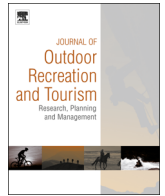




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Recreational activities in urban parks: Spatial interactions among users

T. Santos^{a,*}, R. Nogueira Mendes^a, A. Vasco^b^a CICS.NOVA Interdisciplinary Centre of Social Sciences, Faculdade de Ciências Sociais e Humanas (FCSH), Universidade Nova de Lisboa, Avenida de Berna, 26 C, 1069-061 Lisboa, Portugal^b cE3c | Centro de Ecologia, Evolução e Alterações Ambientais/Faculdade de Ciências da Universidade de Lisboa, Portugal

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ABSTRACT

The goal of the present paper is to analyze spatial overlap and social conflicts between mountain bikers and runners in an Urban Green Park. The methodology uses publicly available volunteer geographic information, compiled in a spatial database with places (tracks) where these activities occur, in order to measure the use intensity. Results show: (1) the rate of biker and runner compliance with the park's trails, and (2) places where potential conflicts among users are likely to happen. Profiling user's preferences can help managers and decision makers to design proper infrastructure for outdoor activities. Strategic management errors can be avoided by knowing user preferences in urban parks, and by offering improved conditions which meet the expectations and needs of different user groups.

MANAGEMENT IMPLICATIONS

This paper presents an efficient method to detect spatial overlaps between different recreational activities which is useful when financial and personnel resources for monitoring visitors in recreational urban green areas are scarce. The dataset comprises Volunteer Geographic Information, publicly available through web sharing services. It constitutes an alternative or a complementary data base compared to direct survey methods. The study revealed the suitability of this methodological approach for the two most popular outdoor recreation activities within urban parks – mountain biking and running.

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1. Introduction

The recreational use of urban spaces has increased significantly in recent years, due to a trend towards healthier lifestyles in which regular exercise plays a leading role (Brown, Schebella, & Weber, 2014; Heath et al., 2006; Williams & Shaw, 2009). Examples include walking, running or biking, activities for which large urban green parks provide excellent conditions. These parks, located within the city, are intended for public use and include landscape features such as trees, shrubs, extended grassy areas, playgrounds or water bodies (Cvejić et al., 2015). Such territories are attractive, whether because of proximity (Giles-Corti et al., 2005) (since the majority of its users are nearby residents of these spaces) or due to the existence of equipment and spaces especially dedicated to host these uses (Kaczynski et al., 2014).

According to Eagles (2014), a research priority, within park tourism, is visitor monitoring, namely use type, intensity and

location, and impact measurements. In terms of urban and local parks the same principle could be applied. Due to the massive use, ecological impacts like species/habitats reduction degradation and fragmentation are likely to occur (e.g., Ballantyne, Gudes & Pickering, 2014; Pickering, Rossi & Barros, 2011). However these effects might be of less concern in green urban areas than in natural ones. In urban environments, social and biophysical carrying capacities should be assessed to ensure good management and service for all users.

Urban green areas are attractive places that provide visitors with many services for health and well-being (Pröbstl-Haider, 2015). In recent surveys, visitors indicated that “being in contact with nature in a peaceful environment” was one of the motivations to attend such places (Manning & Anderson, 2012; Schipperijn et al., 2010; Vasco, 2015). Nevertheless, different recreation activities taking place in the same area can induce spatial and social conflicts, especially during peak usage periods like holidays and weekends (Aikoh, Abe, Kohsaka, Iwata & Shoji, 2012; Nogueira Mendes, Silva & Sila, 2012). Such conflicts can diminish visitors' satisfaction and, in worst scenarios, can lead to collisions and injury. Conflicts among recreational users have been addressed by Rossi, Pickering, and Byrne (2012), Arnberger and Brandenburg

* Corresponding author.

E-mail addresses: teresasantos@fcs.h.unl.pt (T. Santos), rmendes@fcs.h.unl.pt (R. Nogueira Mendes), anaritavasco@gmail.com (A. Vasco).

(2007), Arnberger, Haider, and Brandenburg (2005), Lindsey (1999), Bury, Holland, and McEwen (1983). Rossi, Pickering, and Byrne (2013) have verified that different users on multi-use trails do not always generate conflict, but Vaz, Williams, Silva, & Phillips (2009) proposed that different places and different users require different management strategies. This is particularly important in the context of countries like Portugal where biking and trail running in urban green areas is a recently popularized activity.

Most serious conflicts among recreational uses occur between non-motorized and motorized activities (Rossi et al., 2013). However, among non-motorized ones, such as mountain biking or trail running, there is also a predisposition to serious conflicts, namely in urban parks where both activities occur in the same day-period. Nogueira Mendes et al. (2012) and Campelo (2015) confirmed that mountain biking in peri-urban natural parks near Lisbon occur in the early morning and late evening. If you have the same spatial use, at the same time and at high intensity, conflicts are expected. A common strategy, which usually results in fewer user conflicts, is to offer a network of recreational facilities, normally through trails or footpaths (Nogueira Mendes, Dias & Pereira Silva, 2014a; Wimpey & Marion, 2011). In fact, when there is no formal option or when trails are not adjusted from their intended usage, informal trails tend to appear, along with unauthorized technical features (jumps, bridges, etc.) (Leung, von Ruschkowsk, Pickering, Nogueira Mendes & Kollar, 2014).

