# Using volunteered geographic information to assess the visitor use of parks

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## Introduction

With increasing numbers of people using parks for recreation, it is important to understand about when people visit, what they do and where the go during their visit. Trail counters are often used to assess visitor numbers and although quite accurate, these don't often provide managers with information about off trail use or what activities people are undertaking. With the increased popularity of social media, people are now sharing geodata about their visit to parks, including in the form of GPS route data on fitness websites such as Strava, MapMyFitness and Wikiloc. This type of volunteered geographic information (VGI) is starting to be used by researchers and managers to assess visitor use of parks (Senaratne et al., 2017). But which websites, what sort of information is available and what are the limitations of this type of data? We conducted three research projects to determine: (1) what types of VGI is available for different parks, (2) how does route data vary among websites, (3) how useful is this VGI for assessing visitor use across and within parks, and (4) how accurate is this data compared to trail counters.

## Study Area

The three projects were conducted in south-east Queensland, Australia where there are a large number of parks including world heritage areas. Some of these parks are close to cities such as Brisbane where hiking, mountain biking and running are popular, while others are more remote and less popular.

## Methods

The first project compared the number of routes for 40 parks to determine how much data is available and what park characteristics effected the number of routes posted on three popular websites: Strava, MapMyFitness and Wikiloc. The second project compared the amount and quality of route data from MapMyFitness, Wikiloc and GPSies for three parks ranging from urban to remote to see which websites provided the best data for overall use and which was best to asses off trail use. The third project focused on popular reserves close to Brisbane to compare differences in patterns of use by mountain bikers, runners and hikers based on route data from MapMyFitness This route data was also compared with trail counter data to assess the accuracy of VGI.

## Results

Volunteered geographic information was available for 39 of the 40 parks assessed, with 23 parks having >50 routes, and over 8,500 routes for the region on MapMyFitness. Parks bordering urban areas had on average 3.5 times the number of routes compared to those further away ($P<0.05$). Of the three platforms, MapMyFitness was the most popular for urban parks with most routes posted in 2013-2014, but few in 2017. Wikiloc was more popular for remote parks, provided better data about off trail use and does not appear to be declining in popularity. Route data from MapMyFitness can be used to compare patterns of use among activities. For example, in large urban reserve network, mountain biking was more popular

than running and walking, with mountain bikers travelling further and using more parks. There were also differences in the total distance travelled, and which days of the week were popular among the three activities. Finally the route data was good at predicting the relative popularity of individual trails when compared with trail counter data ($P<0.001$, $R^2=0.681$).

## Discussion

Volunteered geographic information from fitness websites provides useful information on the relative popularity of parks, the amount of on and off trail use, and on differences in the patterns of use among activities. Similar results have been found in the limited number of other studies using VGI to monitor visitors in natural areas (Campelo & Mendes, 2016; Heikinheimo et al., 2017; Lera et al., 2017; Norman & Pickering 2017; Santos et al., 2016). Route data can be sourced rapidly from many websites and provides a pre-existing data source for researchers and managers to evaluate visitor use within a wide range of parks. Understanding the benefits and limitations of VGI is important. For example there is variation in the popularity of websites, including among different types of users and for different types of activities, and in the number and types of routes available among parks. Also, VGI will not record use by visitors adverse to these types of technology and social media. There can also be privacy issues in using social media data even when it is publically available. Finally websites vary in popularity over time, they differ in the types of data posted and in the accessibility of their data to researchers and managers.

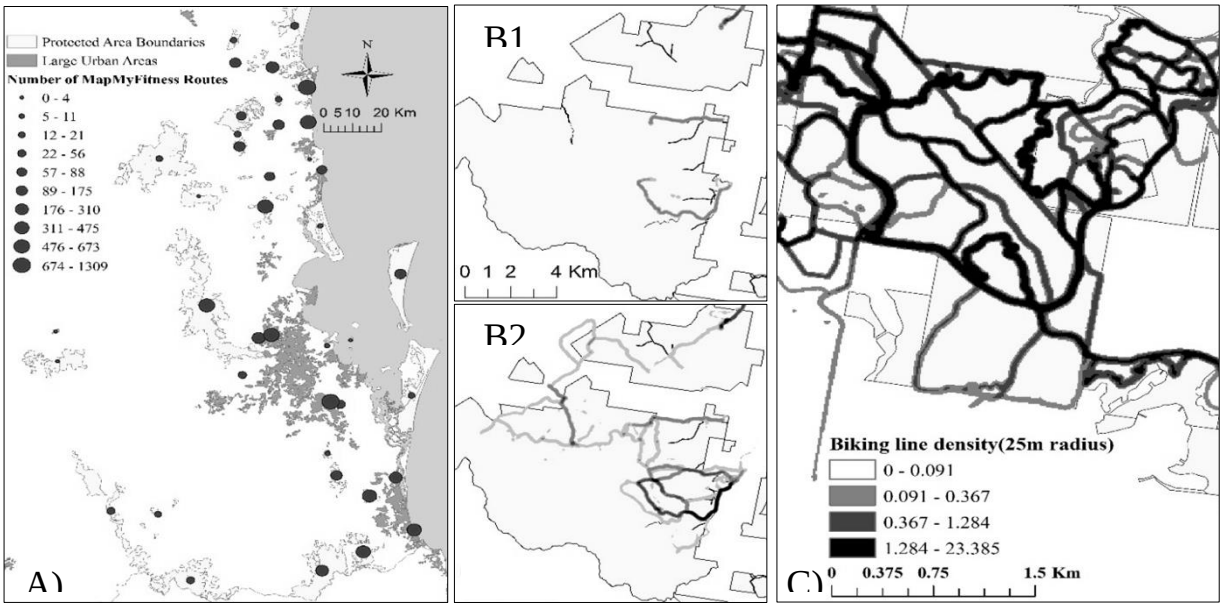


Figure One. Results from three projects assessing VGI data in south-east Queensland, Australia. A) The total number of routes from MapMyFitness for 40 parks. B) Spatial differences in off trail use based on route data from MapMyFitness (B1) and Wikiloc (B2) for Mount Barney National Park. C) Differences in the intensity of use of trails by mountain bikers in Daisy Hill Conservation Park based on route data from MapMyFitness.

## References

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