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Research article

Multiple methods of public engagement: Disaggregating socio-spatial data for environmental planning in western Washington, USA

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1. Introduction

Environmental planners and conservation scientists emphasize the importance of taking into account the cultural services provided by ecosystems when making environmental management decisions (Daniel et al., 2012). The Millennium Ecosystem Services Assessment (MEA) (2005: 8) defines cultural services as the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences." Included among these benefits are "cultural diversity, spiritual and religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, recreation and ecotourism" (Daniel et al., 2012). Rawluk et al. (2017: 13) argue that knowing which attributes the public values in a given landscape is important because such knowledge "can support the alignment of policy and planning to social priorities and expectations." Environmental planning processes that engage multiple publics are an important means by which environmental managers can identify a broad range of uses and values assigned to areas that are targeted for management actions (Ellis et al., 2010; Luyet et al., 2012; Reed, 2008).

Recent studies indicate that public participation GIS (PPGIS) has the potential to expand the ability of managers to reach a broad spectrum of the public during environmental planning processes (Brown and Kyttä, 2014). Tulloch (2008: 353) define PPGIS as a "field within geographic information science that focuses on ways the public uses various forms of geospatial technologies to participate in public processes, such as mapping and decision making." By linking uses and values to locations in the form of GIS data layers, PPGIS facilitates environmental planning analyses that account for social values (Sherrouse et al., 2011). The social data layers created through PPGIS can be structured for use with analytical techniques such as an analytical hierarchical process (AHP), which combines qualitative and quantitative factors for ranking and evaluating alternative scenarios (Bathrellos et al., 2012). Bathrellos et al. (2013) combined socioeconomic data along with geological and natural hazard data to develop rural development and urban suitability maps (Bathrellos et al., 2013, 2017). Brown and Reed (2012) used a variant of the AHP approach, known as values compatibility analysis, to develop an all-terrain vehicle use suitability map for a national forest in Oregon, USA that incorporated social values data collected through a PPGIS process.

PPGIS projects engage the public in a variety of ways, ranging from mail, Internet, or in-person surveys to community workshops and focus groups (Brown and Kyttä, 2014; McLain et al., 2013b). They also employ diverse technologies, including paper maps, interactive online maps, and offline computerized mapping applications. As PPGIS becomes more widely used, the question of which publics PPGIS engages assumes greater importance (Brown, 2012). Decisions based on input from one public may have unanticipated or disproportionately negative impacts on unrepresented publics. And decisions made without input from key segments of the public may prove difficult to implement. However, determining who constitutes the relevant public is challenging (Predmore et al., 2011). Factors such as geographic scope, the issues involved, and who has relevant knowledge all affect which publics are relevant for a particular planning process (Schlossberg and Shuford, 2005).

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Most planning situations involve multiple relevant publics, each with its own set of interests and differing levels of comfort with various forms of public engagement (Glucker et al., 2013; Haddock and Quinn, 2016). Gaining a better understanding of which publics are likely to be reached with which PPGIS approaches is of critical importance if such projects are to expand public input into environmental decision-making.

In a review of PPGIS studies conducted primarily in the global North, Brown (2012) found that participants tended to be disproportionately older, white men with relatively high levels of income and formal education. There are exceptions to this tendency, however. Pert et al.'s (2015) indigenous cultural ecosystem services mapping project in Australia and Carver et al.'s (2009) use of PPGIS for fire management planning in Montana both involved only members of indigenous groups. Only a few studies (Brown et al., 2014; Pocewicz et al., 2012) compare how the type of PPGIS approach or technology used affects who participates. These studies are ambiguous as to whether different types of participants differ in the values they assign to the landscape or in their environmental management preferences. Pocewicz et al. (2012) found that PPGIS participants in Wyoming who used paper maps tended to be older, had lived in the area longer, and had less formal education than respondents who completed the same survey online. Yet, both groups mapped similar places and gave similar reasons for why those places were important. In contrast, Brown et al. (2014) found that participants in a landscape values mapping workshop were more likely to be men and somewhat older than those who did the values mapping online. Additionally, rural residents were less likely than urban residents to participate in the online survey (Brown et al., 2014). They found relatively little overlap in the spatial location of sites marked by the two sets of participants. Sites considered important for recreation, however, overlapped 67 percent of the time. As PPGIS becomes more widely used, additional studies regarding differences in who participates in workshop and online processes are needed so that managers can develop outreach strategies that are more effective at reaching a greater diversity of population subgroups.

