Applications of GIS in Spatial Visitor Management of Protected Areas

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1 Introduction
Spatial land use planning is a critical component of visitor management in urban parks and other protected areas. It serves to manage visitor distributions in relation to park infrastructure and landscape features (Wolf, Hagenloh, & Croft, 2012; Wolf, Stricker, & Hagenloh, 2012; Wolf, Stricker, & Hagenloh, 2013).

2 Methods
Participatory spatial planning of public lands is a relatively new development in visitor management. In this research we used public participation geographic information system (PPGIS) mapping and tracking combined with questionnaire-based surveying to monitor distributions, land use behavior, and certain impacts of visitors to selected national parks and surrounding land tenures in Northern Sydney, Australia (Wolf, Wohlfart, & Brown, 2014; Wolf, Wohlfart, Brown, & Bartolomé Lasa, 2015).

Fundamental spatially implicit management questions were asked on (1) distributions of visitors; (2) spatial overlap of different visitor activities; (3) use of visitor infrastructure; (4) location-specific actions required to improve existing visitor experiences. (5) Another aim was to evaluate the various PPGIS methods.

3 Results
3.1 Results: How do visitors distribute in parks?
• PPGIS mapping allowed for detailed mapping of visitor distributions. Generally visitors tend to aggregate in parks using preferred infrastructure for their activities or movements between sights/sites.

3.2 Results: How do different visitor activities spatially overlap?
• PPGIS mapping was used to identify areas of overlap of visitation by mountain bikers and horse riders. This generated evidence that conflicts may arise in specific locations.

3.3a Results: How do visitors use infrastructure: park assets?
• Similarly as shown for visitor movements along tracks in parks, PPGIS is effective at capturing visitor use of point assets such as picnic tables. In this case we used PPGIS tracking (GPS tracking).
• Notably, assets or landscape features in the proximity of other assets strongly influenced their use. For instance, proximity to barbecues, parking lots, playgrounds, toilets and garbage bins either attracted or repelled visitors from using picnic sites depending on their primary motivation to visit.

3.3b Results: How do visitors use infrastructure: interpretative media?
• Varying demand for specific visitor assets or the effectiveness of interpretive media to attract visitors to various sights can be captured through several important variables:
  - Attracting power: percentage of visitors who stop at an asset/sight,
  - Distracting power: number of detours that visitors take to access assets/sights off the main path,
  - Holding power: time spent at an asset/sight.

3.4 Results: How can visitor experiences be improved?
• PPGIS mapping can be used to visualise actions required to improve visitor experiences.

3.5 Results: How do the different PPGIS visitor monitoring methods compare?

References: