

Length of Stay Study using BluFAX Monitoring Sensors in Banff

The Town of Banff uses Traffax traffic monitoring devices called BluFAX. BluFAX sensors are used to collect data from discoverable Bluetooth devices and Wi-Fi devices in vehicles. Most new vehicles have Bluetooth technology embedded in the entertainment systems and mobile phones hands-free systems, however portable electronic devices such as cell phones, tablets, and GPS devices also have Bluetooth and Wi-Fi technology embedded. The roadside BluFAX sensors record the identification IDs (i.e., MAC addresses) of devices within its detection range and log the date/time stamp of each MAC address detected/seen.

Not every vehicle on the road has a Bluetooth or Wi-Fi device. Thus the data collected is a sample of the total volume of the road. There is an assumption that the discoverable Bluetooth devices are homogeneously distributed among the vehicles. Field tests from around the world show approximately a 5% sampling rate for vehicles with Bluetooth devices, varying slightly from city to city. The detection rate for Wi-Fi is still being determined.

The map below depicts all locations of BluFAX sensors in Banff.

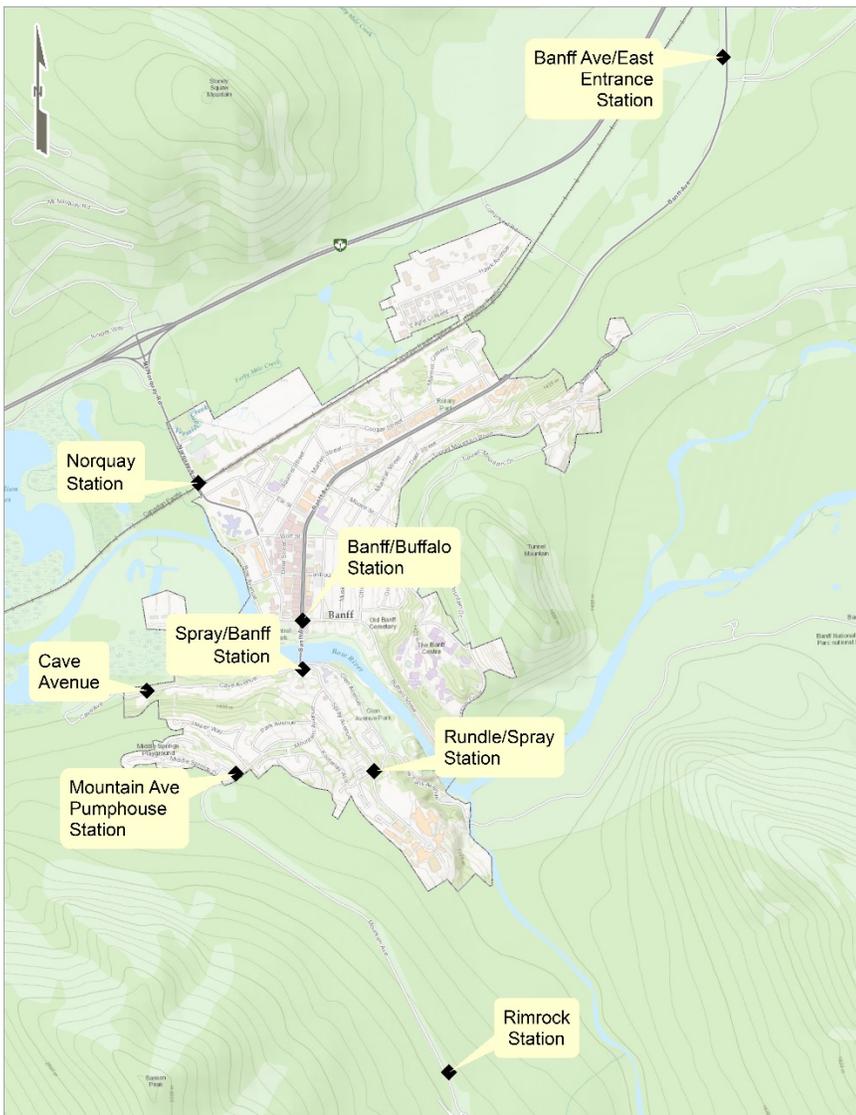


Figure 1.

