Weather, daylight, snow and bicycle traffic on rue de Terrebonne

Six count series, August 2024 to November 2026: methods in brief and the main results

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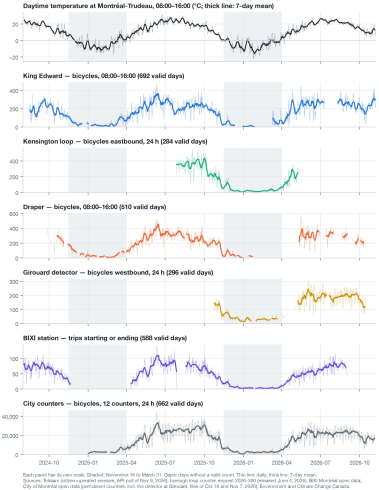
Terrebonne-open-sources

November 10, 2026

The question and the sources

- How does the number of bicycles counted on rue de Terrebonne vary with temperature, wind chill, rain, snow, daylight and snow loading?
- Six series, each analysed on its own and never compared in level:
  - **King Edward** and **Draper**: citizen-operated Telraam camera sensors, bicycles 08:00–16:00 (691 and 509 valid days from August and September 2024)
  - **Kensington loop**: the borough's counter, eastbound, 24 h (284 days, July 27, 2025 to May 10, 2026; hourly release of June 4, 2026)
  - **Girouard detector**: the City's detector at the east end, westbound, 24 h (296 days, October 24, 2025 to October 15, 2026)
  - **BIXI station** Grand Boulevard / de Terrebonne: trips starting or ending, regular season
  - **City counters**: twelve loop counters elsewhere in Montréal, as a reference
- Weather: Environment and Climate Change Canada, Montréal-Trudeau (daily rain, snowfall, snow on the ground; hourly temperature and wind). Snow loading: the City's record for the sector that contains each counter (CDN-301, CDN-111).

The record



Each panel has its own scale.

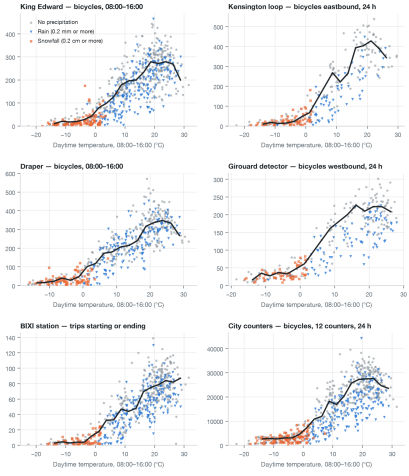
Method (1): what is counted

- A Telraam sensor counts **only in daylight**: about 9 hours in December, 16 in June. Its daily total moves with the length of the day even if riding does not.
- Every Telraam figure here is the count in a **fixed window, 08:00–16:00**, daylight all year. The evening peak is left out.
- Valid day: at least 8 reported hours and 6 hours of uptime, and all eight window hours with uptime of 0.5 or more. Nothing is interpolated.
- The loop: eastbound channel only (the westbound channel under-counts from about March 1, 2026).
- BIXI: a day without a trip is absent from the file, not a zero; April 15 to November 15 only in the models.

Method (2): the model

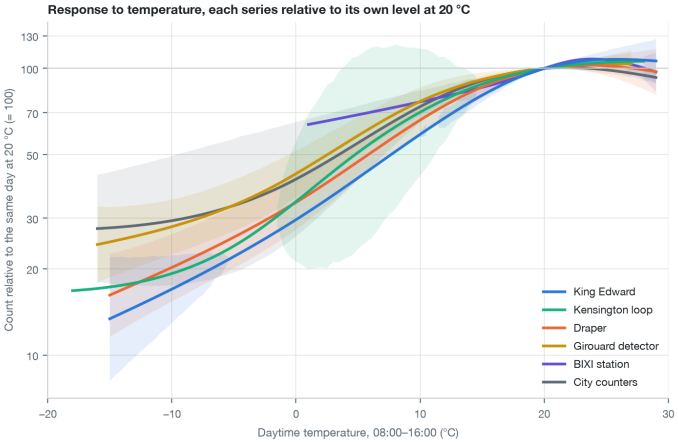
- One **negative binomial regression per series**, log link: every effect is a percentage change, so series can be set side by side without comparing levels.
- Terms: day type, holidays, counting year, time of year (two annual harmonics), daytime temperature, rain and snowfall in classes, snow on the ground, wind, snowfall of the day before.
- Temperature: a spline, and a line with one change of slope whose position is estimated.
- Intervals robust to autocorrelation (Newey–West); moving-block bootstrap for the change of slope.
- Checks: effects re-estimated inside calendar months; each month left out and predicted; wind chill in place of temperature; an hourly model of the loop for darkness.

