructure were compared to those that were not affected, and to those that might have lost bicycle traffic because of new infrastructure elsewhere. It was found that bicycle travel tended to increase where new infrastructure has been built, and to decline at some locations after alternate bicycle friendly infrastructure was created. Based on year-to-year changes it appears that cycling increased by 60 percent in locations with improved cycling infrastructure, increased slightly at locations with no change in infrastructure, and decreased slightly at locations where new infrastructure might have diverted traffic away from these locations. See figure 3.

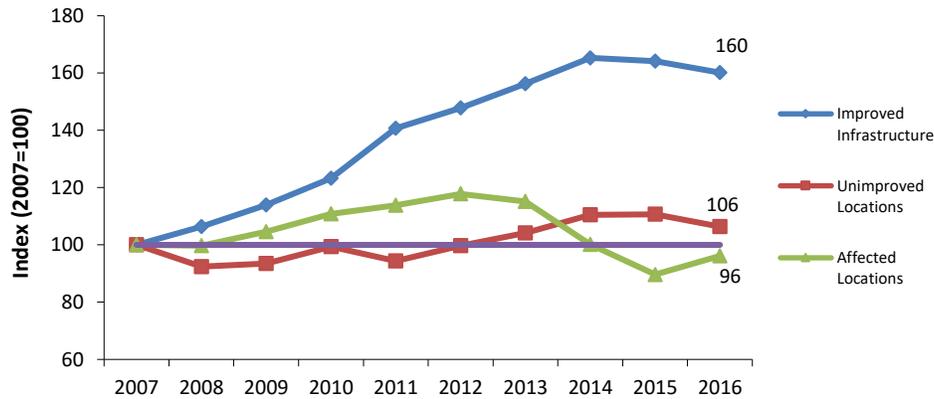


Figure 3. Index of Commuter Cycling in Winnipeg by impact of infrastructure improvements (2007-2016)

#### V. TOTAL NUMBER OF CYCLISTS IN WINNIPEG

Given that our counts are not representative of the city as a whole and that they focus on short time periods, it is difficult to translate the counts into estimates of overall numbers of cyclists in Winnipeg. However, in the absence of alternative information we have developed estimates of total commuter cyclists in Winnipeg based on our downtown counting locations. A circle of 22 of our counting locations surround the downtown area and cover most of the ways that cyclists would have to travel between the downtown area and outlying areas. For the majority of the locations, we have at least one or two counts in mid-to-late spring of this year (earlier spring counts are lower and they have been excluded from the calculations of typical spring commuting.) For locations where no count is available for

2016, the most recent previous counts have been used or in some cases an estimate has been used based on the ratio between morning and afternoon counts and they have been estimated separately. Afternoon counts are 32 percent higher than morning counts on average.

Average morning rush hour traffic in and out of downtown at these 22 locations is estimated at 2,023 cyclists and average afternoon rush hour traffic is estimated at 3,112. This gives a total morning and afternoon rush hour count of just over 5,100. Total daily bicycle traffic (24 hours) is estimated at 12,109 based on the proportion of cyclist trips during morning and afternoon rush hours identified in the 2004 Winnipeg Area Transportation Study (42.4 percent).<sup>1</sup> Based on the assumption that these cyclists are passing once in each direction, the number of *cyclists* is estimated at half of this number, or about 6,000 cyclists traveling in and out of downtown Winnipeg on a given day during mid to late spring in 2016.

Data from Winnipeg Bike to Work Day<sup>2</sup> and other surveys show that commuter cyclists are traveling between all regions of the city, and their routes do not always go through the downtown area. Only 48 percent of those who registered with Winnipeg Bike to Work Day in 2009 were actually traveling to or from the downtown area of the city. This suggests that in 2016 about 12,600 people commuted by bicycle each day in Winnipeg during mid-to-late spring.

Similar estimates have been made each year since 2007 and these estimates are summarized in figure 4 below. Again, these estimates suggest that commuter cycling reached a peak in 2014 and has declined slightly since then.