The primary use of the BluFAX sensors in Banff is for monitoring and sharing vehicular travel times on the road network. Vehicular travel times can be calculated using the difference in detection times of a unique MAC ID logged between two sensors. The data is transmitted to a server over the cellular network or Ethernet cable, and the server will match addresses and their timestamps dynamically and in real time to publish live travel time data to a website.

This study examines length of stay data derived from the BluFAX sensors using a similar methodology. The study period was May 1st 2016 to August 31st 2016, thus four months of data collected from any of the existing sensor locations (Figure 1). The study time period was based on data from the peak visitation months in Banff, which is typically during the summer, May to end of August.

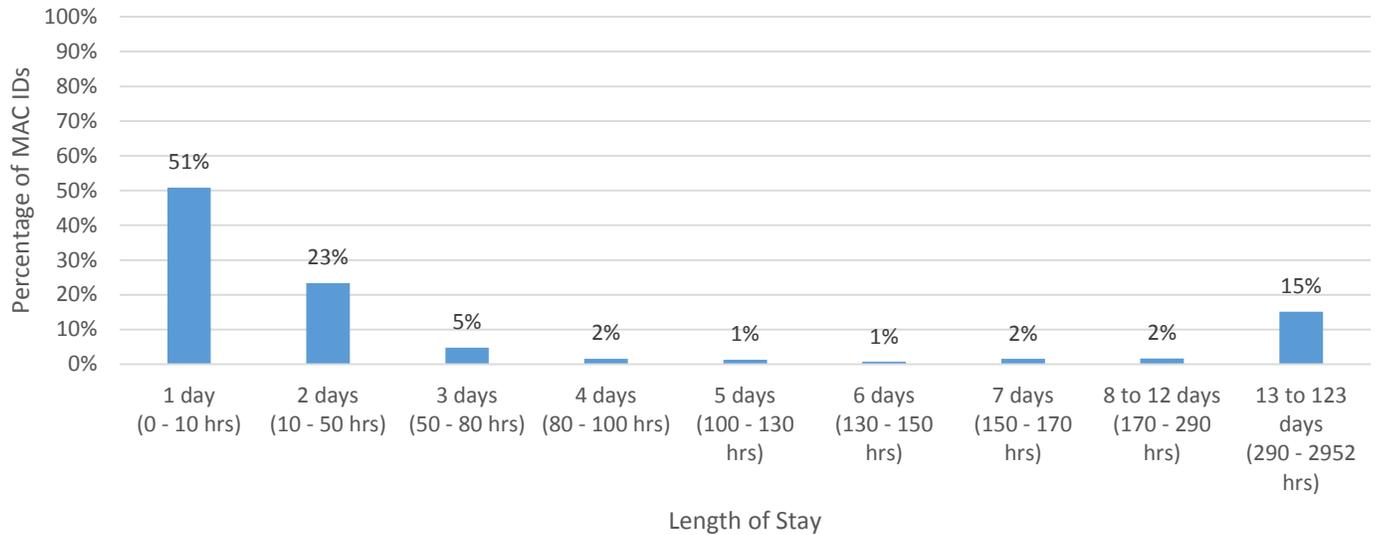
The length of stay was inferred by calculating the difference in detection times between when a unique MAC ID was first 'seen' (detected) at any one sensor, and when it was last 'seen' at any one sensor during the study period. This methodology discounts any movements completed between the first and last detection of the study time period. For example, a vehicle that comes into Town and gets detected at the Norquay sensor on May 10th, may stay for a 4 hours, then leaves Town (detected at Banff Ave sensor), and then returns again on May 14th (detected at Banff Ave sensor) stays for 2 hours and then leaves again (gets detected at the Banff Ave sensor again), if it's never detected/ does not return again within the four months, then it would be logged as having a length of stay of about five days (May 10th to May 14th) because it's based on when the vehicle was first 'seen' and last 'seen'. The length of stay is not recorded as 6 hours in this study, because it's solely based the first and last detection regardless of the individual trips between. Consequently, this methodology is best suited to isolated short term visitor data because it is assumed that transit, commuters and residents are likely making frequent repeated trips - thus they would be first be detected very early on, and their last detection would likely occur again near the end of the study period, making their length of stay appear prolonged.