Knowledge of what is happening in the territory constitutes the basis for improved sustainable management of urban green parks. Methods for collecting information regarding visitors' preferences and behaviors include applying questionnaires, GPS tracking of visitors or automatic visitors' counters (Arnberger et al., 2005; Muhar, Arnberger, & Brandenburg, 2002; Wolf, Hagenloh, & Croft, 2012; Wolf, Stricker, & Hagenloh, 2013; Wolf, Stricker, Hagenloh, 2012). Alternatively, Volunteered Geographic Information (VGI) can be a valuable tool for mapping leisure activities, allowing information over large areas to be acquired cheaply, if not freely (Foody et al., 2014). Web share services have already been tested for monitoring recreational activities like mountain biking and geocaching (Santos, Nogueira Mendes, Rodrigues, & Freire, 2012; Santos, Nogueira Mendes, & Vasco, 2014; Nogueira Mendes et al., 2012; Campelo & Nogueira Mendes, 2014). Nogueira Mendes et al. (2012, 2014a) presented a methodology for monitoring mountain bikers in a protected area located in Portugal, where uploaded tracks were mapped, allowing inferences about where activities occur, their intensity of use, and the users' preferences. These results provided the park's authority and other stakeholders with a first insight of the mountain biking activity within the park suggesting that the same method could be used to monitor other activities or other places.

The present study innovates the approach of comparing data sets from different activities obtained from VGI, thus providing a new method to monitor outdoor recreation activities. The method is more expedient than traditional ones and takes advantage of the multitude of collaborative and sharing online platforms that many outdoor recreationists use. Examples of general online sharing services with public access include GPSies, Wikiloc Garmin Adventures and Endomondo. Other services, with restricted access (with deployment plans free or paid) include Runtastic or Strava, among others. These also offer other training services or personal counseling (Campelo & Nogueira Mendes, 2014).

The work presented intends to analyze the spatial overlap and social conflicts between mountain bikers and runners in Lisbon's major urban park, Monsanto Forest Park. Both activities are motivated by "a close connection to nature", and often use the same trails, thus contributing to interpersonal conflicts. To study this situation, two datasets were compiled. These included information regarding the park's users, obtained in several inquiries, and a

spatial database, collected through web share services, concerning the places where these activities occur and their intensity.

2. Study area

Located within Lisbon, capital of Portugal, the Monsanto Forest Park (MFP), with about 900 ha, is not only the largest green area in the city, but also the major urban park in the Metropolitan Area. The actual configuration of this recreational area is from 1938 (Decree-Law no. 29135, 16th Nov, 1938) when the afforestation plan was implemented. The only conservation status applied in this area is a Forest Settlement Plan. Intended to serve as the City's "green lung" and as a leisure zone for the local population, it has long been equipped with a wide network of multiple-use trails, classic fitness circuits, bike wash equipment and playgrounds (Fig. 1). The trails' total length is 30.5 km, of which 22 km are pedestrian and bike trails, and 7.4 km are dedicated to cycling. The trails are non-paved. Informal tracks, on the other hand, are very narrow (under 1 m) and in high slope areas.

The Park is on the western side of the city, and is surrounded by seven parishes, and two neighboring counties, Oeiras and Amadora. Located near highly urbanized residential areas, it is crossed by a free-way that divides the park into two areas.

Notorious signs of heavy use and impacts can be observed in the park area, such as informal trails, root exposure and soil erosion. However, unlike other public facilities such as playgrounds, outdoor activities centers or environmental interpretation centers, monitoring the use of such trails is not easy. In addition to the wide dispersal of existing trails and pathways, almost every day small informal shortcuts are added, or paths are illegally opened, which leads to increasing challenges for visitor and trail monitoring (Nogueira Mendes, Vasco, Santos, Ferreira Silva, & Pereira Silva, 2014).

In Portugal, biking and trail running are recent activities in recreational and natural areas (20 to 5 years, respectively). Therefore, there is not a conduct code along with good practices from most users and, consequently, conflicts can occur. Furthermore, the more active users tend not to follow parks' regulations and open off-track trails. A similar behavior was detected by Taczanowska, Arnberger, and Muhar (2006), in LOBAU, a peri-urban park, located in Austria.

In a recent survey conducted in the fields around children's playgrounds and online during June/July of 2014, 366 park visitors were interviewed (Vasco, 2015). The first conclusion was that families are one of major users of MFP, followed by fitness users. The average visitor belongs to the age group between 35 and 44 years, has higher education, works as a specialist in intellectual and scientific professions, and comes from adjacent neighborhoods and surrounding municipalities, which follows the same characteristics identified by Taczanowska et al. (2006). Most of these users are regular visitors of the park, preferably in the summer, for 1 or 2 h with their children, traveling by private car and in groups of up to 5 people. For families, mountain bikers were perceived as responsible for social impacts like potential collisions and/or injuries, while using the trail network. Furthermore, the park's authorities also consider mountain biking activity to be related with illegal trail development (Nogueira Mendes et al., 2014). These facts could be considered as a sign of massive usage of this area from mountain bikers, requiring special attention and monitoring.

3. Material and methods

The main dataset used in this study was collected from GPSies.com, one of the oldest and more popular free web share services

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