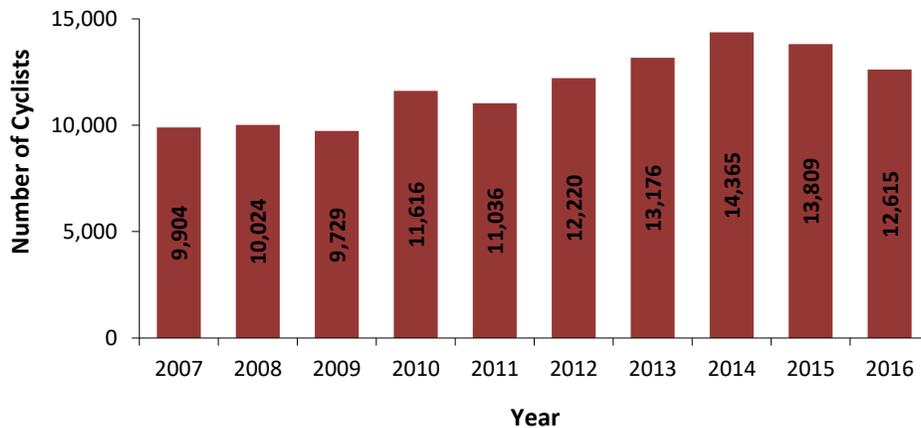


Figure 4. Estimated daily commuter cyclists in Winnipeg during May and June (2007 – 2016)

## VI. CONCLUSIONS

There is strong evidence that even the limited construction of new cycling infrastructure that has occurred since 2009 had a positive impact on the numbers of cyclists in Winnipeg, but this growth has stalled. Growth in cycling numbers has taken place primarily at locations with new bike lanes and multi-user paths, and primarily during the period immediately following the introduction of new infrastructure. The locations with these new bicycle facilities have also seen a reduction in sidewalk riding. On the other hand, major bridges and underpasses that have not yet been improved or which do not have bike lanes continue to push cyclists onto the sidewalks, or to discourage them from riding at all. If these major barriers are dealt with, the frequency of cycling throughout the entire cycling network can be expected to increase.

In addition, we reached the following conclusions:

- After taking into account location, weather conditions, spring timing and time of day, commuter cycling in Winnipeg peaked in 2014 and has declined slightly over the past two years
- On a typical weekday in mid to late spring, an estimated 6,000 cyclists commuted in and out of the downtown area of Winnipeg, and throughout the entire city about 12,600 cyclists commuted on a given day. The total number of individual commuter cyclists in the city would be higher, given that not every cyclist commutes every day
- Sidewalk riding has been declining where bike paths and trails are available. More than half of cyclists ride on the sidewalks on major bridges and underpasses, but where bike paths exist, only 6 percent ride on sidewalks

A more comprehensive survey would be needed to more accurately estimate the number of cyclists and the bicycle share of traffic in Winnipeg. The only such survey done on a regular basis is the Census of Canada which identifies the number of people commuting to work, by mode of transportation in 2001, 2006 and 2011. Data from these sources suggests that commuter cycling increased in the City of Winnipeg by 32 percent between 2006 and 2011. However there is no source available that provides annual data, seasonal transportation patterns, or bicycle travel for purposes other than travel to or from work. This means that, despite the bicycle counts reported here, there is a continued lack of basic data on the numbers and other characteristics of cyclists in Winnipeg, and throughout Manitoba. Such information is needed by governments and others in order to identify trends and develop policies related to active transportation.

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**JEREMY HULL** is a founding member of Bike Winnipeg, a non-profit bicycling advocacy organization incorporated in 2007. He has served on the board during most of the past ten years and is currently the chair of the board's Education Committee. He has organized, managed and reported on Bike Winnipeg's spring bike counts since 2007. Jeremy can be reached at [hull.jeremy@gmail.com](mailto:hull.jeremy@gmail.com).

### Acknowledgements

I would like to thank the dedicated volunteers who have contributed to our bicycle counts over the past ten years.

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- 1 Calculated from data in iTrans Consulting, Winnipeg Area Travel Survey Results, Final Report, July 2009, p. 33. This shows that 4,620 bicycle trips were taken during the AM and PM rush hours and 10,890 bicycle trips were taken over 24 hours.
  - 2 According to Bike to Work Day registration data, in 2008 40% of cyclists worked in the downtown area. In 2009, 48% of cyclists traveled between the downtown and other areas of the city. Reports based on Bike to Work Day registration data in 2008 and 2009 are available from Jeremy Hull on request.