Multi-Day Study:

Between May and August, there was about 123 days worth of data that resulted in 333,862 unique MAC IDs being matched and recorded within Banff. Where the length of stay surpassed 13 days, the data was grouped and assumed to a mix of visitors, locals, commuters, or transit. This is because those making frequent and repeated trips past detectors (i.e. a local or public transit bus) would have likely done so early on and again fairly late within the four months, resulting in the appearance of a longer stay (such as 13 days or longer).

Multi-Day Study

based on unique 333,862 MAC IDs that were detected over 4 months (May - August 2016)



For the period of May 1 to August 31 2016:

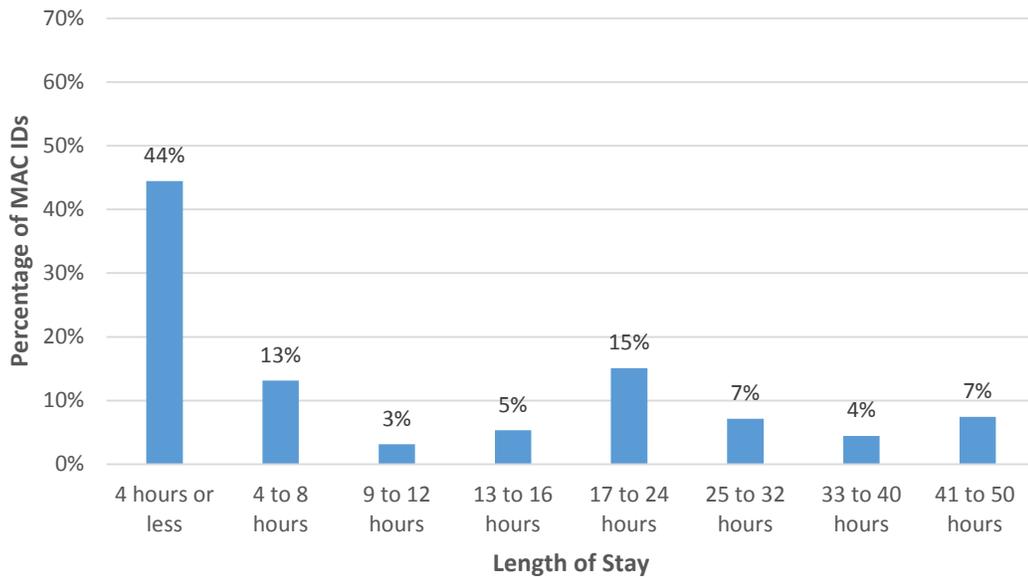
- 51% of the vehicles detected stayed one day or less (0 to 10 hours). These are likely to be day visitors to Banff.
- 23% of the vehicles detected stayed approximately 2 days (10 to 50 hours). These are likely to be weekend visitors to Banff, staying one night.
- 15% of the vehicles detected stayed 13 to 112 days (290 to 2952 hours). These are possibly, long term visitors, locals, commuters or public transit buses.

Two Day Study:

To better examine short term visitors to Banff a subset of the original dataset was analyzed, where only those IDs detected staying fifty hours or less were used. This means that it only contained records where the length of stay for any individual ID was equal to or less than fifty hours from when it was first detected at any sensor and last detected at any sensor over the four month study period. A cut-off of 50 hours was chosen because it captures length of stays likely exhibited by day trippers and overnight/potential weekend visitors. This dataset contained 187,515 unique MAC IDs.

Two Day Study

based on 187,515 unique MAC IDs that were detected staying 50 hours or less
(between May - August 2016)



For the period of May 1 to August 31 2016, and for a dataset containing only records with a length of stay between 30mins and 50 hours:

- 44% of the vehicles detected stayed 4 hours or less. This likely represents the average length of stay for short term day trippers.
- 13% of the vehicles detected stayed 4 to 8 hours. This likely represents the longer stays of day trippers.
- 3% of the vehicles detected stayed 9 to 16 hours. This likely is a blend of day trippers and some visitors staying one night.
- 22% of the vehicles detected stayed 17 to 32 hours. This likely represents visitors staying one night in Banff.
- 11% of the vehicles detected stayed 33 to 50 hours. This likely represents visitors staying two nights, possibly weekend visitors.

Conclusion:

This data reveals length of stay patterns of vehicles detected in Banff, and can be used to infer the potential impacts and needs of visitors on parking, transit and vehicle travel.