Temperature: the raw relation



Each panel has its own scale. Black line: median of the days without precipitation.

Temperature: the fitted response, relative to 20 °C



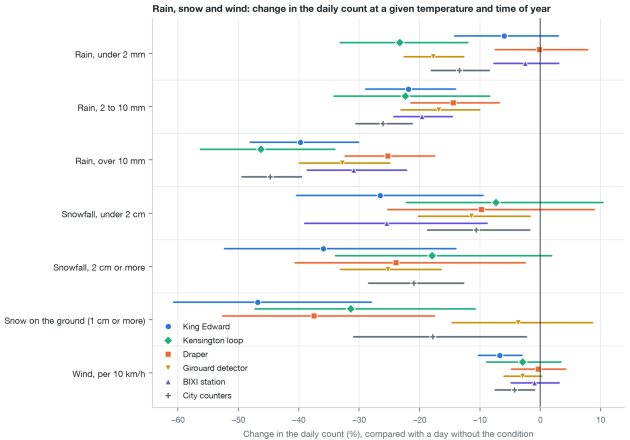
Negative binomial models, one per series, with day type, year, season (two annual harmonics), rain, snowfall, snow on the ground and wind held fixed. Bands: 95 % intervals (autocorrelation-robust). Logarithmic axis: equal vertical steps are equal percentage changes.

Terrebonne series: 5 to 6 % more bicycles per degree up to roughly 20 °C; at 0 °C, 30 to 43 % of the count at 20 °C; at −10 °C, 17 to 28 %.

Temperature: what the fits say

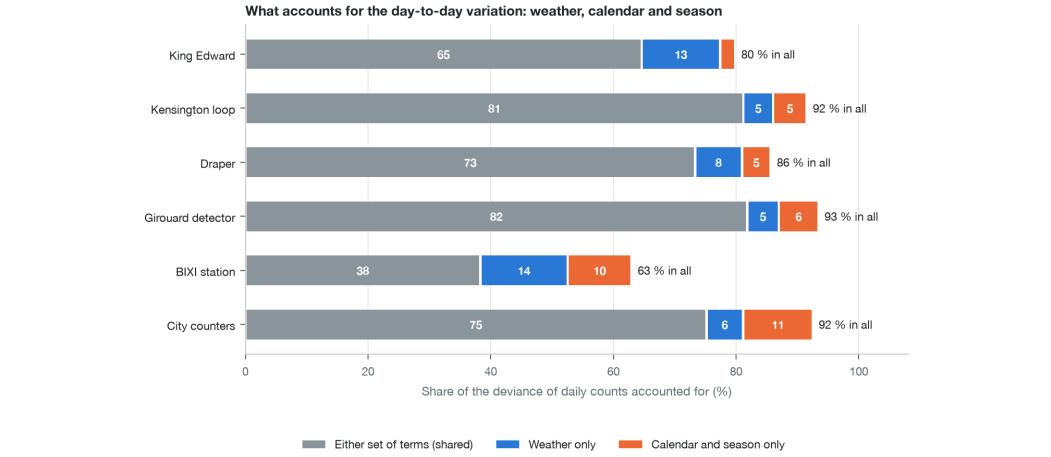
- Below roughly 20 °C, each degree goes with 5 to 6 % more bicycles on the four Terrebonne series; the same inside calendar months.
- Above that the count is flat or falls slightly. The position of the bend is poorly determined (intervals of ten degrees or more): the response bends gradually.
- **No second change of slope in the cold**: below 0 °C the percentage slope is not distinguishable from the slope between 0 and 20 °C.
- The -1 and -5 °C thresholds of the earlier analyses came from fitting straight lines to the counts themselves.
- Wind chill in place of temperature and wind fits about as well (correlation 0.996); the data cannot separate them.