Factors that have been found to affect the types and locations of mapped activities, values, or management preferences include livelihood occupation (Brown et al., 2015a), community of residence (Alessa et al., 2008; Beverly et al., 2008), stakeholder group (Brown et al., 2015b), self-reported familiarity with the area (Brown and Weber, 2011), income (Brown and Weber, 2011), and proximity of domicile to study or project site (Brown, 2016). Of these factors, residence location has emerged as particularly important in shaping what values people map and where they map them (Brown, 2016). PPGIS participants have a tendency to map values or activity sites that are close to home (Beverly et al., 2008; McLain et al., 2013a) and assign high values to places near their homes (Alessa et al., 2008). Pocewicz and Nielsen-Pincus (2013) documented a phenomenon known as geographic discounting, in which individuals mapped positive biological conditions and land use preferences closer to their homes and negative conditions and land use preferences further from their homes. Sociological studies show that significant differences exist between urban and rural residents' outdoor recreation activities (Cordell, 2012; Dwyer, 1994). However, only one PPGIS study (Brown et al., 2015a) has looked explicitly at how values mapping patterns differ along an urban-rural continuum. That study showed that rural landholders' values were concentrated in smaller areas and located closer to their homes than those of urban or semi-urban landholders. Brown (2016) reported that differences in place of residence was one of two conditions associated with higher potential for mapping bias and calls for research that pays attention to geographical representativeness in PPGIS projects.

The need for public engagement strategies to consider the role of place and community type has become apparent (Pert et al., 2015). Measham et al. (2011) found that residents of isolated dryland communities in Australia faced significant barriers to participating in government-run community engagement processes owing to the long distances and pressing seasonal work demands that residents in urban areas did not face. Efforts to implement interactive web-based public engagement forums in England for flood risk management (White et al., 2010) and urban development in Toronto (Rinner and Bird, 2009) indicated that online applications can improve the reach of engagement processes, however, they may not be effective at reaching population segments that are less technologically inclined. Differential participation in the face-to-face dialogue and interactive web engagement processes described above suggest that what works in one context may not work in another, and that there is therefore a need for multiple engagement strategies when engaging with different communities.

The primary aim of this article is to enhance understanding about how two commonly used PPGIS approaches—community workshops and internet surveys—differ in who they bring to the environmental planning table. A secondary aim is to expand knowledge about favored destinations and activities associated with public forest road networks, with a focus on exploring how favored destinations and activities differ for urban and rural residents. Our study contributes to the field of environmental planning and management in several ways. First, it helps fill the gap in knowledge about whether and how different types of PPGIS approaches differ in terms of the publics that they are able to engage in environmental deliberation processes. Second, very little research has been published regarding the uses and values different segments of the public associate with forest road networks on public lands. Given that many countries have extensive forest road networks on public lands, this is an important knowledge gap that our study addresses. From a practical standpoint, the lessons learned from this PPGIS project can inform the development of more effective and broader reaching PPGIS strategies and data analysis procedures for a variety of environmental planning situations.

2. Study area

This study took place in the Mt. Baker-Snoqualmie National Forest (MBSNF) located in Washington (USA) on the western slope of the Cascade Mountain Range. The 6870 sq km forest borders Canada on the north and extends south 370 miles to Mt. Rainier National Park (United States Department of Agriculture, Forest Service (USDA-FS), 1990). The national forest includes nine wilderness areas (covering 3340 sq km) and provides access to two heavily visited national parks, North Cascades and Mt. Rainier. Steep topography and dense vegetation make travel through and across the MBSNF and surrounding areas difficult and most major transportation routes closely follow rivers. The MBSNF is categorized as an urban national forest because of its proximity to several large urban areas. Parts of the forest are located 70 km east of the Seattle metropolitan area (pop 3.7 million) (US Census Bureau, 2015). The northern part of the forest is located within 70 km of the Vancouver, BC metropolitan area (pop 2.5 million) (British Columbia, 2016). Dozens of rural communities with a long history of reliance on timber and other natural resources derived from the national forest also are an important part of the MBSNF's socio-economic fabric. With 2.0 million annual visitors, the MBSNF is one of the most heavily visited national forest in the United States (USDA-FS, 2010). The most popular activities for visitors are hiking, downhill skiing, and scenic viewing (USDA-FS, 2010). Four major