Landscape and Urban Planning 102 (2011) 1–15

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Public Participation GIS: A new method for national park planning

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ARTICLE INFO

Article history:
Received 21 September 2010
Received in revised form 1 March 2011
Accepted 12 March 2011
Available online 14 April 2011

Keywords:
Park experiences
Environmental impacts
PPGIS
Indicators
Standards
Public participation GIS

ABSTRACT

This paper describes research to evaluate the use of a public participation geographic information system (PPGIS) methodology for national park planning. Visitor perceptions of park experiences, environmental impacts, and facility needs were collected via an internet-based mapping method for input into a national park planning decision support system. The PPGIS method presupposes that consistent with the dominant statutory framework, national parks should be managed for both visitor enjoyment and natural and cultural resource protection. This paper: (1) describes the PPGIS method used in a 2009 park planning study conducted for national parks in the Greater Alpine region of Victoria, Australia; (2) presents and evaluates selected results of the Greater Alpine study and provides examples of how PPGIS data can be used for decision support in park planning; (3) provides a summary of lessons learned including a discussion of future implementation constraints. The results demonstrate that an internet, participatory mapping method, though not without limitations, can be effective in measuring visitor experiences, environmental impacts, and facility needs for a variety of park planning processes. PPGIS expands a park agency's repertoire of methods to engage the public in planning and can help build and sustain trust in a park agency's planning process and decisions.

1. Introduction

Most national park systems have a dual and potentially conflicting statutory mandate to provide for both visitor enjoyment and natural and cultural landscape protection. For example, the purpose of U.S. National Park system is "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (National Park Service Organic Act of 1916, 16 U.S.C. 1). In the U.K., the purposes of national parks are to conserve and enhance the natural beauty, wildlife and cultural heritage while promoting opportunities for the understanding and enjoyment by the public, with an added duty to foster the social and economic well-being of the local communities (National Parks and Access to the Countryside Act of 1949, Part II § 5 and 11a). In Victoria, Australia, the location of this study, the purpose of Parks Victoria is to conserve, protect, and enhance natural and cultural values, provide quality experiences, services and information to customers, provide excellence and innovation in park management, and contribute to the environmental, social and economic wellbeing of Victorians (Parks Victoria, 2009).

To be effective, national park management authorities require park planning and management methods that provide useful information for decision support including information about visitor experience and resource protection. Resources available for park planning and decision-making include statements of park purposes, observations of park staff, indicators and standards of quality, and public input (Anderson, Lime, & Wang, 1998). Common to national park planning is the development of plans that recognize the diversity of national park resources and visitor opportunities both within individual national park units, and at different parks on a regional or national scale. Differential national park qualities may be reflected in a regional or national park system plan (e.g., Ecosystem Management Plan), a park comprehensive plan (e.g., a Master or General Management Plan), or a park sub-area plan (e.g., a Backcountry Management Plan).

Two planning concepts that are central to national park planning are park management zones and indicators of quality. Large parks comprise multiple management zones that address management priorities within a park (e.g., conservation, recreation or educa-

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doi:10.1016/j.landurbplan.2011.03.003

tion) and typically reflect the spatial heterogeneity of biophysical conditions and visitor opportunities. Management zones provide a means to spatially separate potentially conflicting park activities, or alternatively, to collocate complementary activities. The potential for diverse visitor experiences is recognized in various public lands planning frameworks such as the Recreation Opportunity Spectrum (Driver & Brown, 1978); Limits of Acceptable Change (Stankey et al., 1985), Visitor Impact Management (Graefe, Kuss, & Vaske, 1990), Visitor Activities Management Process (Parks Canada, 1991); Visitor Experience and Resource Protection (Hof & Lime, 1997; Manning, Graefe, & McCool, 1996; Wilkinson, 1995), and Quality Upgrading and Learning (Chilman, Foster, & Everson, 1990). Future park management frameworks will likely move towards a systems approach focused on linkages between the physical environment and visitor opportunities (Brown, Koth, Kreag, & Weber, 2006) and the application of geographic information systems (GIS) technology can facilitate these linkages.

Indicators and standards of quality are often attached to management zones to provide criteria to assess the effectiveness of management activities. Indicators may be established for both physical resources and experiential outcomes. For example, on Kangaroo Island in South Australia, environmental indicators include the number of hooded plover pairs and the percentage of waste diverted from landfill on the island, whereas the experiential indicators include the proportion of visitors who believe they had an intimate experience with wildlife in a natural setting, and the proportion of visitors who believed their experience was similar to that suggested in marketing documents (TOMM, 2006). Other common indicators used in park management include encounters with particular visitor groups (Hall, Shelby, & Rolloff, 1996; Martinson & Shelby, 1992; Stankey, 1980; Vaske, Graefe, Shelby, & Heberlein, 1986; Young, Williams, & Roggenbuck, 1991); number of groups camped within sight or sound of each other (Roggenbuck, Williams, & Watson, 1993; Williams, Roggenbuck, Patterson, & Watson, 1992; Young et al., 1991); number of pieces of litter visible from campsite (Roggenbuck et al., 1993); and depth of erosion on a trail (Parks and Wildlife Service Tasmania, 2003).