Rain, snow and wind at a given temperature and time of year



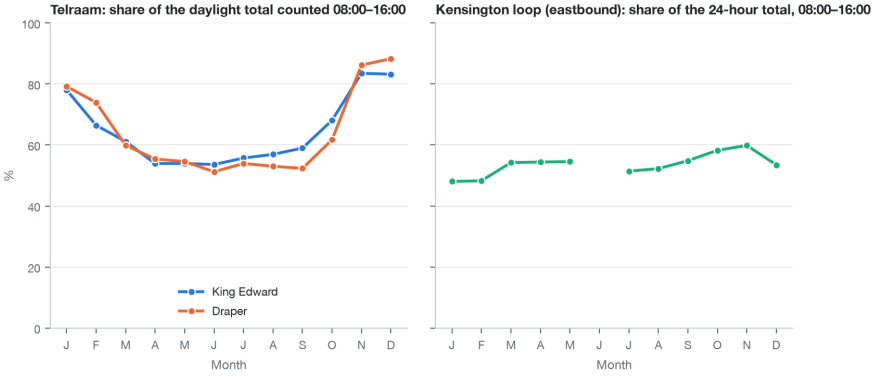
Negative binomial models, one per series; lines: 95 % intervals (autocorrelation-robust). Rain and snowfall are the day's totals at Montréal-Trudeau (24 h). A series has no mark where it has fewer than five such days (BIXI: April 15 to November 15 only). Snowfall of 10 cm or more is merged with 2 to 10 cm.

Season or weather?



Most of what the models account for can be credited to either: the record cannot fully separate season from weather. Weather effects estimated inside calendar months are the same.

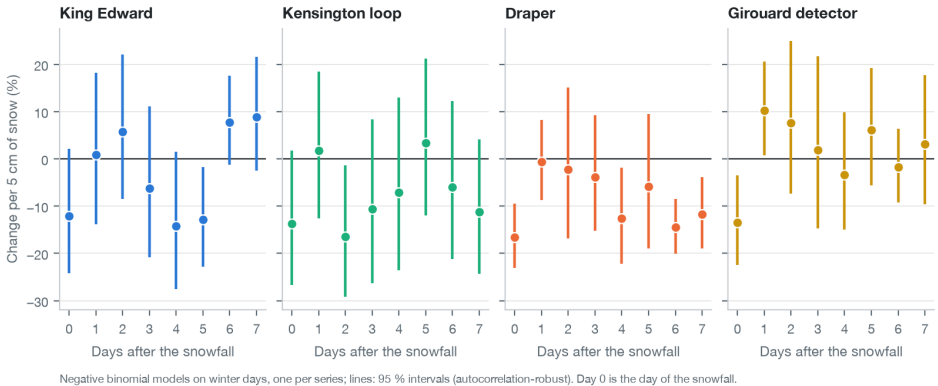
Day length: what a daylight-only sensor sees



Left: a Telraam sensor counts only in daylight, so its daily total covers 9 hours in December and 16 in June; the fixed window covers the same 8 hours all year.
Right: the loop counts day and night; June has no complete day in the hourly release (July 26, 2025 to May 11, 2026; released June 4, 2026).

On the loop (hourly), the same evening hour carries 27 % (19 to 34) fewer bicycles after sunset than before, at the same temperature and in the same month.

Snowfall and the days after (winter days)



Negative binomial models on winter days, one per series; lines: 95 % intervals (autocorrelation-robust). Day 0 is the day of the snowfall.

The day of the snowfall shows the clearest reduction; no pattern common to the four series on the following days. Snow on the ground carries part of the after-effect.

