Monitoring and management of mountain biking through public participation geographic information systems

Isabelle D. Wolf, NSW National Parks and Wildlife Service, Office of Environment and Heritage, Hurstville, Australia; University of New South Wales, Sydney, Australia, i.wolf@online.ms
Teresa Wohlfart, NSW National Parks and Wildlife Service, Office of Environment and Heritage, Hurstville, Australia
Gregory Brown, University of Queensland, Brisbane, Australia
Abraham Bartolomé Lasa, NSW National Parks and Wildlife Service, Office of Environment and Heritage, Hurstville, Australia
Monica Torland, School of Tourism and Hospitality Management, Centre for Tourism Leisure and Work, Southern Cross University, Australia

Introduction

Many protected areas worldwide have a dual statutory mandate both to provide for visitor enjoyment and for the conservation of natural and cultural heritage. Furnishing quality recreation experiences is essential for national parks and other public green spaces to convey the benefits of visiting parks to the community and to build a constituency for their protection. Mountain biking for example has become an increasingly popular activity in national parks in Australia and elsewhere in the world. A range of benefits can accrue from mountain biking such as individual health and well-being, increased social cohesion and a stronger connection with the natural environment and specific places within parks. However, associated with this activity are also numerous social and environmental issues. Thus park management needs to monitor mountain biking to improve existing experiences or lack thereof while minimising potential impacts.

Participatory planning of public lands is a relatively new development in visitor experience management of parks and other protected areas. In this study we used public participation geographic information system (PPGIS) mapping (Brown and Weber, 2011) combined with questionnaire-based surveying to monitor distributions, needs and certain impacts of mountain bikers in selected national parks and surrounding land tenures in Northern Sydney, Australia.

Methods

PPGIS mapping was performed online via an internet-based map (Fig. 1a-b) and in the field along visitor tracks via a paper-based map, accompanied by a questionnaire-based survey. We addressed three fundamental and spatially implicit management questions that inform both visitor activity development and management: (1) What are the distributions of mountain biking activities and their underlying reasons; (2) What location-specific actions are required to improve existing experiences; (3) How can track infrastructure be shared between different activity groups and what are the potential social conflicts.

(a) Mapping
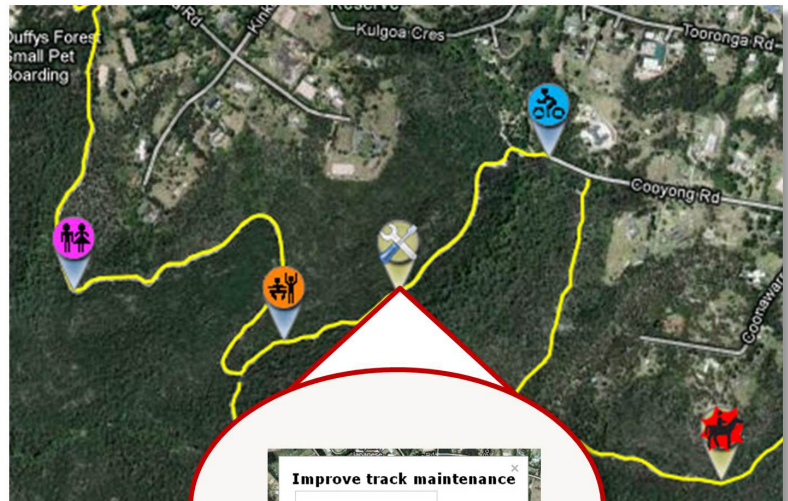
(b) Commenting
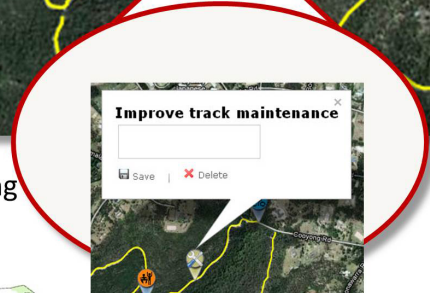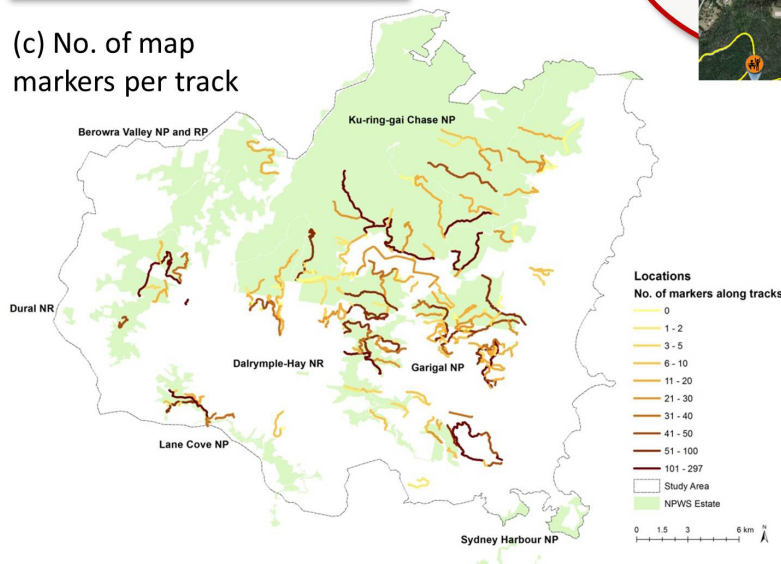
(c) No. of map markers per track