Standards are threshold points associated with an indicator (e.g., depth of erosion should not exceed 3 cm or "no more than six encounters with other groups per day during peak season"). Establishing useful and cost effective indicators remains a major challenge to park managers. Research as early as Clark, Hendee, and Campbell (1971) demonstrated differences between recreationists and managers in defining what constitutes an environmental experience, highlighting the need to seek public input when establishing indicators and standards.

Public participation is important to protected area planning and management because decisions about management zones and indicators of quality involve a series of subjective value judgments and a diversity of interests (McCool & Cole, 1997). Experiential knowledge gained through a public involvement process can add different perspectives and augment scientific knowledge and expert judgment. The scope of public participation in park planning can vary widely from inviting individual comments on a park plan, to working with national park stakeholder groups in a planning process, to broad-scale surveys of park visitors. It is important in public participation GIS (PPGIS) projects (described below) to articulate clear goals and understand the limitations of the project. For example, acknowledging that visitors perceptions of management will be based on a range of socioeconomic and individual factors including past experience, may lead us to expect that an assessment of current management effectiveness conducted by a visitor is likely to be different to that conducted by a manager who is likely to have a different set of experiences.

Gathering high quality public input is however, a difficult task for park managers. It is difficult to engage many visitors in park planning when they are intent on enjoying limited leisure time. Further, parks are often large and dispersed with low number of staff which makes intercepting park visitors difficult. Research by Weber (2007) in other Parks Victoria sites highlighted demand by visitors for convenient participation methods with the internet being cited frequently as an example of a convenient method. The internet PPGIS platform developed for this study provides a useful mechanism to gather public input from a wide spectrum of Australians. In 2009, 80.1% of the Australian population used the internet (Nielsen, 2009). In 2005 it was estimated that these users have a median age of 36.56 years (www.internetworldstats.com). Importantly, the Australian Bureau of Statistics (2010) showed 71% of users had broadband connections of speeds of 1.5 Mbps or greater which makes using the internet-based PPGIS, particularly accessing the demonstration, a quicker exercise.

As well as being a convenient method that is accessible to the general public, respondents seem to readily understand internet-based PPGIS systems. People's spatial awareness and use of mapping is likely to have improved with usage of programs such as Google Maps and Near Maps. This does not suggest that more traditional methods such as public meetings, focus groups or surveying should not take place. In fact, the PPGIS reported in this study was only one method of a variety used to elicit public input for a management plan. What makes a PPGIS system particularly valuable to land managers is the functionality it provides, for example the ability to overlay visitor data on existing GIS layers such as trails, vegetation and soil. This paper uses data from a project in the Alpine area of Victoria to demonstrate the application of PPGIS in park planning.

1.1. Review of PPGIS applications

In this paper, we present public participation using geographic information systems (PPGIS) as a method for assisting national park planning. The term "public participation geographic information systems" (PPGIS) was conceived in 1996 at the meeting of the National Center for Geographic Information and Analysis (NCGIA). PPGIS combines the practice of GIS and mapping at local levels to produce knowledge of place. The formal definition of the PPGIS remains nebulous (Tulloch, 2007) with use of the term "PPGIS" emerging in the United States and developed-country contexts while the term participatory GIS or "PGIS" is often used to describe participatory planning approaches in rural areas of developing countries, the result of a spontaneous merger of Participatory Learning and Action (PLA) methods with geographic information technologies (Rambaldi, Kwaku Kyem, Mbile, McCall, & Weiner, 2006). Since the 1990s, the range of PPGIS applications has been extensive, ranging from community and neighborhood planning to mapping traditional ecological knowledge of indigenous people (see Sieber, 2006 and Sawicki & Peterman, 2002 for a review of PPGIS applications). Although PPGIS activity often involves community mapping and database development outside of formal government processes, the focus of this paper is on the genre of PPGIS that seeks to expand and enhance public participation and community collaboration in governmental processes for environmental planning and management.

In an early PPGIS public lands application, Brown and Reed (2000) asked individuals to identify the location of landscape values for the Chugach National Forest (U.S.) planning process. Reed and Brown (2003) subsequently developed a quantitative modeling approach using the PPGIS mapped attributes to determine whether management alternatives were generally consistent, and more important, place-consistent, with publicly held forest values. Research using PPGIS has also been conducted to identify the location of highway corridor values (Brown, 2003); to iden-