Snow-loading days

Series	Sector	Winter days	Loading days	Change on a loading day (%)
King Edward	CDN-301	191	44	−4 (−29 to +30)
Kensington loop	CDN-301	132	36	+2 (−25 to +39)
Draper	CDN-111	154	34	−18 (−45 to +22)
Girouard detector	CDN-111	109	18	−9 (−25 to +11)

- With temperature, snowfall, snow on the ground, rain, wind and day type in the model, loading days are not distinguishable from other winter days.
- The intervals are wide: they contain no change and a reduction of a quarter or more. The record does not settle the question.

Location is a parameter: the counters stand at different points of the street

Counter (west to east)	To downtown (km)	Residents within 500 m	Residents per km^2	Instrument
King Edward	6.7	6,130	7,800	camera sensor, 08:00–16:00
Kensington loop	5.9	5,760	7,300	loop, 24 h
BIXI station	5.9	5,730	7,300	bike-share dock
Draper	5.4	6,890	8,800	camera sensor, 08:00–16:00
Girouard detector	4.9	9,320	11,900	detector, 24 h

- Each counter is analysed as its own location. A difference between two counters is a difference between places and instruments, not a discrepancy.
- Like for like (the two camera sensors, same window, same days): Draper counts 1.22 times King Edward (1.16 to 1.29).
- Tested in one model of the four counters: the response to temperature is close along the street; the effects of the weekend, rain and snow on the ground differ by location.
- A coefficient for « centrality » cannot be estimated: four counters of three kinds.

Year to year: is the weather allowed for?

- Yes: the year term is estimated in the same model as temperature, rain, snowfall, snow on the ground and wind. Downtime is accounted for (only valid days; like compared with like).

Series	Years	Dates in both	1. Plain, same dates (%)	2. Season only (%)	3. With weather (%)
King Edward	2025–26 against 2024–25	254	−5 (−16 to +4)	−12 (−23 to +1)	−1 (−11 to +9)
King Edward	2026–27 against 2024–25	76	+26 (−1 to +62)	+22 (−3 to +54)	+27 (+12 to +45)
Draper	2025–26 against 2024–25	132	−11 (−22 to −2)	−20 (−29 to −10)	−12 (−20 to −5)
City counters	2025–26 against 2024–25	213	−8 (−16 to +1)	−10 (−18 to −2)	−7 (−14 to 0)

- King Edward's second year was colder and much snowier than its first (135 against 55 cm of snow on the common dates): the apparent drop disappears once the weather is in the model.
- The result is specific to each location (King Edward at the west end, Draper further east); two to three years do not establish a trend at either.

How well the models predict

		Median absolute error (%)		R^2 (log scale)	
Series	Days	Fitted	Month left out	Fitted	Month left out
King Edward	691	22	23	0.84	0.82
Kensington loop	284	20	25	0.92	0.87
Draper	505	19	20	0.88	0.86
Girouard detector	296	13	14	0.92	0.90
BIXI station	441	15	17	0.59	0.50
City counters	661	15	18	0.94	0.93

Each calendar month in turn is left out and predicted from the rest.

Limits

- Telraam figures are 08:00–16:00 counts; never compared in level with the loop.
- Sensor downtime is accounted for: only complete, valid days are used, compared with days of like season and weather; nothing is filled in. It reduces coverage: King Edward has no valid day in February 2026, Draper none from February to April 2026.
- The loop and the Girouard detector: one winter and one direction each.
- Weather at the airport (9 km); precipitation as 24-hour totals; the state of the lane is not observed.
- Season and weather are confounded; the models describe association in the record, not cause.
- Year-to-year terms absorb anything that differs between years besides the weather (gaps, sensor position); see the note.

Where everything is

- Note, tables, figures (English and French) and scripts: `https://github.com/OpenMobilityData/Terrebonne-open-sources/tree/main/2026-weather-and-bike-traffic`
- Sources: Environment and Climate Change Canada; Telraam (citizen-operated sensors); borough loop counter (access requests 2026-300, released June 4, 2026, and 2026-581, released October 9, 2026); City of Montréal open data (CC BY 4.0); BIXI Montréal open data.