Fig. 1 Internet-based public participation geographic information system (PPGIS) to (a) map and (b) comment on locations, reasons and required actions for mountain biking experiences in northern Sydney. (c) Exemplary map showing number of location markers that were placed by participants along specific tracks within northern Sydney, illustrating visitor distributions.

Preliminary Results

(Re. management question 1) PPGIS enabled us to construct detailed maps and tables of distributions and underlying reasons for mountain biking in Northern Sydney. Fig. 1c illustrates how distributions of mountain bikers can be visualised via ArcGIS maps. Locations of rides correlated strongly with numerous motivations to ride, as inferred from the number of location and reason (motivation) markers placed along specific tracks frequented by mountain bikers within northern Sydney. The strength of the correlation though depended upon whether motivations were mapped inside or outside of parks. For example, for mountain bikers riding outside of parks was strongly driven by the desire to improve riding skills, explore new areas, to experience technical features, excitement, challenging slopes, and because of the convenience and closeness to home.

These correlations were much weaker inside parks. Several motivations however were similarly important inside and outside of parks, including the desire to improve fitness/endurance, socialise with family/friends, enjoy nature/views/scenery, good track surface/conditions, and peace/quiet/solitude.

(Re. management question 2) The most requested actions included opening up tracks for riding, adding linkages between tracks, track maintenance, provision of improved signage and better track design. Detailed distribution maps and tables of these and other actions were constructed based on the PPGIS data, and complemented through findings from the questionnaire-based survey.

(Re. management question 3) We identified areas of overlap of usage by mountain bikers and other visitor groups, and discovered evidence that conflicts (or 'misunderstandings') may arise in specific locations. A greater proportion of advanced and expert mountain bikers compared to beginners or intermediate bikers experienced conflicts. These occurred primarily with motocross/trail bike riders, dog owners and walkers, and to a lesser extent with horse riders and other mountain bikers. Conflicts were almost exclusively based on verbal confrontation or near collision (vs. physical or collision). Commenting on conflicts in the survey was more extensive than the placing of markers via the PPGIS, which may indicate that conflicts are less track-specific than for example requests for track maintenance. The PPGIS made it evident though that conflicts were restricted to areas of overlapping usage, usually only a few tracks, and that conflicts with horse riders were clearly more common within national parks (approx. 70%) whilst conflicts with walkers and other mountain bikers were more common outside of national parks. Open-ended survey comments suggested that some mountain bikers perceived motocross riders as rude, thought that they accessed tracks illegally and caused considerable damage to tracks. Some mountain bikers thought that dog owners needed to be more aware of using a leash on their dogs, in particular as they had experienced dog attacks. At times walkers were thought to be an obstacle to tracks, and misinformed in regards to the use of tracks (e.g., where mountain biking is allowed). Solutions to conflicts were seen in the provision of separate user-specific single tracks, signage to inform about other visitor groups, and the distribution of information identifying needs, safety issues and priorities of different visitor groups.

Conclusions

This research demonstrated that PPGIS mapping is a useful tool to facilitate spatial decision making in national park planning for mountain biking. Data on visitor distributions and requested actions are fundamental for improving visitor experiences in parks and adjacent land tenures. They are further important to manage social conflicts, and can be used for a variety of other purposes such as to ascertain the linkage between park usage and impacts on infrastructure and the environment.

We found limitations and future potential for the application of PPGIS, and the need to combine PPGIS with a survey component to collect participant information and other data that are not or less spatially implicit. Validating PPGIS mapping data that inform about reported park visitation with complimentary techniques such as GPS tracking that inform about actual visitation (Wolf et al., 2012) are currently being explored. Overall, PPGIS offers significant opportunities for park agencies beyond their traditional visitor monitoring techniques in order to engage the public in a productive way to collect large amount of location-specific data. Findings assist in prioritising

future visitor management actions across multiple land tenures and facilitate integration of public stakeholders and local knowledge held by the community in park planning processes.

References

Brown, G. & Weber, D. 2011. Public Participation GIS: A new method for national park planning. Landscape and Urban Planning, 102, 1-15.

Wolf, I. D., Hagenloh, G. & Croft, D. B. 2012. Visitor monitoring along roads and hiking trails: How to determine usage levels in tourist sites. Tourism Management, 33, 16-28.